School Board Action Report

High School Science Instructional Materials Adoption, April 2019

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This Board Action will approve the recommendation of the High School Instructional Materials Adoption Committee for instructional materials for all students taking 9th grade Chemistry A (CHEM A), 9th grade Physics A (PHYS A), 10th grade Biology A (BIO A), 10th grade Biology B (BIO B), and 11th grade Physics B (PHYS B). This Report includes a set of supporting documents, some of which, by their nature, are not fully ADA-compliant.

SCHOOL BOARD ACTION REPORT

DATE: April 5, 2019
FROM: Ms. Denise Juneau, Superintendent
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For Introduction: ~~May 1,~~ May 15, 2019
For Action: ~~May 15,~~ May 29, 2019

1. TITLE

High School Science Instructional Materials Adoption

2. PURPOSE

This Board Action will approve the recommendation of the High School Instructional Materials Adoption Committee for instructional materials for all students taking 9th grade Chemistry A (CHEM A), 9th grade Physics A (PHYS A), 10th grade Biology A (BIO A), 10th grade Biology B (BIO B), and 11th grade Physics B (PHYS B).

3. RECOMMENDED MOTION

I move that the Seattle School Board approve the High School Science Adoption Committee's recommendation to adopt Carbon TIME for instructional materials for Seattle Public Schools' high school Biology A (BIO A) science classrooms, the BIO B curriculum, developed by Seattle Public Schools in collaboration with university partners, for instructional materials for Seattle Public Schools' high school Biology B (BIO B) science classrooms, the CHEM A curriculum, developed by Seattle Public Schools in collaboration with university partners, for instructional materials for Seattle Public Schools' high school Chemistry A (CHEM A) science classrooms, and PEER *(Physics through Evidence: Empowerment through Reasoning)* for instructional materials for Seattle Public Schools' high school Physics A and B (PHYS A and B) science classrooms.

I further move that the Seattle School Board authorize the Superintendent to purchase Carbon TIME as the core instructional materials for Seattle Public Schools' high school Biology A (BIO A) science classrooms, to approve the District-Developed Curriculum for BIO B as the core instructional materials for Seattle Public Schools' high school Biology B (BIO B) science classrooms, to approve the District-Developed Curriculum for CHEM A as the core instructional materials for Seattle Public Schools' high school Chemistry A (CHEM A) science classrooms, and to purchase PEER as the core instructional materials for Seattle Public Schools' high school

Physics A and B (PHYS A and B) science classrooms, for an amount not to exceed $1,034,132, covering licensing through school years 2019-20 through 2027-28.

4. BACKGROUND INFORMATION

A. Background

1. Previous Adopted High School Science Instructional Materials

The most recent high school biology instructional materials adoption in Seattle Public Schools was in 2001-2002. The textbook from BSCS: A Human Approach was adopted from Kendall Hunt Publishing. The textbook was aligned with the 1997 Washington State Standards and Essential Academic Learning Requirements and included an emphasis on student inquiry in the science classroom. These adopted materials were aligned with the now outdated 1996 National Science Standards. The printed materials have publication dates that range from 1997-2001. The instructional strategies included in these materials are no longer best teaching practices and include repetitive content taught in elementary and middle school.

The most recent high school science instructional materials adoption for 9th grade physical science in Seattle Public Schools was in 2001. This course provided the foundation for yearlong Physics and Chemistry. The Active Physics and Active Chemistry series from the publisher It's About Time were centered around student inquiry, and the associated pedagogy was a significant shift for teachers. While a university physics science coach provided professional development until to 2007, it was apparent that physical science teachers, typically in their first years of teaching, needed more support to properly implement the curriculum. From 2007-2009, Seattle Public used a 3-year grant to develop teacher competencies in three areas: content knowledge, pedagogical knowledge and skills in formative assessment. This supported teachers in all science disciplines but did not provide updated curricula for Physical Science or Chemistry teachers.

In the fall of 2010, the Board approved the convening of an Instructional Materials Adoption team to make a recommendation for the adoption of Physical Science, Chemistry, and Physics Instructional Materials. In the spring of 2011, the Science Instructional Materials Adoption Committee made a recommendation of the following instructional materials to the Board: Lab Aids for Physical Science, Living by Chemistry for Chemistry, and Arizona State developed Modeling Physics. The Board did not approve the science adoption. Therefore, no materials were purchased for either Physical Science nor for Chemistry.

Without funding for a full adoption, Seattle Public Schools could only aid in the development of teacher skills to "make it work" with current materials. For Chemistry, this meant teachers modifying any individual teacher created curricula and/or lessons associated with the Chemistry textbook by Addison-Wesley published in 1995. Addison-Wesley is comprehensive in content addressing fundamental concepts such as atomic structure and chemical reactions, but also more complex concepts such as organic

chemistry and acids and bases. The text provided confirmation labs and practice with math but set the teacher up to be the "keeper of knowledge," providing few opportunities for sense-making by students.

Seattle Public Schools partnered with university professors and hosted two-week summer institutes in physics, biology, chemistry and earth science. A subset of both SPS Physics and Physical Science teachers attended a two-week physics training to immerse teachers on physics content and modeling practices in August of 2010. While teachers improved their instructional skills and gained a stronger understanding of content, updated common curricula were not funded for district-wide use. Teachers began to use these materials despite the fact they were not adopted. Without an adoption, teachers are not required to follow these suggested materials. Even though many teachers did use the materials, many others continued to create their own materials, creating pockets of autonomy across the district which led to inequitable experiences for students.

Teachers have realized, and attempted to mitigate, the inadequacy of the current instructional materials in physical science and chemistry to align with the new standards and have tried to fill the void with a variety of disjointed materials, including free internet resources, textbooks, and teacher-created units. Schools with high lab donations, lower teacher turnover, and low free-and-reduced lunch numbers, have used funds to purchase supplemental materials for their schools. This resulted in schools with highly varied instructional resources in both quality and quantity and a lack of common scope and sequence in curriculum and assessment across the district. This patchwork of disjointed and supplemental science curricula across our district's high schools is not replicable, sustainable, or equitable at a systems level, and has left many of our high school students with an inadequately understanding of chemistry.

Current, relevant, and important science topics such as global climate change, gene regulation, space science, and engineering are entirely absent from the current adopted curriculum. Other important topics such as the particulate nature of matter, earth science, waves and energy, photosynthesis, and cellular respiration are only lightly touched upon. The lesson activities are primarily "cookbook" labs, in which students follow an experimental procedure with no embedded opportunities for sense-making, engaging in scientific argument, or explaining phenomena, which has resulted in decades of science instruction characterized by "hands-on" but not "minds-on."

2. 2013 WA State K-12 Science Learning Standards, 2013-Present

In 2013, the Washington State legislature officially adopted the national science standards called the Next Generation Science Standards (NGSS) as the Washington State K-12 Science Learning Standards (WSSLS). The new science and engineering standards call for a significant shift in instruction that will engage more students in science. The shift in science pedagogy called for in the new standards provides all students with 21st century skills not previously embedded within science coursework.

The 2013 Washington State Science Learning Standards are organized into three dimensions: science content, science and engineering practices, and cross-cutting concepts. The pedagogy called for in the new standards focused on students "figuring out" instead of simply "learning about," by engaging students in gathering evidence to

explain scientific phenomena, discourse and argumentation, data analysis, supporting claims from evidence, and integrating technology into science education and engineering design. The new standards also include an entire strand focused on engineering design, both in practice and in the context of science content.

3. 2013 Washington Comprehensive Assessment of Science (WCAS)
In spring of 2018, the new Washington Comprehensive Assessment of Science (WCAS) was implemented statewide for the first time at grades 5, 8, and 11. This is the first state assessment to assess student proficiency around the 2013 Washington State Science Learning Standards. The new test is an entirely digital assessment requiring students to engage interactively with technology to manipulate elements on the screen to demonstrate understanding of scientific principles and practices. Each assessment item explicitly integrates at two or three of the dimensions (Disciplinary Core Ideas, Cross-Cutting Concepts, and Science and Engineering Practices) that comprise the science standards. The test will be administered annually to all grade 5, 8, and 11 students across the state and will be a graduation requirement beginning in 2021.

From 2010 to 2017, Washington State's high stakes science assessment was the Biology End of Course exam for all students and was required for graduation.

4. High School Science Standards Alignment Team & Professional Development
From 2007-2010, SPS received a Math Science Partnership grant from OSPI to build teacher content area in biology, physics and chemistry. The professional development offered skills in three areas: Content knowledge, pedagogical content knowledge, and skills in formative assessment. As teachers developed these skills, they realized the current adopted materials did not have a clear model that took into account initial ideas or one that addressed the systems approach from the new standards. Teachers worked with universities, such as University of Washington and Everett Community College, to use materials developed for undergraduate students in biology, collaborated with other districts, and attended local and national conferences. Without the outside grant, SPS high school teachers would not have had the money to participate in learning best practices based on brain research, nor would they have received learning on formative assessment practices. Unfortunately, deep learning in pedagogy and assessment was not enough. They needed instructional materials to allow them to enact these skills. This collective work made the teachers even more aware of the deficiency of the adopted material.

In 2015, the district articulated that standards alignment and common curricular scope and sequence for all students in all schools was one of the highest priorities for the Curriculum, Assessment, and Instruction department. In response to this important initiative, the Science department convened a High School Science Alignment Team to develop a strategic plan to align with the state's adopted science standards. The team was comprised of a diverse membership, representing all of the district's comprehensive high schools as well as representatives from some of the District's alternative high schools. Each committee member dedicated over 100 hours of their time to evaluating the standards and determining how to attend to the 72 high school standards over the 3 required years of science for graduation. (Note: Washington State now requires 3 years of science for all students as a minimum graduation requirement.) The committee members

met extensively with their building colleagues to seek input and determine the final scope and sequence for science. The resulting sequence includes Physics A and Chemistry A for 9th graders, Biology A and Biology B for 10th graders, and a variety of options for students in grade 11. One of the 11th grade options will be Physics B and Chemistry B.

Concurrent to the work of the alignment committee, high school teachers were invited to attend district-wide professional development sessions offered by the district science department in collaboration with higher education partners from Seattle Pacific University and the University of Washington. This professional learning was to help them develop understanding of the pedagogical shifts called for by our new science standards and to begin transitioning their instruction and assessment practices to align with these standards. An important outcome of this professional development was the need for instructional materials that align with the complex and innovative new science standards.

5. High School Adoption Process and Committee Work, November 2018-Present

The School Board instructed the science team of Curriculum, Assessment, and Instruction to launch a high school science instructional materials adoption in April 2018. The adoption process was carried out over a 7-month period and proceeded according to guidelines outlined in School Board Policy 2015. The process occurred in three phases: Stage 1, Field Test, and Stage 2 (see Attachment F).

5a. Stage 1: October 2018-December 2018

A High School Science Adoption Committee comprised of teachers, school leaders, parents, professionals in STEM fields, and other community members was selected through an application process to ensure a committee that represented the diversity of stakeholders diverse in SPS, including geography, race, ethnicity, gender, and age (see Attachment D).

The committee members identified five categories and 71 specific criteria for evaluation, based on the needs, priorities, data, and research that emerged from the following sources:

- 2013 Washington State Science Learning Standards (adopted from the 2013 Next Generation Science Standards)
- Preliminary Family/Community and Teacher/Staff needs assessment and input survey, which identified the priorities around science materials, instruction, and learning in our district
- A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (National Research Council [NRC] of the National Academy of Sciences)
- The Educators Evaluating the Quality of Instructional Products Rubric (EQuIP) for Science
- Anti-Bias Criteria Screening Tool outlined in Board Policy 2015
- WA OSPI Equity & Civil Rights Task Force

- SPS Formula for Success

The categories were weighted, and a draft of the Science Adoption Review Criteria was presented to the SPS Instructional Materials Committee (IMC) for feedback and the final draft approved for use as the committee's evaluation tool of candidate programs (see Attachment E). The weighted review criteria categories, as voted by the committee included:

- Category 1: Standards Alignment (24%)
- Category 2: Assessments (20%)
- Category 3: Inclusive Educational Practices (17%)
- Category 4: Evaluation of Bias Content (16%)
- Category 5: Instructional Planning and Support (23%)

Nine curriculum vendors responded to the District's Procurement Department's Request for Proposal (RFP). Two programs developed by District science teachers, in collaboration with university partners, were also presented to the Committee. Of the candidates, six offered materials for consideration for BIO A, six for BIO B, eight for CHEM A and CHEM B, and six for PHYS A and B. Between October and December 2018, committee members worked collaboratively in small review teams, composed of both teachers and community members whenever possible, to examine each of the instructional programs using the Review Criteria. The review teams assigned each criteria and category a quantitative score along with annotations based on evidence collected directly from the program materials.

Each of the instructional programs were reviewed a minimum of two times. Due to the breadth and depth of the criteria contained within the five categories of the Review Criteria, a protocol was proposed in which a vendor program could be eliminated from consideration if two separate review teams, independent from each other and without knowledge of each other's work, reached consensus that the candidate materials did not meet the minimum alignment for science standards alignment or anti-bias content and should not be a candidate for consideration.

After each candidate vendor program was reviewed by two independent review teams, the Adoption Committee members eliminated one candidate programs under consideration for Biology, three for Chemistry, and three for Physics, based on examination using the Review Criteria. Two candidates were removed from consideration by Purchasing due to their failure to comply with the requirements of the RFP process. Using the Review Criteria, committee members were asked to reexamine the remaining programs using the following guiding question: Would this instructional material ensure the academic success of all students? Additionally, the committee reviewed the materials once again against the Review Criteria.

Based on this reexamination, the committee voted unanimously to advance to the Field Test Round of the High School Science Adoption process as its finalists the following programs:

- Michigan State University – *Carbon TIME* for BIO A

- SPS District-Developed Curriculum for BIO B
- SPS District-Developed Curriculum for CHEM A
- Accelerate Learning, Inc – *STEMScopes* for CHEM A and B
- University of Colorado Boulder – PEER for PHYS A and PHYS B

5b. Field Test, January – March 2019

All SPS high school science teachers were invited to apply to participate in the High School Science Adoption field test pending principal approval and demonstration of understanding of the 2013 Washington State Science Learning Standards. Twenty one teachers and their students, representing a diversity of years in the profession, science background, gender, and ethnicity, were selected by the Adoption Coordinator to teach the field test unit in their classrooms. The field test classrooms included over 2200 students from nine high schools and three Highly Capable middle schools located in multiple regions of the district, and represented Seattle Public Schools' diverse racial, ethnic, and socioeconomic groups and student populations, including English Language Learners, Special Education, Highly Capable, and general education (see Attachment H). The 21 field test teachers were instructed to implement and instruct a pre-selected unit based on each course: Human Energy Systems for BIO A, Development for BIO B, Atomic Structure for CHEM A, Periodic Trends for CHEM B, Magnetism for PHYS A, and Energy for PHYS B. Field test teachers received 3 hours of training from the vendor including follow-up time to plan and calendar their unit with their field test colleagues.

Field test teachers (see Attachment H) were given the following guidelines and expectations for field test participation in order to ensure the validity of the field test and provide multiple data collection opportunities about each candidate program:

- Implement the unit with as much fidelity as possible
- Submit feedback via a digital survey platform on a weekly basis about the effectiveness of learning activities, standards alignment, and student engagement.
- Work with the Adoption Coordinator and Science Department Specialists to schedule a lesson observation and participate in a post-observation interview
- Select a small student focus group to be interviewed about their experience with the field test unit
- Have all students participating in the field test complete an end-of-unit student survey around the following attributes:
    - Engagement in standards-aligned science practices
    - Using instructional materials that are organized around a conceptual storyline and anchored by a puzzling science phenomena problem to solve

        - Sharing science ideas through student discourse
        - Relevance and accuracy of content for science learning
        - Equity, Identity, and Disposition
    - Administer and score the provided pre-unit and post-unit assessments and record student scores to quantify student growth
    - Participate in a panel interview session with the Adoption Committee

5c. Stage 2: Analysis, March 2019

Prior to beginning the final review and analysis of all data collected for each candidate program, Adoption Committee members completed a survey in which they provided input about how each category of data collected during Stage 1 and the Field Test Stage of the adoption process should be weighted (see Attachment J). When the committee member input was averaged, the weights were assigned to each data set as follows:

- BIO A:
    - Science Review Criteria scores generated from Stage 1 – 34.0%
    - Field Test Data – 55.9%
    - Public Display and Open House Community Input Forms – 10.1%
- BIO B:
    - Science Review Criteria scores generated from Stage 1 – 33.6%
    - Field Test Data – 63.9%
    - Public Display and Open House Community Input Forms – 2.5%
- CHEM A:
    - Science Review Criteria scores generated from Stage 1 – 33.4%
    - Field Test Data – 52.5%
    - Public Display and Open House Community Input Forms – 14.1%
- CHEM B:
    - Science Review Criteria scores generated from Stage 1 – 33.6%
    - Field Test Data – 60.0%
    - Public Display and Open House Community Input Forms – 6.4%
- PHYS A and B:
    - Science Review Criteria scores generated from Stage 1 – 38.2%
    - Field Test Data – 56.6%
    - Public Display and Open House Community Input Forms – 5.2%

The Adoption Committee reconvened on March 13 and March 16, 2019 at the conclusion of the field test period for panel interview sessions with the field test teachers from each candidate program, organized by course. Each field test reported to the committee about their experience implementing the candidate program they field tested and their perception of their students' experience, and to provide input and feedback about the instructional materials in that program. In the panel interview, field test teachers were asked a set of 23 questions aligned with Science Instructional Materials Review Criteria categories and criteria by the Adoption Coordinator. Adoption Committee members asked follow-up questions of the field test panels throughout the session. Committee members were instructed to record notes during each panel interview. Following each panel interview session, committee members analyzed their notes for evidence of alignment with the five categories in the Review Criteria and assigned a value between 0 and 4.

After each panel, the Adoption Committee worked in small teams to review additional data sources generated from the Field Test stage for evidence of alignment with the Science Instructional Materials Review Criteria, including post-observation teacher interviews, student focus group interviews, end-of-unit student attribute surveys, and student growth data as measured by pre- and post-unit assessments. Combining this new data with their notes from the Field Test teacher panels, the Committee members collaborated in their teams to collectively synthesize and review all the data for each program to reach consensus on a Field Test score between 0 and 4 in each of the five categories detailed in the Science Instructional Materials Review Criteria (see Attachment E). The score for each category was weighted as previously determined on the Review Criteria, then tallied and reported as a consensus score.

Committee members then reviewed Community Input Forms submitted by members of school communities and the public who reviewed instructional materials from the vendor program under consideration for adoption. Although the amount of data generated for each vendor program was very small, committee review teams analyzed the input forms for each finalist vendor program and assigned a Public Input score between 0 and 4 in each of the five categories in the Science Instructional Materials Review Criteria (see Attachment E). The score for each category was weighted and then tallied and reported as a consensus score.

6 Data Collection Results (see Attachment I)

In addition to the results of the Adoption Committee's evaluation of the finalist candidate programs in Stage 1 using the Science Instructional Materials Review Criteria, the committee also reviewed multiple data sources to inform their selection and recommendation of the most suitable candidate for adoption. These data were collected from the classroom field test of the candidate programs, which included teacher and student feedback, and input collected during the public display of the instructional materials.

6a. Summary of Committee Scoring at end of Stage 1

At the end of Stage 1, the Adoption Committee members completed their evaluation and scoring review of the program instructional materials using the Science Instructional Materials Review Criteria described above in Section A and Attachment J. At the conclusion of Stage 1, the total average weighted scores as measured by the Science Instructional Materials Review Criteria for each of the categories were as follows:

- Biology:
  - Michigan State University: *Carbon TIME* – 56.8
  - District-Developed Curriculum for BIO B – 52.1
  - Pearson Education, Inc.: *Miller & Levine Biology* – 35.9
  - Houghton Mifflin Harcourt: *HMH Science Dimensions* – 30.8
  - Accelerate Learning, Inc.: *STEMScopes* – 27.5
  - McGraw-Hill Education: *Inspire Science* – 21.6

- Chemistry:
  - Accelerate Learning, Inc.: *STEMScopes* – 37.4
  - District-Developed Curriculum for CHEM A – 35.1
  - McGraw-Hill Education: *Inspire Science* – 32.6
  - Houghton Mifflin Harcourt: *HMH Science Dimensions* – 27.3
  - Pearson Education, Inc.: *Pearson Chemistry* – 11.8
  - PASCO Scientific: *Essential Chemistry* – 7.2

- Physics:
  - University of Colorado Boulder: *PEER* – 42.7
  - Accelerate Learning, Inc.: *STEMScopes* – 27.4
  - McGraw-Hill Education: *Inspire Science* – 27.7
  - Houghton Mifflin Harcourt: *HMH Science Dimensions* – 17.3
  - PASCO Scientific: *Essential Physics* – 5.2

The composite score was based on a rubric designed to result in a 75-point score for an instructional program that exhibited strong evidence for alignment to the standards in every criterion.

6b. Field Test Data Summary

The field test portion of the adoption provided an opportunity to see the candidate programs enacted in the classroom and to collect data around alignment to the science standards, assessment systems, inclusive educational practices, instructional planning and support, and student and teacher attitudes and dispositions, as well as collect student growth data.

6b. i.) Field Test Teacher Panel Interview Data: On March 13 and March 16, 2019, all teachers participating in the field test attended a panel interview session conducted by the Adoption Committee members and responded to a set of questions about their experience with, and attitudes around, the candidate program they field tested in their classroom. The questions addressed the following topics:

Standards Alignment, Assessments, Inclusive Educational Practices, Evaluation of Bias Content, and Teacher Supports for Planning and Usability.

Committee members convened following the field test teacher panel interview session to review and analyze their panel interview reports for qualitative evidence of the field-tested materials' alignment with the Instructional Materials Review Criteria categories: Standards Alignment, Assessments, Inclusive Educational Practices, Evaluation of Bias Content, Instructional Planning and Support.

Based on this analysis, committee members reached a consensus that there was "strong evidence" from the Carbon TIME field test panel reports for alignment in each of the Review Criteria categories, from the BIO B District-Developed Curriculum field test panel reports for alignment in each of the Review Criteria categories, from the CHEM A District-Developed Curriculum field test panel reports for alignment in each of the Review Criteria categories, and from the PEER field test panel reports for alignment in each of the Review Criteria categories. However, there was only "moderate" or "minimal" evidence from the STEMScopes field test panel reports for alignment in each of the Review Criteria categories.

6b. ii.) Field Test Classroom Observation Data and Teacher Interviews: Observations were conducted in each field test classroom and post-observation interviews of the field test teacher were conducted. A qualitative analysis of the data was performed to identify evidence of 10 characteristics: evidence of science practices within the unit, presence of authentic phenomena in the unit storyline, revisiting the phenomena during the unit, evidence of engaging phenomena within the unit, multiple types of evidence gathered during the unit, student engagement around the evidence gathered, opportunities of students to engage in sense-making discourse, self-assessment, quality of student explanations, and usefulness of the materials.

Data analysis of the Carbon TIME Classroom Observation and Teacher Interview data showed "*Superior Evidence*" for 7 of the 10 characteristics:

- Presence of a unit phenomenon
- Multiple types of evidence gathered during the unit
- Student engagement around the evidence gathered during the unit
- Student discourse for sense-making
- Student self-assessment opportunities
- Student explanations
- Accurate and rich content information

Data analysis of the Carbon TIME Classroom Observation and Teacher Interview data showed "*Strong Evidence*" for 3 of the 10 characteristics:

- Science and Engineering practices included in the unit
- Unit phenomenon is engaging for students

- Usefulness of the unit materials

Data analysis of the Biology B District-Developed Curriculum field test Classroom Observation and Teacher Interview data showed "*Superior Evidence*" for 1 of the 10 characteristics:

- Science and Engineering practices included in the unit

Data analysis of the Biology B District-Developed Curriculum field test Classroom Observation and Teacher Interview data showed "*Strong Evidence*" for 9 of the 10 characteristics:

- Presence of a unit phenomenon
- Revisiting the unit phenomenon
- Unit phenomenon is engaging for students
- Multiple types of evidence gathered during the unit
- Student engagement around the evidence gathered during the unit
- Student discourse for sense-making
- Student progress tracking and self-assessment opportunities
- Student explanations
- Usefulness of the unit materials

Data analysis of the District-Developed Curriculum field test Classroom Observation and Teacher Interview data showed "*Superior Evidence*" for 3 of the 10 characteristics:

- Presence of a unit phenomenon
- Unit phenomenon is engaging for students
- Multiple types of evidence gathered during the unit

Data analysis of the District-Developed Curriculum field test Classroom Observation and Teacher Interview data showed "*Strong Evidence*" for 7 of the 10 characteristics:

- Science and Engineering practices included in the unit
- Revisiting the unit phenomenon
- Student engagement around the evidence gathered during the unit
- Student discourse for sense-making
- Student progress tracking and self-assessment opportunities
- Student explanations
- Usefulness of the unit materials

Data analysis of the STEMScopes field test Classroom Observation and Teacher Interview data showed "*Strong Evidence*" for only 1 of the 10 characteristics.

- Science and Engineering practices included in the unit

Data analysis of the Physics A and Physics B PEER field test Classroom Observation and Teacher Interview data showed "*Superior Evidence*" for 1 of the 10 characteristics:

- Usefulness of the unit materials

Data analysis of the PEER field test Classroom Observation and Teacher Interview data showed "*Strong Evidence*" for 9 of the 10 characteristics:

- Science and Engineering practices included in the unit
- Presence of a unit phenomenon
- Revisiting the unit phenomenon
- Unit phenomenon is engaging for students
- Multiple types of evidence gathered during the unit
- Student engagement around the evidence gathered during the unit
- Student discourse for sense-making
- Student progress tracking and self-assessment opportunities
- Student explanations

6b. iii..) Student Focus Group Interview Data A student focus group from each field test classroom was selected by the field test teacher to be interviewed by the Adoption Coordinator or Science Department specialists who conducted the classroom observation responses.

Student data was collected from the student focus group interviews that followed the field test classroom observations. A qualitative analysis of the data was performed to identify evidence of 9 characteristics that closely aligned with the interview questions: discourse for sense-making, consensus building, phenomenon present and helpful, elicitation of initial models, evidence collected helped understand the phenomenon, tools to track ideas through the unit, assessments that were fair and helped know if you were learning, the unit helped you learn science, and whether the students would recommend these materials.

Data analysis of the Carbon TIME Student Focus Group Interview data showed "*Strong Evidence*" for 8 of the 9 characteristics:

- Discourse for sensemaking
- Consensus building
- Phenomenon present and helpful
- Evidence to help understand the phenomenon
- Elicitation of ideas for an initial model
- Fair assessments that inform students of their progress
- Does this unit help you learn science?
- Would you recommend these materials?

Data analysis of the Biology B District-Developed Curriculum field test Student Focus Group Interview data showed "*Strong Evidence*" 9 of the 9 characteristics:

- Discourse for sensemaking
- Consensus building
- Phenomenon present and helpful
- Evidence to help understand the phenomenon
- Elicitation of ideas for an initial model
- Ways to track ideas throughout the unit
- Fair assessments that inform students of their progress
- Does this unit help you learn science?
- Would you recommend these materials?

Data analysis of the District-Developed Curriculum field test Student Focus Group Interview data showed "*Strong Evidence*" for all 10 of the 10 characteristics analyzed:

- Discourse for sensemaking
- Consensus building
- Phenomenon present and helpful
- Evidence to help understand the phenomenon
- Elicitation of ideas for an initial model
- Ways to track ideas throughout the unit
- Fair assessments that inform students of their progress
- Does this unit help you learn science?
- Would you recommend these materials?

Data analysis of the PEER field test Student Focus Group Interview data showed "*Strong Evidence*" 9 of the 9 characteristics:

- Discourse for sensemaking
- Consensus building
- Phenomenon present and helpful
- Evidence to help understand the phenomenon
- Elicitation of ideas for an initial model
- Ways to track ideas throughout the unit
- Fair assessments that inform students of their progress
- Does this unit help you learn science?
- Would you recommend these materials?

6b. iv.) Student Growth Data: All teachers participating in the field test were asked to administer the vendor-provided pre-unit assessment at the beginning of the field test and the vendor-provided end-of unit assessment at the conclusion of the field test in order to collect student growth data for the standards addressed in the field test unit as a result of instruction. The average student growth data for each field test teacher was calculated.

The average student growth scores for each vendor were as follows:

- Carbon TIME (BIO A): 50.2%
- District-Developed Curriculum (BIO B): 64.5%
- District-Developed Curriculum (CHEM A): 68.6%
- STEMScopes (CHEM A): 28.1%
- STEMScopes (CHEM B): 0.9%
- PEER (PHYS A): 53.2%.

6b. v.) Student End-of-Unit Attribute Survey All students who participated in the field test were asked to complete an end-of unit attribute survey that asked them to reflect on their learning and engagement during the field test unit. The survey questions asked students to self-report about their learning over the course of the field test instruction and their attitudes about their experience with the unit and included questions about:

  - Students' engagement in standards-aligned science practices
  - Using instructional materials that are organized around a conceptual storyline and anchored by a puzzling science phenomena problem to solve
  - Sharing science ideas through student discourse
  - Relevance in science learning
  - Equity, Identity, and Disposition

1,247 students completed the survey and the responses were tallied and reported.

BIO A:
Nearly all students participating in the Carbon TIME field test reported that they were provided with *opportunities to participate in critical standards-based science practices* during the field test. The highest values in this survey category were as follows:

- 94% reported collecting data for a science investigation
- 97% reported analyzing or interpreting data from a science investigation
- 98% reported using data as evidence to support a claim
- 97% reported putting ideas together to communicate them better to others

Students also reported that the organization of the Carbon TIME unit lessons into a coherent *storyline* that includes a *scientific phenomenon* to figure out and explain supported their science learning.

- 80% agreed that the science concepts they were learning in the unit connected with the phenomenon
- 82% agreed the order of the lessons in the unit helped them see why the lessons within the unit were chosen to help them understand the main ideas
- 88% agreed that working with a scientific phenomenon in a unit help their learning

In the survey categories related to student *discourse* around science ideas,

- 87% agreed with the statement that it is important for students to have an opportunity to make sense of science ideas together.
- 96% of the Carbon TIME field test students reported that were "often" given the opportunity to share their ideas during the field test unit

The Carbon TIME students also reported *that listening to other students helped them:*

- Improve their ability to argue with evidence (79%)
- Learn how to communicate their ideas more clearly (81%)
- Improve their thinking (86%)
- See different perspectives on a topic (92%)

In the attribute categories of Identity, Disposition and Learning,

- 76% reported that the work they did in the unit was interesting to them and connected with something in their life
- 85% of Carbon TIME field test students reported that they were learning science

Over 50% of student respondents reported that they "identify as a student of color." The Adoption Committee believes that the adoption of the Carbon TIME program therefore has important implications for improving the opportunity gap for students in Biology A through improved learning outcomes.

BIO B

Nearly all students participating in the field test of the Biology B District-Developed Curriculum reported having *opportunities to engage in standards-based science practices* during the field test.

- 98% reported collecting data for a science investigation
- 99% reported analyzing or interpreting data from a science investigation
- 99% reported using data as evidence to support a claim
- 96% reported putting ideas together to communicate them better to others

Students also reported that the organization of the Biology B District-Developed Curriculum unit lessons into a coherent *storyline* that includes a *scientific phenomenon* to figure out and explain supported their science learning.

- 77% agreed that the science concepts they were learning in the unit connected with the phenomenon
- 77% that agreed the order of the lessons in the unit helped them see why the lessons within the unit were chosen to help them understand the main ideas
- 79% agreed that working with a scientific phenomenon in a unit help their learning

In the survey categories related to student *discourse* around *sharing science* ideas in the Biology B District-Developed Curriculum field test,

- 81% agreed with the statement that it is important for students to have an opportunity to make sense of science ideas together
- 96% reported that were given the opportunity to share their ideas during the field test unit

The students in the Biology B District-Developed Curriculum field test also reported *that listening to other students helped them:*

- Learn how to communicate their ideas more clearly (77%)
- Improve their ability to argue with evidence (80%)
- Improve their thinking (82%)
- See different perspectives on a topic (86%)

In the survey categories reporting on student *engagement* and *identity, disposition, and learning* during the Biology B District-Developed Curriculum field test,

- 73% reported that the work they did in the field test unit was interesting to them and connected with something in their life, respectively
- 77% of students reported that they were learning science during field test

CHEM A

209 students participating in the field test of the District-Developed CHEM A Curriculum completed the survey and responses were tallied and reported and the committee identified the following trends in the quantitative survey data.

Nearly all students participating in the field test of the District-Developed CHEM A Curriculum reported having *opportunities to engage in standards-based science practices* during the field test.

- 97% reported collecting data for a science investigation
- 98% reported analyzing or interpreting data from a science investigation
- 99% reported using data as evidence to support a claim
- 97% reported putting ideas together to communicate them better to others

Students also reported that the organization of the District-Developed CHEM A Curriculum unit lessons into a coherent *storyline* that includes a *scientific phenomenon* to figure out and explain supported their science learning.

- 84% that agreed the order of the lessons in the unit helped them see why the lessons within the unit were chosen to help them understand the main ideas
- 82% agreed that starting the unit with the exploration of a scientific phenomenon helped their learning
- 80% agreed that the science concepts they were learning in the unit connected with the phenomenon

Students in the District-Developed CHEM A Curriculum field test also reported agreement with statements about engaging in the *scientific practice of modeling*:

- 86% created models of their thinking in the unit
- 86% had opportunities to revise models of their thinking in the unit
- 86% shared models of their thinking with their peers in the unit

In the survey categories related to student *discourse* around *sharing science* ideas in the District-Developed CHEM A Curriculum field test,

- 96% reported that were given the opportunity to share their ideas during the field test unit
- 89.5% agreed with the statement that it was important for students to have an opportunity to make sense of science ideas together during the field test

The students in the District-Developed CHEM A Curriculum field test also reported *that listening to other students helped them:*

- Learn how to communicate their ideas more clearly (89%)
- Improve their thinking (89%)
- See different perspectives on a topic (96%)

In the survey categories reporting on student *engagement* and *identity, disposition, and learning* during the District-Developed CHEM A Curriculum field test,

- 84% reported that the work they did in the unit was interesting to them
- 84% reported a that the work they did in the unit connected with something in their life
- 84% of students reported that they felt confident they could do science during the field test
- 88% of students reported that they were learning science during the field test

213 students participating in the field test of the STEMScopes program completed the survey and responses were tallied and aggregated.

Similar, though to a lesser extent, students participating in the field test of the STEMScopes program reported having *opportunities to engage in standards-based science practices* during the field test.

- 87% reported collecting data for a science investigation
- 90% reported analyzing or interpreting data from a science investigation
- 91% reported using data as evidence to support a claim
- 91% reported putting ideas together to communicate them better to others

Students in the STEMScopes field test reported significantly less agreement with statements related to the organization of unit lessons into a coherent *storyline* that includes a *scientific phenomenon* to figure out and explain when compared with the District-Developed Curriculum field test group.

- 63% that agreed the order of the lessons in the unit helped them see why the lessons within the unit were chosen to help them understand the main ideas
- 59% agreed that the science concepts they were learning in the unit connected with the phenomenon
- 67% agreed that the unit phenomenon helped their learning

Students in the STEMScopes field test also reported significantly less agreement with statements about engaging in the *scientific practice of modeling* when compared with the District-Developed Curriculum field test group:

- 60.5% created models of their thinking in the unit
- 59% had opportunities to revise models of their thinking in the unit
- 57% shared models of their thinking with their peers in the unit

In the survey categories related to student *discourse* around *sharing science* ideas in the STEMScopes program field test, students reported somewhat less frequent opportunities to share their science ideas and considerably less emphasis on discourse for sense-making.

- 88% reported that were given the opportunity to share their ideas during the field test unit
- 67% agreed with the statement that it was important for students to have an opportunity to make sense of science ideas together during the field test

The students in the STEMScopes program field test reported *that listening to other students' ideas in the field test was* overall less helpful for learning than what was reported in the District-Developed Materials field test.

- Learn how to communicate their ideas more clearly (76%)
- Improve their thinking (80%)
- See different perspectives on a topic (82%)

In the survey categories reporting on student *engagement* and *identity, disposition, and learning* during the STEMScopes program field test, students reported significantly less engagement and confidence in their learning.

- 67% reported that the work they did in the unit was interesting to them
- 50% reported a that the work they did in the unit connected with something in their life
- 63% of students reported that they felt confident they could do science during the field test
- 70% of students reported that they were learning science during the field test

Over 50% of student respondents reported that they "identify as a student of color." The Adoption Committee believes that this survey data suggests that use of the STEMScopes program has the potential to negatively impact learning outcomes for students of color in Chemistry A, thereby perpetuating or exacerbating the opportunity gap.

PHYS A and B

Nearly all students participating in the PEER field test reported having *opportunities to engage in standards-based science practices* during the field test.

- 95.5% reported collecting data for a science investigation
- 94% reported analyzing or interpreting data from a science investigation
- 5.5% reported using data as evidence to support a claim
- 95% reported putting ideas together to communicate them better to others

Students also reported that the organization of PEER unit lessons into a coherent *storyline* that includes a *scientific phenomenon* to figure out and explain supported their science learning.

- 78% agreed that the order of the lessons in the unit helped them see why the lessons within the unit were chosen to help them understand the main ideas
- 73% agreed that starting the unit with the exploration of a scientific phenomenon helped their learning
- 70% agreed that the science concepts they were learning in the unit connected with the phenomenon

Students in the PEER field test also reported agreement with statements about engaging in the *scientific practice of modeling*:

- 92% created models of their thinking during the unit
- 92% had opportunities to revise models of their thinking during the unit
- 93% shared models of their thinking with their peers during the unit

In the survey categories related to student *discourse* around *sharing science* ideas in the PEER field test,

- 95% reported they were given the opportunity to share their ideas during the field test unit
- 86% agreed with the statements that talking with peers about their ideas helped them to learn science better and the statement that it was important for students to have an opportunity to make sense of science ideas together during the field test

The students in the PEER field test also reported *that listening to other students helped them:*

- Learn how to communicate their ideas more clearly (84%)
- Improve their thinking (85%)
- See different perspectives on a topic (89%)

In the survey categories reporting on student *identity, disposition, and learning* during the PEER field test,

- 81% of students reported that they felt confident they could do science during the field test
- 82% of students reported that they were learning science during the field test

6b. vi.) Field Test Data Synthesis and Analysis Committee members collaborated in their teams to collectively review and synthesize all Field Test data collected for each program. The review teams worked to reach consensus on an overall score for each program in each of the five categories detailed in the Science Instructional Materials Review Criteria (see Attachment E) using the 0-4 scoring rubric. Once the scores were assigned and weighted using the Review Criteria weightings, they were tallied and reported as a consensus Field Test score

for each candidate program. The consensus Field Test scores reported by the committee are as follows:

- Carbon TIME (BIO A): 74.2
- District-Developed Curriculum (BIO B): 79.8
- District-Developed Curriculum (CHEM A): 77.5
- STEMScopes (CHEM A): 22.8
- STEMScopes (CHEM B): 22.5
- PEER (PHYS A and B): 76.1

6c. Community Input from Instructional Materials Public Displays and Information Sessions (Attachment G)

Community and family stakeholders were invited and encouraged via multiple communications and community engagement methods to review the adoption candidate programs and submit a Community Input Form.

Textual versions of the candidate program were publicly displayed for nine weeks and links to the candidate programs' online materials were available for public review via the District website. In addition, two "open house" public information sessions were held in the north and south end of the district, respectively, and were open from 9:00am-3:00pm. The Adoption Coordinator, Science Department Staff, members of the Adoption Committee, and Science Adoption Field Test teachers were available to answer questions about the candidate programs and to provide guidance in reviewing the materials. Over 25 community members attended these "open house" public information sessions.

Community Input Forms were available electronically on the District website, at the four public display locations, and the open house events for community members to review the three candidate programs and provide feedback. The Community Input Form included criteria selected from the five categories in the Science Adoption Review Criteria used by the Adoption Committee to review and assess all the candidate materials, including Standards Alignment, Assessments, Inclusive Educational Practices, Evaluation of Bias Content, and Instructional Planning and Support. Translated versions of the Community Input Form were made available in the District's top five languages: Spanish, Chinese, Somali, Tagalog, and Vietnamese.

In total, two Community Input Forms were submitted by community members from public display sites, open house information sessions, and online via the District website regarding Carbon TIME. The public reviewers had an very positive response to the curriculum based on the 19 and 24 "yes" boxes that were checked indicating alignment to the Review Criteria in each input form, respectively, when compared with a total of only 3 "no" boxes checked. A qualitative analysis of the data collected for the question: *How well do you feel this program meets the high expectations we have set to provide all our students with an equitable, authentic science experience?* showed that both community members rated Carbon TIME "Well" on a scale of "Very Well" to "Poor".

No Community Input Forms were submitted by members of the public for the Biology B District-Developed Curriculum program.

In total, one Community Input Form was submitted by a community member from a public display site, open house information session, or online via the District website regarding the District-Developed curriculum for CHEM A. A qualitative analysis of the data collected for the question: *How well do you feel this program meets the high expectations we have set to provide all our students with an equitable, authentic science experience?* showed that the community member who provided the input did not provide a rating for this program, however they included the following comment: "The district developed curriculum is much more engaging and exciting, the chemistry can be applied to real life, connecting science to real world things."

No Community Input Forms were submitted for the STEMScopes materials.

In total, one Community Input Form was submitted by a community member from a public display site, open house information session, or online via the District website regarding PEER. A qualitative analysis of the data collected for the question: *How well do you feel this program meets the high expectations we have set to provide all our students with an equitable, authentic science experience?* showed that the community member who provided the input assigned PEER a rating of "Well" on a scale from Very Well to Poor. The form also included the following comment: "I only know about (PEER) Physics A, but it seems great."

The actual volume of Community Input Forms submitted belies the community engagement efforts made by the Adoption Committee to collect data from community stakeholders. Unfortunately, informal and anecdotal input about the candidate programs could not be analyzed or evaluated, because the communication methods could not be compared reliably with data collected legitimately from the Community Input Forms.

7. Synthesis of All Data Collection Results and (see Attachment J)

Each committee review team applied the weighting formula developed by the committee at the outset of Stage 2 to the scores below for each of the three candidate programs:

- Review Criteria Average Score (Stage 1)
- Field Test Data Review Team Consensus Score
- Public Input Data Review Team Consensus Score

Each committee review team calculated their weighted consensus scores for the Review Criteria scores from Stage 1, the Field Test data, and the Public Input data including annotated evidence collected from the data to support their scores. Each review team reported their scores and supporting evidence as to the other committee review teams. The committee identified patterns and trends across all review team reports and each review team tallied their three final scores to report a total score for this candidate.

During the teams' data reporting, Committee Members commented on the overall positive feedback from the Carbon TIME field test, both from the teachers and from the students. Members were impressed with the passion of the field test teachers, and with the comments from students about their engagement with the content.

Based on the committee's findings from the field test outcomes and data collected, the Carbon TIME program received overwhelming support from the Adoption Committee members. Some pointed out that the curriculum was the highest-scoring program during the Review Criteria phase, and that the field test data components unsurprisingly supported that assessment.

Additionally, Committee Members identified strengths they saw within the Carbon TIME curriculum: the lessons were robust and strong, focused on scientific practices and strong discourse. Students grew in their understanding of important science concepts. Students were very positive in their comments about their experiences with biology within Carbon TIME.

In conclusion, the review teams shared their feeling that this curriculum was "ready to put in front of kids" and was overall a strong solution to the need for a new biology curriculum for BIO A.

Members noted that teachers on the field test panel were overwhelmingly enthusiastic about the BIO B District-Developed curriculum. One student Committee member noted that he went through the field test unit in Biology B class and felt that the lessons flowed well. The Adoption Committee members identified that one of the strengths of the District-Developed Curriculum is that it follows the structure of Carbon TIME, so it has a "seamless structure" for those students taking both BIO A and BIO B.

Based on the committee's findings from the field test outcomes and data collected, the District-Developed curriculum for CHEM A was the top candidate based on the field test data and the committee Review Criteria data regarding the program's strong storyline and phenomena, opportunities for student discourse, and engagement in practices and rigor. The STEMScopes program did not receive positive feedback around usability and differentiation, field test data, including teacher input, revealed that it did not have an overarching phenomenon, therefore no storyline, and little student growth of scientific content understanding.

Adoption Committee members commented that they had strong concerns about the lack of student growth and the student comments from STEMScopes. One group said that the student growth data was both "compelling and heartbreaking." One quoted a teacher from the field test panel, who said that the STEMScopes curriculum "made me a worse teacher."

Additionally, Adoption Committee members identified strong concerns around bias content within STEMScopes. They noted that some teachers were offended by content found within at least one video in the Field Test unit. Many members agreed that this

was not only concerning, but a “red flag” that eliminated STEMScopes from their considerations.

Conversely, the District-Developed Curriculum for CHEM A received much higher praise. Teams mostly agreed that the curriculum strongly addressed the standards, though some teams felt that it could take a less conservative approach. Some members felt that there was a missed opportunity in addressing cultural aspects within the curriculum, but that the collaborative nature of the curriculum made addressing such concerns easy. Adoption Committee members identified comments from students that they said demonstrated a passion for the content, that students appreciated it and learned from it better than from STEMScopes. Students stated that they looked forward to coming to class and learning chemistry from the District-Developed curriculum.

Members commented on the overall positive feedback from the PEER field test, both from the teachers and from the students. Members were impressed with the passion of the field test teachers, and with the comments from students about their engagement with the content. Modeling and sense-making within the lessons was highlighted as well.

The Adoption Committee then proceeded to the decision-making phase. Adoption Committee members agreed to an anonymous vote to confirm their recommendations for adoption to the School Board. The results confirmed support of Carbon TIME as the sole recommendation for BIO A, the District-Developed Curriculum as the sole recommendation for BIO B, the District-Developed Curriculum as the sole recommendation for CHEM A, and PEER as the sole recommendation for PHYS A and B. The Committee elected to not move a curriculum forward for Adoption for CHEM B at this time but recommended that funding be made available for teachers to continue to collaboratively develop CHEM B, using the CHEM A District Developed course as a guide.

After examining all of the procedures and steps in the adoption process and ensuring that all steps in Board Policy 2015 were met, the Instructional Materials Committee approved the recommendations as listed above for adoption on March 28, 2019.

8. Decision

Each Adoption Committee review team calculated their weighted consensus scores for the Review Criteria scores from Stage 1, the Field Test data, and the Public Input data including annotated evidence collected from the data to support their scores. Each review team reported their scores and supporting evidence as to the other committee review teams. The committee identified patterns and trends across all review team reports and each review team tallied their three final scores to report a total score for each candidate finalist program. The Adoption Committee then proceeded to the decision-making phase. Adoption Committee members agreed to an anonymous vote to identify a single finalist for recommendation for adoption to the school board for each of the courses.

Based on the synthesis and summary of all data reviewed by the committee and the reporting of final scores, Carbon TIME was unanimously recommended for Adoption for BIO A, with two members recusing themselves from the vote.

The District-Developed Curriculum was unanimously recommended for Adoption for BIO B, with four members recusing themselves from the vote. 36.0% of voting members recommended that the Board not only Adopt the District-Developed Curriculum, but also provide funding for additional improvements through teacher collaborations. in professional development settings.

PEER was recommended for Adoption for PHYS A and PHYS B with a unanimous vote. The District-Developed Curriculum was overwhelmingly recommended for Adoption for CHEM A, with six members recusing themselves from the vote. One member voted to move neither program forward for Adoption, while 58.3% of voting members recommended that the Board not only Adopt the District-Developed Curriculum, but also provide funding for additional improvements through teacher collaborations. in professional development settings.

In addition to the above, the Adoption Committee voted unanimously to not recommend an Adoption for CHEM B; however, they also unanimously voted to put forth a recommendation similar to the above, to recommend that the Board provide funding for continued development of the District-Developed Curriculum for CHEM B through teacher collaborations in professional development settings.

After examining all the procedures and steps in the adoption process and ensuring that all steps in Board Policy 2015 were met, the Instructional Materials Committee approved the sole recommendation of Carbon TIME for adoption for BIO A, the District-Developed Curriculum for adoption for BIO B, the District-Developed Curriculum for adoption for CHEM A, and PEER for adoption for PHYS A and B on March 16, 2019.

B. Research

SPS Research and Evaluation Department Curriculum Adoption Teacher Survey, February 2019 (Attachment M)

A critical part of the district's process for adopting and implementing new curriculum materials is learning how to best support teachers, for example by providing professional development, support, and resources where they are most needed. Accordingly, the SPS Research & Evaluation (R&E), in partnership with the Curriculum, Assessment and Instruction (CAI) department administered a survey in February 2019 to certificated classroom teachers regarding their experiences with new or planned curriculum materials. The survey included question panels related to the K-12 science instructional materials adoption.

In February 2019, the SPS Research and Evaluation Department administered the Curriculum Adoption Teacher Survey for all elementary school teachers, K-12 science, as well as middle school math and K-5 ELA teachers (see Attachment M). 57% of science teachers at grades 9-12 responded to the survey. The survey provided important

data for the Adoption Committee and SPS Science Department about the need for high quality instructional science materials to support alignment to standards and close the opportunity gap in science learning for students of color in the District. The survey also asked teachers to identify the types of systems, structures, and supports needed to transition to a new instructional materials program following adoption. Teachers hope that new NGSS-aligned materials will help to engage students in authentic, hands-on learning experiences that center around a scientific phenomenon that students can relate to their own lives. This, they said, will help students who might typically not have enjoyed science become enthusiastic science learners. Teachers also asserted that interest and skills in science are necessary to succeed in the highly scientific and STEM-based economy into which they will graduate.

C. Alternatives

1. Do not approve the committee-recommended instructional materials and return to each teacher developing their own instructional resources. This alternative is not recommended by the Committee of experts, that each gave 60 hours of their time as they adhered to a strict process and review of the candidates. Independent, autonomous teaching that creates different programs in each school and each science classroom within a school is not an effective way to provide equitable science education to our students across the district. Teachers will be forced to continue to work in isolation within their buildings and attempt to align their personal lessons to the standards.

a. Pros:

- None

b. Cons:

- Not aligned to the 2013 WA State Science and Engineering Standards (currently aligned only to the 2009 standards), which does not prepare students for advanced science courses, for the WA State high stakes assessment in grade 11, or for college
- Teachers do not have the expertise, nor the time, to develop curriculum in a vacuum
- Without collaboration with colleagues, there are no checks and balances to ensure the curriculum addresses the standards and is rigorous
- No embedded formative or summative assessments, no embedded discourse for sense-making, no differentiated or multilingual reading materials, and no opportunities to use technological tools to deepen the science experience
- Assessments will not be consistent and likely not 3-dimensional. It is impossible to develop a robust assessment bank in a vacuum
- No guarantee of engineering design instruction

- Current science resources are not based on the latest brain-based research about how students learn, do not contain best practices used in literacy and mathematics, nor address cultural relevancy

5. FISCAL IMPACT/REVENUE SOURCE

The nine-year cost to adopt Carbon TIME for Biology A, District Developed Materials for Biology B, District Developed Materials for Chemistry A and B, PEER for Physics A and B, and a 0.4 FTE Science Curriculum Specialist is $1,034,132.

	Year 1	Year 2	Year 3	Years 4-9	Total All Years 1-9
BIO A	$ 65,770	$ 28,119	$ 28,891	$ 14,400	**$ 137,180**
BIO B	$ 63,370	$ 25,719	$ 26,491	$ -	**$ 115,580**
CHEM A	$ 66,713	$ 29,163	$ 30,038	$ -	**$ 125,914**
CHEM B	$ 34,147	$ 35,171	$ 36,226	$ -	**$ 105,544**
PHYS A	$ 189,188	$ 29,163	$ 30,038	$ -	**$ 248,389**
PHYS B	$ 190,913	$ 29,163	$ 30,038	$ -	**$ 250,114**
0.4 FTE Curriculum Specialist	$ -	$ 51,411	$ -	$ -	**$ 51,411**
TOTAL	**$ 610,102**	**$ 227,909**	**$ 181,721**	**$ 14,400**	**$ 1,034,132**

A. The Carbon TIME curriculum is a free and open resource. Nine-year total costs include ADA compliance, website maintenance and professional development.

B. The District-Developed Curriculum for BIO B is a free and open resource. Nine-year total costs include ADA compliance and professional development.

C. The District-Developed Curriculum for CHEM A is a free and open resource. Nine-year total costs include ADA compliance, professional development additional collaboration funding as recommended by the Adoption Committee to continue development and revision of a CHEM B curriculum that parallels CHEM A.

D. PHYS A and B curriculum nine-year total costs include adoption of new materials from the University of Colorado Boulder, the developer of the PEER curriculum, to align with the new standards. Includes unlimited access to, and support for, the program, including annual incremental updates and upgrades to the curriculum and professional development.

E. $51,411 – 0.4 FTE Science Curriculum Specialist for implementation of the Adoption.

There is currently confirmed budget for High School Science. The revenue source is the curriculum budget in the general fund.

Expenditure: ☐ One-time ☐ Annual ☒ Multi-Year ☐ N/A

Revenue: ☐ One-time ☐ Annual ☐ Multi-Year ☒ N/A

6. COMMUNITY ENGAGEMENT

With guidance from the District's Community Engagement tool, this action was determined to merit the following tier of community engagement (See Attachment C):

☐ Not applicable

☐ Tier 1: Inform

☐ Tier 2: Consult/Involve

☒ Tier 3: Collaborate

Throughout the duration of the Adoption Process, community, family, and teacher stakeholders received regular communications and updates, and were informed of all opportunities to provide input or participate in the process, including:

- Applying to serve on the Adoption Committee
- Submitting input via a paper or online survey as part of the Needs Assessment conducted at the outset of the process to inform the development of the Review criteria used to evaluate the vendor programs submitted for consideration
- Reviewing the instructional materials for the three finalists' candidates online or in person at one of the five public display locations across the district and submitting a Community Input Form with their feedback
- Attending an open house Science Adoption information and instructional materials review session
- Following the outcomes of all Adoption Committee meetings on the SPS Science Adoption webpages through publication of meeting notes
- Receiving updates and announcements via SPS Communications on the SPS website and via emails to SPS families and staff
- Communications were translated into 5 languages to encourage participation.

This input and participation was solicited by the Science Department through multiple communication pathways including multiple emails via SPS Communications, announcements on the District website and SPS social media, through a robust website presence providing links to online versions of the finalists candidate materials, communications to SPS high school principals and high school teachers, and family letters. The Science Department also provided community engagement touch-points to reach stakeholders, including speaking engagements with community organizations and hosting two full-day open house information sessions in the north and south end of the district, respectively.

Textual and online instructional materials for the three candidate vendor programs were made available for public review and input online on the SPS Science Adoption webpage, as well as at the following physical locations across the district:

- Ingraham High School
- Garfield High School
- Chief Sealth International High School
- John Stanford Center for Education Excellence

7. EQUITY ANALYSIS

"There is no doubt that science and science education are central to the lives of all Americans. Never before has our world been so complex and science knowledge so critical to making sense of it all. When comprehending current events, choosing and using technology, or making informed decisions about one's health care, understanding science is key. Science is also at the heart of the ability of the United States to continue to innovate, lead, and create the jobs of the future. ALL students no matter what their future education and career path must have a solid K–12 science education in order to be prepared for college, careers, and citizenship." (*Appendix A: Conceptual Shifts in the Next Generation Science Standards.* National Research Council. 2013. *Next Generation Science Standards: For States, By States*)

Seattle Public Schools is committed to eliminating opportunity gaps to ensure access and provide excellence in education for every student. *Board Policy #0030 - Ensuring Racial and Educational Equity* was developed to work toward the district's mission to eliminate opportunity gaps. Goals of this policy that will be supported through the adoption of a standards-aligned K-5 science instructional materials program include equitable access to a high-quality curriculum and educational resources, and professional development to strengthen teachers' knowledge and skills for eliminating opportunity gaps and other disparities in achievement. The last high school science adoption in Seattle Public Schools was in 2001-2002. In the absence of an updated, standards-aligned science curricula, schools with heavy PTSA involvement, lower teacher turnover, and low free-and-reduced lunch, have used building funds to purchase supplemental materials for their schools. This has resulted in highly varied instructional resources in both quality and quantity across our district and a lack of common scope and sequence in curriculum and assessment. This patchwork of disjointed and supplemental science curricula is not replicable or sustainable at a systems level and, most importantly, is profoundly inequitable for Seattle Public School's underserved populations. As a result of this inequitable access to science instructional materials, low-income students and students of color are far more likely to be inadequately prepared for high-school level science courses, as evidenced by the achievement gaps in SPS between white students and students of color reported for grade 8.

Nationally, there is a crisis in equity in STEM fields, and in Washington state there is great disparity between the concentration of STEM-related jobs and a prepared labor pool. By 2030 in Washington State, 67% of job openings will require a STEM credential or training. Currently, 37% of students in the class of 2021 are expected to lack adequate

training, preparation, or credentials for entry into STEM careers or post-secondary opportunities (Washington STEM, *STEM by the Numbers: Equity and Opportunity,* 2019. http://www.washingtonstem.org/STEMbythenumbers). The data below quantifies the manifestation of the opportunity gap for students of color locally and nationally at both K-12 and in the workforce:

- Washington State's 4th grade Black and Latino students, respectively, score 31 and 29 points lower on the National Assessment of Educational Progress in Science. (*2015 National Assessment of Educational Progress (NEAP) Nation's Report Card*, http://nces.ed.gov/nationsreportcard/states/)
- In the first year of the 5th grade WCAS, Washington State's new statewide science assessment, SPS White students in grade 5 had a passing rate of 81.2%, while their Black counterparts had a passing rate of 28.6% and Latino counterparts a passing rate of 44.6% (WA State Report Card, 2017-18).
- Washington's achievement gaps in math and science have not improved in over a decade and are the 12th largest in the nation. If efforts to improve the achievement gap continue at this current rate, it would take 150 years for Black students to realize the same level of achievement as their peers (Center for Education Policy, *The Achievement Gap: Slow and Uneven Progress for Students,* 2010).

Inequitable access to science instruction and materials has been particularly impactful to our underserved populations of students, including English language learners and students with special needs. Historically, K-12 science has focused on direct instruction and an overemphasis on confirmation labs (activities for which the outcome is known and used as an exercise to confirm an idea), devoid of opportunities to engage in authentic science practices or engineering design activities, pedagogically making it difficult for many learners to access and engage meaningfully with the science content. The adoption of new science materials will address the need to provide science learning that will include multiple modalities in both instruction and assessment.

The adopted materials will increase equitable access to all K-12 students and prepare them for success in core science courses in high school and college preparatory science courses (AP/IB), which is particularly important as Washington State moves to a 24-credit graduation requirement, necessitating completion of three years of science coursework. ~~In addition, the class of 2020 will be the first for whom passing the new statewide science assessment, the WCAS, will be a graduation requirement.~~ The test, taken at the end of grade 11, addresses all of the 9-12 science standards, whereas the previous state science assessment, the Biology EOC, tested only Biology standards. The WCAS data will be used for district accountability and no longer a graduation requirement.

Research suggests that a diverse STEM workforce is essential not only to providing equitable opportunities, but to ensuring that the outcomes of STEM endeavors in research and industry reflect, and are enriched by, the diverse perspectives and attributes represented by our reginal and national populace. In an article published in Scientific American by Medin, Lee, and Bang (October 2014), the authors argue that "STEM-related endeavors are better when they include culturally diverse perspectives and approaches… Being around people who are different from us makes us more creative, more diligent, and harder-working. It promotes innovation."

By increasing access of all students to science, particularly students of color, English language learners, and students with special needs to science, Seattle Public Schools will continue to prepare students for STEM fields.

In order to help ameliorate the gender, racial, cultural, religious, and/or sexual orientation bias frequently experienced by students, all programs submitted for review were thoroughly and carefully reviewed for evidence of an anti-bias lens using the Evaluation of Bias Content category of the Review Criteria which includes the criteria from the Board Policy 2015 Anti-Bias Screener tool and the Washington Models for the Evaluation of Bias Content in Instructional Materials (publ. Sept. 2009). Committee members scrutinized the texts for examples of materials containing bias and/or stereotyping based on gender, race, religion and/or sexual orientation. Committee members reviewed texts and recorded all findings, drawing from evidence from the instructional materials. Any instructional materials program that failed to achieve an acceptable score in this category were eliminated from consideration.

8. STUDENT BENEFIT

Based on all the evidence gathered during the course of the 12-month adoption process, the Adoption Committee firmly believes that adopting the Carbon TIME instructional materials program for all BIO A high school science classrooms, the District-Developed Curriculum for all BIO B high school science classrooms, the District-Developed Curriculum for all CHEM A high school science classrooms, and the PEER instructional materials program for all PHYS A and PHYS B high school science classrooms will provide a substantial benefit to students, as measured by student academic growth, engagement in standards-aligned practices, availability of teacher instructional scaffolds and supports, and greater equity and consistency in students experience across the district as a result of a common curricular scope and sequence and common assessments. A summary of these benefits is outlined below.

- **Common Instructional Materials and Unit Scope and Sequence**
  Regardless of school assignment, students in all schools across the district will have access to current, high-quality, standards-aligned science instructional materials in a common scope and sequence and will be held to common expectations for learning outcomes for the first time in the history of Seattle Public Schools. Having common science instructional materials and assessments in all BIO A, BIO B, CHEM A, PHYS A, and PHYS B classrooms will maximize the benefit of Science Department supports and professional development opportunities. This common scope and sequence allow teachers to work collaboratively toward standards-aligned instructional practices and use of assessments to best support and meet student learning needs, including the development of resources to differentiate instruction and provide culturally responsive instruction.

  In addition, students will receive instruction from teachers that have received adequate professional development in implementation and effective use of the instructional materials. The 2019-24 Strategic plan vision is Every Seattle Public Schools' student receives a high-quality, world-class education and graduates prepared for college, career, and community. An excerpt from the Theory of Action is as follows: WHEN WE

FOCUS on ensuring racial equity in our educational system, unapologetically address the needs of students of color who are furthest from educational justice, and work to undo the legacies of racism in our educational system...

BY doing the following:

- Allocating resources strategically through a racial equity framework
- Delivering high-quality, standards-aligned instruction across all abilities and a continuum of services for learners

- **Educational Excellence and Equity for Every Student**
  Goals of Policy No. 0030 will be supported through the adoption of a standards-aligned high school science instructional materials program that includes equitable access to a high-quality curriculum and educational resources, and professional development to strengthen teachers' knowledge and skills for eliminating opportunity gaps and other disparities in achievement.

9. WHY BOARD ACTION IS NECESSARY

☒ Amount of contract initial value or contract amendment exceeds $250,000 (Policy No. 6220)

☐ Amount of grant exceeds $250,000 in a single fiscal year (Policy No. 6114)

☐ Adopting, amending, or repealing a Board policy

☐ Formally accepting the completion of a public works project and closing out the contract

☒ Legal requirement for the School Board to take action on this matter

☒ Board Policy No. 2015, Selection and Adoption of Instructional Materials, provides the Board shall approve this item

☐ Other:

10. POLICY IMPLICATION

The motion is in compliance with Policy No. 2015, Selection and Adoption of Instructional Materials. In addition, Policy No. 6220, requires Board action because the contract exceeds $250,000. This process followed all of the requirements outlined in this policy.

11. BOARD COMMITTEE RECOMMENDATION

This motion was discussed at the Curriculum and Instruction Policy Committee meeting on April 23, 2019 and the Curriculum and Instruction Policy Committee of the Whole on April 30, 2019. The Committee reviewed the motion and moved the item forward for consideration by the full board.

12. TIMELINE FOR IMPLEMENTATION

Upon approval of this motion, Adoption of the Carbon TIME program as the official science curriculum for BIO A, Adoption of the District-Developed Curriculum program as the official science curriculum for BIO B, Adoption of the District-Developed Curriculum program as the official science curriculum for CHEM A, and Adoption of the PEER program as the official science curriculum for Physics A and Physics B, Seattle Public Schools will provide the recommended funding for professional development and purchase instructional resources and materials from the University of Colorado Boulder with student use beginning in the 2019-2020 school year.

The following implementation will follow this general timeline:

- May 2019: Communications to families, community, staff, and school and central leaders
- May-June 2019: SPS Science Department will work with the SPS Purchasing department to finalize the contract between Seattle Public Schools and the University of Colorado Boulder (and Michigan State University, if applicable) and ensure that orders for all schools are accurately placed.
- May 2019: The Science Department and the Department of Curriculum, Assessment, and Instruction will develop a schedule and goals and outcomes for initial and ongoing professional development.
- May-July 2019: Department of Technology Services will work with the University of Colorado Boulder, Michigan State University, and District Biology and Chemistry teachers to develop a pathway to compliance for all online components of the adopted program with the Americans with Disabilities Act (ADA).
- July-August 2019: Instructional materials will be delivered to all SPS BIO A, BIO B, CHEM A, PHYS A, and PHYS B classrooms.
- July-August 2019: The University of Colorado Boulder, Michigan State University, and District Biology and Chemistry teachers will work with the SPS Science Department and Department of Technology to establish systems for creating teacher accounts and student logins and responding to ongoing needs for technical support.
- August 2019: BIO A, BIO B, CHEM A, PHYS A, and PHYS B teachers will receive 3 days of in-depth professional development in the format, pedagogy, and implementation of the adopted instructional materials.
- September 2019-June 2020: Three additional days of science teacher professional development distributed throughout the school year plus implementation of online professional development opportunities including Schoology-based resources and Skype-based webinars.
- June 2020: The Science Department will conduct an evaluation of the first-year implementation of the adopted instructional materials, including analysis of student growth data and teacher/student/community input and feedback.

13. ATTACHMENTS

- Attachment A:
    - A1: Biology A: Final Candidate Vendor Proposal
    - A2: Biology B: Final Candidate Vendor Proposal
    - A3: Physics: Final Candidate Vendor Proposal
    - A4: Chemistry: Final Candidate Vendor Proposal
- Attachment B: 9-12 Science Adoption Communications Plan
- Attachment C: 9-12 Science Adoption Community Engagement Plan
- Attachment D: High School Science Adoption Committee Membership
- Attachment E: High School Science Adoption Instructional Materials Review Criteria
- Attachment F: High School Science Adoption Process Timeline, Summary, and Outcomes
- Attachment G:
    - G1: Biology A: Summary of Community and Family Input and Feedback
    - G2: Biology B: Summary of Community and Family Input and Feedback
    - G3: Physics: Summary of Community and Family Input and Feedback
    - G4: Chemistry: Summary of Community and Family Input and Feedback
- Attachment H: Field-Test Schools and Participating Teachers w/ distribution map
- Attachment I: Field-Test Data and Analysis: Field Test Teacher Input & Feedback, Student Growth Data, Classroom Observation Data, Student Interview and Survey Data
    - I1: Biology A
    - I2: Biology B
    - I3: Physics
    - I4: Chemistry
- Attachment J: Analysis Summary of Feedback & Data Collected
    - Includes all data collected from all sources (community, field test teachers, student surveys and interviews, and student assessment data, etc.)
    - How adoption committee used this to score and determine final candidates for the BAR
        - J1: Biology A
        - J2: Biology B
        - J3: Physics
        - J4: Chemistry
- Attachment K: Racial Equity Analysis Tool

- Attachment L: ADA/Consent Decree Compliance Ratings (Pending)
- Attachment M: SPS Research & Evaluation Teacher Adaptation Survey, February 2019

Attachment A1: Carbon TIME Proposal

Proposal Overview and Revisions

In response to Seattle Public School's Request for Proposal (RFP) Steps 1 and 2, Michigan State University, the lead organization in the collaborative research partnerships that develop Carbon TIME, submitted the proposal on the following pages. Carbon TIME does not have a cost, as it is a free and open educational resource, constantly improved by educators and university researchers. As such, the proposal submitted by MSU identifies costs for ADA compliance and website maintenance as the only foreseeable financial costs to the District for an Adoption of Carbon TIME.

Carbon TIME Response to Seattle Request for Information

October, 2018

Contents

The development of *Carbon TIME* materials and assessments is supported in part by a grant from the National Science Foundation: Sustaining Responsive and Rigorous Teaching Based on *Carbon TIME* (NSF 1440988). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Accessing Teaching Materials and Assessments on the *Carbon TIME* Website

Carbon TIME is a freely accessible, tested and proven, NGSS-aligned program that includes curriculum, assessment, professional development, and professional networks. While most closely aligned with Life Sciences, *Carbon TIME* also integrates some core disciplinary ideas from Earth Sciences and Physical Sciences. All *Carbon TIME* curriculum materials and supporting research can be accessed through the *Carbon TIME* website: http://carbontime.bscs.org/. This site has a link to *Carbon TIME's* password-protected assessment site. In this section we summarize the resources available and provide directions for viewing password-protected resources.

The Carbon TIME Curriculum and Research Website

The website has materials accessible through five tabs, as well as a link to the password-protected assessment site. The contents of the five tabs are summarized in the following paragraphs.

Home: A brief overview of the *Carbon TIME* project.

About: An introduction to *Carbon TIME's* goals and units.

Units: *Carbon TIME's* six units (*Systems and Scale, Plants, Animals, Decomposers, Ecosystems,* and *Human Energy Systems*) are accessed through the drop-down menu for this tab. Each unit is designed for three to four weeks of instructional time. The introduction to each unit includes a list of materials needed for investigations and hands-on activities. All other materials are included in printable form on the website. The home page for each unit includes a link to download a Zip file containing all unit materials. More details about unit features and design are included in the Overview and Responses to Adoption Criteria, below.

Educator Resources: The drop-down menu for this tab includes two kinds of resources:

- Curriculum resources: This section provides access to educative resources for teachers that apply to all units. (In contrast, unit-specific resources are under the Units tab.)
- Library: Resources linked from this section provide additional information about the *Carbon TIME* project.

Research: One of the distinguishing features of *Carbon TIME* is its extensive research base, used both for development and for evaluation of the curriculum and PD. Much of this research is available through this tab. It has three drop-down sections:

- Published articles and book chapters: copyright laws prevent us from including copies of most articles on the website, but all are available by using the links provided for the author or the Environmental Literacy project: envlit@msu.edu.
- Conference papers and presentations: links to download the papers and presentations are included with citations in this section.
- Technical reports and working papers: this section includes technical information for teachers and researchers about our procedures for curriculum development and research methods.

Contact: This includes contact information for the project.

The Carbon TIME Assessment System

The *Carbon TIME* project includes an extensively validated online system for assessing students' three-dimensional science performances. This system is accessed through the Assessment Site button on the right of all pages of the *Carbon TIME* site. It is password-

protected to prevent students from accessing the tests and answer keys. It includes many features for both teachers and researchers. The key features are summarized below.

Logging in to the assessment site. When you click on the site link, you will go to a login page. We have created an account for Seattle reviewers to use:

- Login: Seattle (case sensitive)
- Password: assessment (case sensitive)

Tutorials and FAQs: The bottom of every page has a link to Tutorials and FAQs page. This page includes three kinds of resources:

- *Detailed tutorials* introducing users to features of the site and explaining how to use them.
- *Assessment curriculum* with (a) the full item pool used for all *Carbon TIME* assessments, including tables showing which items are on which assessments, and (b) interpretation guides for the full test and each of the unit tests, including correct answers to each question, suggestions for grading or formative assessment, and interpretations of common student responses based on learning progression research.
- *Website FAQs* with frequently asked questions and responses.

Seeing tests from a student perspective. If you would like to take a test as a student, here's how:

- Click on Tests in the top menu bar.
- Click "Give Tests" for the class (Biology Period 1) that has been created for you.
- Choose the test you would like to give, and copy the passcode for that test.
- Click the "URL for students to take tests: http://carbontime.org/student" link at the top of the page.
- Copy the passcode and submit
- Enter any name and grade level that you would like
- Click the Start Exam button

Online Professional Development

Carbon TIME's PD course of study includes 35 hours of face-to-face workshops and 35 hours of online coursework. The online coursework can be accessed as follows:

- Go to https://bscs.sarus.io/
- Enter the following credentials
    - **Username**: user@carbontime.org
    - **PW:** Carbon2018
- The Dashboard with *Carbon TIME* courses (outlined in Appendix C) will be viewable
    - 1st course: *Carbon TIME* Year 1 preF2F (Summer Year 1 pre face-to-face)
    - 2nd course: *Carbon TIME* Year 1 Unit Investigations (Summer Year 1 post face-to-face)
    - 3rd course: *Carbon TIME* Year 1 PD (School Year 1)
    - 4th course: *Carbon TIME* Year 2 preF2F (Summer Year 2 pre face-to-face)
    - 5th course: *Carbon TIME* Year 2 PD (School Year 2)
- Click on any course to view content and tasks
- Move through online course tasks using the "Complete and Next" button on the top right or by using the vertical menu on the left-hand side

Overview of the *Carbon TIME* Curriculum and Research Support

Carbon TIME is a freely-accessible project that has been supported by a series of National Science Foundation (NSF) grants since 2005.[1] The project began with the general goal of supporting *environmental science literacy:* preparing students to use scientific knowledge and practices in their decisions about environmental issues.

We have used an iterative design cycle in which (a) goals for student learning are formulated, (b) assessments and instructional systems are designed to achieve those goals, and (c) designed innovations are tested in school settings, producing data that can be analyzed to inform revision of goals and a new cycle. Our design team is a research-practice partnership including university-based science education researchers, teachers, school administrators, and experts in professional development.

The Carbon TIME Program: Curriculum and Assessment, Professional Development, and Professional Support Networks

The *Carbon TIME* project has produced an extensive library of free resources organized around "three legs of the stool," each necessary but not sufficient for lasting improvements in science education: 1. Curriculum and assessment; 2. Professional development, and 3. Professional support networks that include research-practice partnerships.

1. Curriculum and assessment. *Carbon TIME* focuses on the science of carbon-transforming processes in socio-ecological systems at multiple scales: cellular and organismal metabolism in plants, animals, and decomposers; energy flow and carbon cycling at ecosystem and global scales; carbon sequestration; and, combustion of fossil fuels. The current imbalance among these processes is a primary driver of global climate change.

We have developed six three-week-long teaching units. Four units focus on macroscopic scale systems: *Systems and Scale, Animals, Plants,* and *Decomposers.* Two units focus on large-scale systems: *Ecosystems* and *Human Energy Systems* (which focuses on global carbon cycling). Unit synopses can be found in the Library on the website (http://carbontime.bscs.org/library). All of the units are organized around an instructional model that assesses and scaffolds students' three-dimensional engagement with phenomena. Information about the *Carbon TIME* instructional model and on how these units address NGSS performance expectations is provided in the section on Standards Alignment below.

All of the units are accompanied by an online assessment system that provides teachers with partially scored responses while simultaneously enabling us to collect and analyze student achievement data at scale. These assessments are discussed in detail in the section on Assessment below.

2. PD course of study. Both classroom observations and student learning data supported the design of a two-year course of study that includes 35 hours of face-to-face workshops and 35 hours of online PD. The development process was built on partnerships among teachers, researchers, and PD providers working together to develop the practical

[1] This research is supported in part by a grant from the National Science Foundation: Sustaining Responsive and Rigorous Teaching Based on *Carbon TIME* (NSF 1440988). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. Additional support comes from the Great Lakes Bioenergy Research Center (United States Department of Energy Office of Science BER DE-FC02-07ER64494), and the Dow Chemical Company Foundation.

knowledge that teachers need to understand students and enact the *Carbon TIME* instructional model. The course responds to the realities of teachers' current classroom communities while providing rationales, modeling, and support for what classroom communities that scaffold and assess three-dimensional science learning can look and sound like.

A core goal of our PD was to engage teachers and PD leaders in productive sensemaking that helped teachers make progress towards rigorous and responsive science teaching practices. The online coursework can be accessed through the links provided on page 3 above. The course of study is described in more detail in the section on Instructional Planning and Support below.

3. Professional support networks with research-practice partnerships. The final component of *Carbon TIME* involved development of research-practice partnerships to support sustained engagement by teachers, researchers, and school administrators. A key advantage of partnerships is that they provide a means for researchers and practitioners to work together to solve problems of implementation. In our partnerships there is a two-way street between researchers and practitioners, such that researchers, teachers, and administrators play essential but complementary roles. For example, grading rubrics developed by teachers led to strategies in the curriculum for assessing students' three-dimensional learning. Plans for continuing professional networks and research-practice partnerships are discussed in the section on Instructional Planning and Support below.

Research and Evaluation

Carbon TIME is unique among NGSS-based programs in its extensive use of research for understanding students, developing and field-testing materials and programs, and evaluating students' three-dimensional learning at scale. In this section we briefly introduce the main strands of *Carbon TIME* research.

Learning progression research. The *Carbon TIME* curriculum and assessments are built on a foundation of learning progression research. Here's a definition from the National Research Council report *Taking Science to School:* "Learning progressions are descriptions of the successively more sophisticated ways of thinking about a topic that can follow one another as students learn about and investigate a topic over a broad span of time." (NRC, 2007). Our learning progression research provides the foundation for curriculum development (described in the section on Standards Alignment below) and assessment development (described in the Assessment section below).

Developing and field-testing materials and programs. *Carbon TIME* materials and programs were developed using an iterative design cycle by a research-practice partnership that includes researchers, teachers, and administrators. Through the development process these materials and programs have been far more extensively field-tested than any other NGSS-aligned program.

We are in the last year of a five-year study; the full five years of the study will involve approximately 160 participating teachers working in diverse middle and high school classrooms, with each teacher and their students participating for two successive years (about 900 different classrooms total). The 94 schools participating to date include urban, suburban, and rural schools. There are 26 middle schools and 68 high schools, including 10 of the 11 Seattle high schools. The percentage of students in a school receiving free and reduced lunch ranges from 3% to 99%, with a mean of 41%. The percentage of underrepresented minority students in the participating schools ranges from 0% to 100%, with a mean of 43%.

Table 1 outlines major project data sources and quantities of data collected in the first three project years; the main years of project data collection are Years 2–5. We are currently analyzing data from Years 3 and 4.

Table 1. Data Sources for the *Carbon TIME* Project (First Three Years)

Data Source	Baseline Year (2014–5)	First Full Year (2015–6)	Second Full Year (2016–7)	Additional Data*
Full Data Set (120 participating middle and high school teachers in 2014-17)				
Participating teachers	17*	27	83	
Student tests (8/student)	2,920	21,058	60,371	244**
Teacher surveys (3/teacher each year)	104	169	294	
PD videos & field notes (3 days/cohort)	0	52 hrs.	95 hrs.	
Online PD (~10 hours/cohort)***	0	300 hrs.	450 hrs.	
Case Study Data Set (17 cases involving 14 teachers: 5 middle school, 9 high school)				
Participating teachers		8	9	
Student interviews (4 focus students/class)		40	65	52**
Teacher interviews (5/teacher)		22	47	
Classroom videos (~10 lessons/teacher, 2 videos/lesson)		195	197	
Student work (~12 examples/focus student)		472	498	

*Participating teachers in the baseline year implemented assessments with their students but did not implement *Carbon TIME* instruction.
** We also collected some interview and test data from college students for learning progression development.
*** We collected video, field notes, assignments, and discussion threads from 3 days of face-to-face and ~10 hours of online Professional Development (PD) each year for each teacher.

Evaluating students' three-dimensional learning at scale. The learning progression research provides the foundation for development of the *Carbon TIME* assessment system, described in more detail in the assessment section below. Because we have developed a system for online testing and automated scoring of students' constructed responses, we have been able to evaluate students' three-dimensional learning at a far larger scale than any other NGSS-aligned curriculum project (more than 1.1 million student *Carbon TIME* constructed responses have been scored so far). Two key findings from this research are as follows:

- The *Carbon TIME* program supports students' three-dimensional learning in a wide range of schools, as described above. It is far more effective than the curricula that teachers were using before they entered the program. These findings are discussed under Standards Alignment, below.
- *Carbon TIME* narrows the achievement gap between initially low-achieving students and initially higher-achieving students. These findings are discussed under Accessibility for Diverse Learners below.

Planned Final Revisions

The curriculum materials, assessments, and PD course of study currently on the website are from Year 4 of the five-year research and development project. We will not be making further changes in the assessments, but there will be additional changes in curriculum materials and the PD course of study. These changes are described in the sections below on Standards Alignment and Instructional Planning and Support. An outline describing the planned final contents of the website is included in Appendix A below.

Responses to Adoption Criteria

1. Standards Alignment

All *Carbon TIME* units are organized around a fundamental purpose: We want to provide teachers with the tools they need to lead classroom learning communities that *assess and scaffold students' three-dimensional engagement with phenomena.* We discuss the assessment tools below. In this section we focus on how the units scaffold students' engagement with phenomena. We discuss (a) NGSS coverage (b) learning progressions research, (c) the *Carbon TIME* instructional model and supporting resources, and (d) research evidence for success in supporting three-dimensional learning.

NGSS coverage

A full list of NGSS performance expectations addressed by *Carbon TIME* units can be found in the NGSS Mapping document in the Library on the website (http://carbontime.bscs.org/sites/default/files/educator_resources/NGSS_Mapping_CarbonTIME_2018.pdf). These performance expectations include all middle- and high-school performance expectations focused on matter and energy in living systems, from cellular metabolic processes to matter cycling and energy flow in ecosystems. These are about half of the life science performance expectations. The life science performance expectations not addressed by *Carbon TIME* focus on genetics, evolution, and community ecology.

The units also address physical science standards associated with matter, energy, and chemical change—essential prerequisites for understanding matter and energy in living systems. Finally, the units address Earth science expectations associated with global carbon cycling and climate change. In terms of the three dimensions of the NRC framework, the units focus on the following:

- All eight science practices, organized into three clusters: (a) asking questions; (b) inquiry (planning and carrying out investigations, analyzing and interpreting data, engaging in argument from evidence); and (c) application (developing and using models, constructing explanations, designing solutions).[2]
- All seven crosscutting concepts, with particular emphasis on: (a) scale, proportion, and quantity; (b) systems and system models; and (c) energy and matter: flows, cycles, and conservation.
- Disciplinary core ideas in the life sciences (LS1: From Molecules to Organisms: Structures and Processes; LS2: Ecosystems: Interactions, Energy, and Dynamics); Earth and space sciences (ESS2: Earth's Systems; ESS3: Earth and Human Activity); and physical sciences (PS1: Matter and Its Interactions; PS3: Energy).[3]

Learning progressions research

Our assessments show that only a tiny percentage of high-school biology students are initially able to achieve the NGSS performance expectations. The learning progressions research plays an essential role in analyzing how student make sense of phenomena and providing a basis for instructional design. An article from the *American Biology Teacher* titled,

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[2] Using mathematics and computational thinking; and obtaining, evaluating, and communicating information are included in all three clusters.

[3] The *Carbon TIME* Content Simplifications document in the Educator Resources Library (http://carbontime.bscs.org/library) explains ways in which we have simplified some explanations of chemical process that are compatible with NGSS, but may be criticized by chemists or physicists.

"Learning Progressions and Climate Change," introducing this research can be found through the link to Learning Progressions and Climate Change in the Educator Resources Library (http://carbontime.bscs.org/library).

We have developed three learning progressions, each focusing on a particular set of practices, disciplinary core ideas, and crosscutting concepts. These learning progressions are briefly described in Table 2 below. A deeper description of the three *Carbon TIME* learning progressions can be found in the chapter by Covitt and Anderson (Assessing Scientific Genres of Explanation, Argument, and Prediction, cited in the 2018 Research publications: http://carbontime.bscs.org/articles-book-chapters).

Table 2: *Carbon TIME* Learning Progressions

Learning Progression	***Practices***	***Disciplinary Core Ideas***	***Crosscutting Concepts***
Macroscopic explanation (carbon)	Explanation, using models	Carbon-transforming processes (combustion, photosynthesis, cellular respiration, digestion, biosynthesis) at multiple scales	Conservation, flows, cycles, of matter and energy Connecting systems at different scales
Macroscopic inquiry	Asking questions, analyzing data, arguments from evidence		
Large-scale systems	Data & model interpretation, explanation, prediction	Ecosystem & global carbon cycling & energy flow, climate change	

Each learning progression describes a succession of student performances as they engage with phenomena. Those phenomena include combustion, plant and animal growth and movement, and decay at the macroscopic scale; biomass pyramids and disturbances to ecosystems; global changes in carbon dioxide concentration and climate change. The performances include the kinds of questions students ask, the kinds of explanations they provide, and their approaches to investigations. The learning progressions provide an essential foundation for design of curriculum materials.

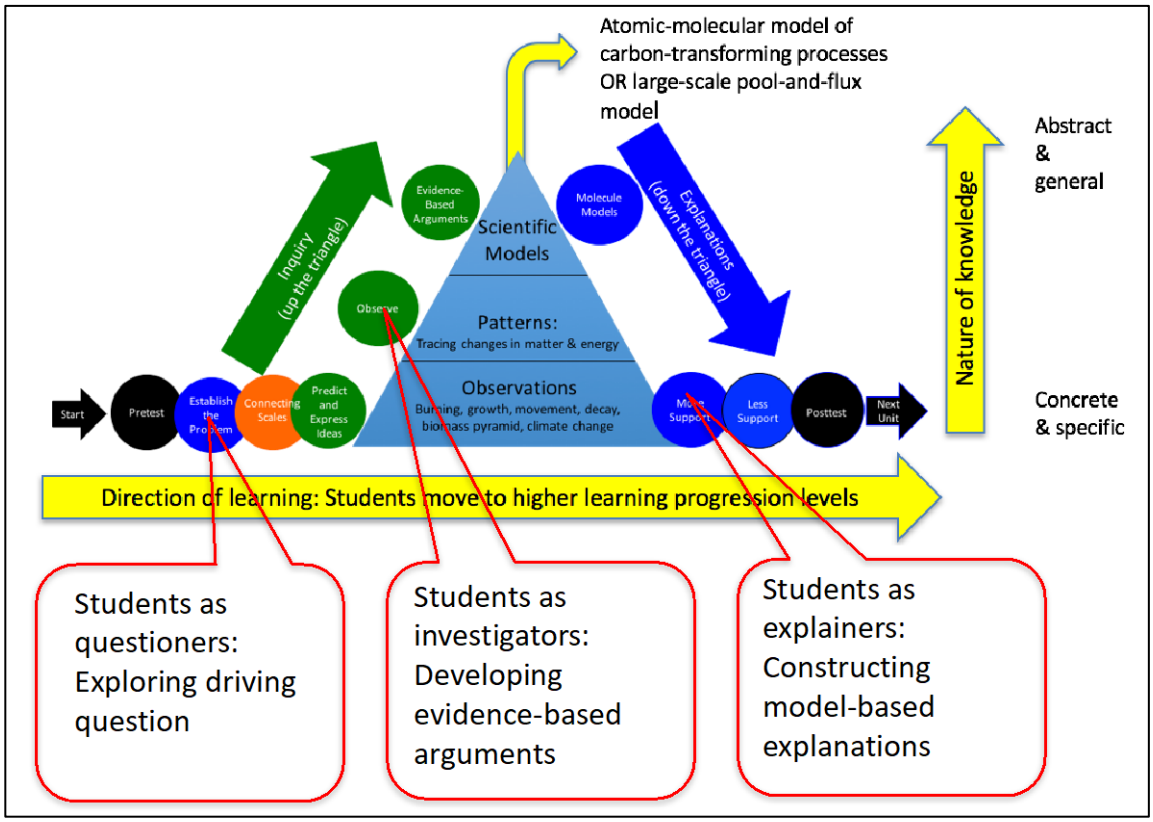
The *Carbon TIME* instructional model and supporting resources

All *Carbon TIME* units are organized around an instructional model and storyline, represented in Figure 1, below. A detailed discussion of the instructional model and its enactment in each unit can be found in the Educator Resources Library (http://carbontime.bscs.org/library). As Figure 1 shows, each unit is organized around a storyline that engages students in the three clusters of science practices described above. We first describe the basic sequence of practices, then the tools and recurring features that support those practices.

- *Students as questioners:* Each unit begins with a phenomenon and driving question. For example, in the *Systems and Scale* unit the teacher shows that ethanol burns but not water, and students consider the driving question: "What happens when ethanol burns?" Students use the Expressing Ideas Tool to record and discuss their ideas and questions. A key outcome of the discussion is a set of student questions about the phenomenon that they will answer during the unit.
- *Students as investigators:* In each unit the initial discussion leads first to a lesson providing students with foundational knowledge (scale, atoms, and molecules for

Systems and Scale), then to an investigation in which students trace matter and energy through systems. Students use the Predictions Tool and the Evidence-based Arguments Tool to record and discuss their ideas. They reach evidence-based conclusions and record unanswered questions to be addressed later in the unit.

- *Students as explainers:* Each unit concludes with a series of activities where students use molecular models to model the phenomena, then use the Explanations Tool to develop and discuss rigorous scientific explanations that answer the driving question. They then use what they have learned to explain other related phenomena (for example, burning methane, wood, gasoline, and propane in *Systems and Scale*).



Unit resources: tools and recurring features. First and foremost, we invite you to explore the extensive resources provided for each unit on the *Carbon TIME* website. Each unit provides teachers with a tool kit that they can use to tailor their teaching to the needs of their students. The Read Me document at the beginning of each unit (for example, http://carbontime.bscs.org/ss_read_me) helps teachers to make key choices about what activities and resources to use. *Carbon TIME* uses "Turtle Trails" (explained in the Educator Resources Library: http://carbontime.bscs.org/sites/default/files/educator_resources/Turtles_07.05.16-1.pdf) to designate more- and less-detailed and complex learning pathways within a unit.

Each unit is also organized around a set of tools and recurring features that are consistent across units, enabling students to build proficiency as they engage successive units. Explanations of many of these tools and recurring features can be found in the Educator Resources Library: http://carbontime.bscs.org/library .

- Process tools (Expressing Ideas Tool, Predictions Tool, Evidence-based Arguments Tool, Explanations Tool) provide scaffolding for students' engagement in the roles on questioners, investigators, and explainers.

- The Learning Tracking Tool is a new feature to be included in the final revision of the units. Students will construct a storyline of their learning by completing one row of the tool after key activities and discussing what they have written about their learning and questions to address in future lessons. A completed Learning Tracking Tool for *Systems and Scale* is included below as Appendix B. The color-coded circles track the progression of students' roles and practices.
- Big Ideas probes are included in every unit to support student self-assessment and public discussion of different ideas about the unit driving questions. A document in the Educator Resources Library discusses approaches to using them.
- The Three Questions are used to define rigorous scientific explanations and provide a checklist that students and teachers can use to evaluate student explanations (e.g., http://carbontime.bscs.org/sites/default/files/system_scale/handouts/Three_Questions_Handout.pdf).
- Discourse routines engage teachers and students in divergent and convergent discussions around each process tool. They are discussed in the Discourse Routines document in the Educator Resources Library.
- Readings are used for multiple purposes in the units. Those purposes and strategies for helping all students make sense of the readings are explained in the "Reading Strategies: Questions-Connections-Questions" document in the Educator Resources Library.
- Students use molecular models to construct model-based explanations of combustion and key metabolic processes—photosynthesis, cellular respiration, digestion, and biosynthesis.
- PowerPoint presentations serve multiple purposes. They scaffold class discussions, present information, and provide animations of the chemical changes in combustion and metabolic processes.
- Posters are used to remind students of key ideas and record data from investigations.
- Online videos accompany the investigations in the four macroscopic-scale units: *Systems and Scale, Animals, Plants,* and *Decomposers.*
- In the *Ecosystems* and *Human Energy Systems* units students use games, online simulations, and online models to investigate and explain matter cycling and energy flow in ecosystems and Earth systems.
- Formative and summative assessments are discussed in more detail in the Assessment Section below. They are explained in the "Assessment Purposes in *Carbon TIME*" document in the Educator Resources Library.

Cross-unit connections. Finally, we note that the units are all connected through an overall storyline, starting with the simplest of the core carbon-transforming processes—combustion—then moving to how living systems transform matter and energy at organismal and ecosystem scales, and concluding with global-scale carbon cycling and its implications for climate change. These connections are discussed in detail in three documents in the Educator Resources Library: http://carbontime.bscs.org/library .

- Unit synopses
- Carbon TIME FAQ: Which Units Should I Teach?
- *Carbon TIME* Instructional Model

Effects on student achievement

Research conducted over multiple years shows that teachers are enacting instruction that produces three-dimensional learning at scale. Figure 1 compares Item Response Theory (IRT)-based estimates of student pretest and posttest proficiencies with end of school year baseline levels (students of the same teacher the year before) for the first two years of this

study. For detailed methods and results see two documents in Technical Reports and Working Papers under the Research tab (http://carbontime.bscs.org/technical-reports-working-papers):

- Validation of *Carbon TIME* assessments
- Quantitative analyses of students' learning gains

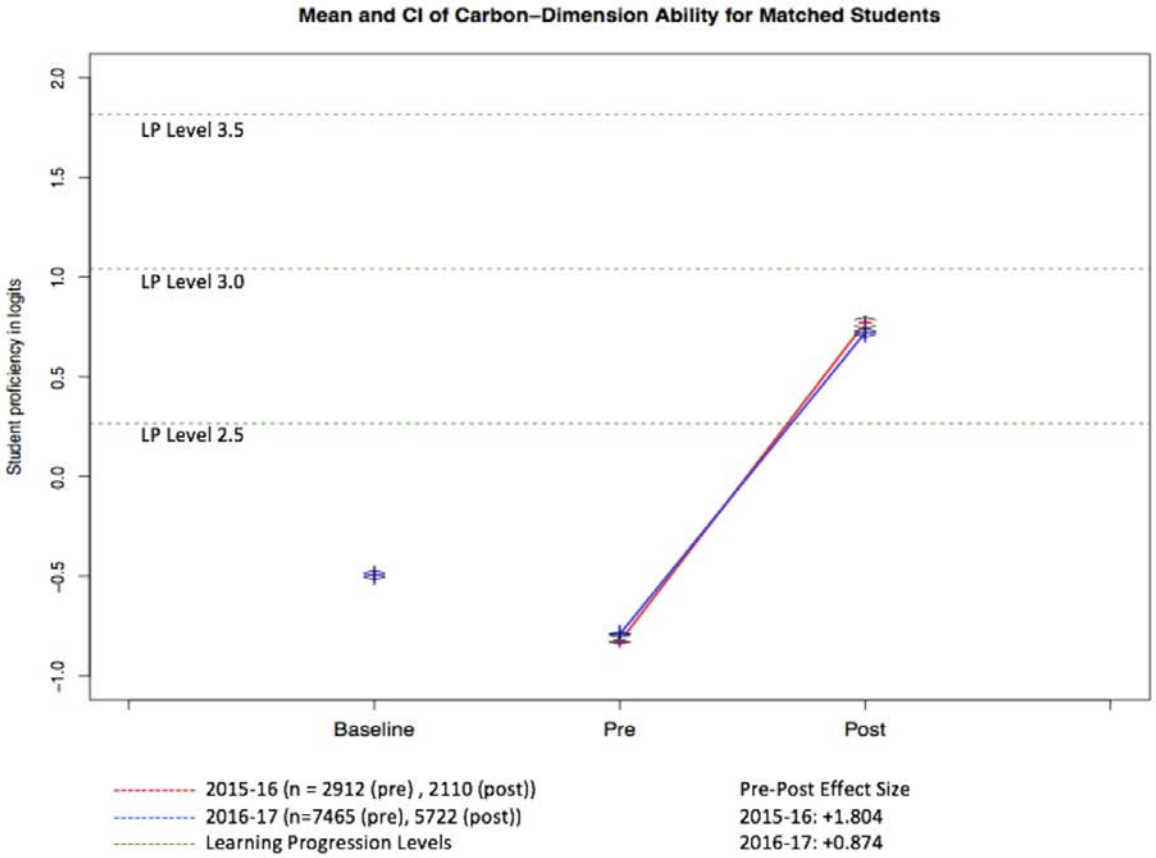


Figure 2: Mean learning progression (LP) levels of students in Carbon TIME and baseline (classes of participating teachers the year before they started using Carbon TIME). Error bars represent 95% confidence intervals. LP Level 4 is equivalent to full achievement of NGSS performance expectations in this domain.

These results from over 10,000 students show that students improved significantly compared to both pretest and baseline performances. In other studies we have shown that high school students participating in *Carbon TIME* show higher proficiency on learning progression-based assessments than college science majors in biology courses (Rice, Doherty, & Anderson, 2014).

2. Assessments

The Carbon TIME program includes both classroom assessments and large-scale or monitoring assessments that are valid, reliable, and efficient. We have devoted many research and development cycles to creating, testing, and improving *Carbon TIME* assessment systems. In this section we first describe the online assessment system, then discuss the array of resources for classroom formative and summative assessment in *Carbon TIME.*

Online assessment system

The core of the *Carbon TIME* assessment system is an online testing platform that includes an overall test to be taken by students at the beginning and end of the school year as well as pretests and posttests for each of the six *Carbon TIME* units.[4] Directions for assessing and using this password-protected system are above. Since the tests are capable of eliciting student responses across learning progression levels, the same tests are used for both middle- and high-school students. Teachers can download student responses in full test or spreadsheet format. In both formats, forced-choice portions of responses are automatically scored by the system. Anonymized responses are also shared with researchers.

The learning progression frameworks and assessment systems are the products of multiple cycles of development and revision. We have developed validity evidence that these systems measure students' three-dimensional learning. Through the 2017-18 school year, the *Carbon TIME* assessment system has been used by more than 30,000 students who have taken more than 160,000 unit tests and overall tests. Our automated scoring system has assessed more than 1.1 million student written explanations. This system is an important tool for classroom teachers, and it has provided essential data for our research and design work.

The Research tab of the website contains a several reports on the development and validation of this system, including the following:

- The complete item list for *Carbon TIME* assessments is available on the Tutorials and FAQs page of the password-protected Assessment site (see instructions for access on pages 2-3 above).
- Validity evidence for assessments: http://carbontime.bscs.org/sites/default/files/research/technical_reports_working_papers/CarbonTIMEAssessmentValidation.pdf
- Methods for analysis of quantitative assessment data: http://carbontime.bscs.org/sites/default/files/research/technical_reports_working_papers/Quantitative_Analyses_of_Students_Learning_Gains.pdf
- Description of how the automated scoring system was developed and used: See the poster by Thomas and Draney on the 2018 Conference Presentations page: http://carbontime.bscs.org/2018-conference-presentations

Classroom formative assessment and grading

Recent research on classroom assessment has generally focused on formative assessment. Teachers, however, are also legitimately concerned with grading and holding students accountable for their performances. We have worked to design classroom assessment systems that serve both of these purposes, as well as the important purpose of helping students assess the quality of their own work. The Educator Resources Library has a document describing resources for each of these purposes of assessment and how they can be used: http://carbontime.bscs.org/sites/default/files/research/technical_reports_working_papers/Assessment_in_Carbon_TIME.pdf . Key points from that document are summarized below.

Formative assessment: Insight into students' knowledge and practice. *Carbon TIME* materials are designed to enable productive classroom discourse, in which talk, writing, and norms of interaction support figuring out phenomena. Process Tools and pre- and post-assessments are designed, in part, to elicit *interesting wrong answers*. That is, the questions aim to reveal how students are thinking even if they don't fully understand the science.

Every *Carbon TIME* resource that involves student writing—tests, quizzes, process tools, Big Ideas probes, and worksheets—is accompanied by an Assessing tool or a Grading

[4] Funding for this system in its current form will continue only through the 2018-19 school year.

tool that documents highlight common patterns in students' ideas to help teachers begin to identify these patterns in their own classrooms. For example the Assessing tool for the *Systems and Scale* Expressing Ideas Tool is at http://carbontime.org/WebContent/CTIME_Downloads/SystemsAndScale/1.2_Assessing_Expressing_Ideas_Tool_for_Ethanol_Burning.pdf . Additionally, discussing the various ideas that exist in the classroom fosters shared curiosity and supports individual students in better understanding their own thinking.

Student self-assessment. Students are often not aware of their own prior knowledge and preconceptions. In order for effective learning to occur, student must be given opportunities to articulate these ideas and compare them to the scientific explanations they learn through classroom activities. In addition, throughout a unit, students need to be able to assess the quality of their arguments and explanations, in order to improve them. The Three Questions, the *Carbon TIME* discourse routines, and shared checklists and rubrics are all designed to involve students in assessing their own thinking and writing.

We have found that having students revisit earlier tools helps them to identify how their thinking has changed over the course of a unit. Teachers have also found Big Ideas Probes useful for helping students to see how their ideas are changing as they progress through a unit. For example, see the Assessing tool for the *Systems and Scale* Big Ideas probe: http://carbontime.org/WebContent/CTIME_Downloads/SystemsAndScale/Assessing_Big_Idea_Probe_Filler_Up.pdf .

Grading and accountability. Grading provides a means of communicating with students about *what matters* in *the* classroom: What they are accountable for, and why their talk and writing is important. *Carbon TIME* has supports for this assessment purpose throughout each unit.

1. *Students as questioners and investigators.*
    a. Expressing Ideas and Predictions Tools – students are accountable for articulating their initial ideas, for listening and responding to others' ideas and questions, and for returning to earlier ideas later in the unit and noticing how ideas have changed.
    b. Evidence-Based Arguments Tool – students are held accountable for key evidence, arguments, and unanswered questions by the end of the lesson
    c. Assessment tools provide Learning Progression level guidance.
2. *Explanations Tools and general explanations lessons: Students as explainers.*
    a. The Three Questions provide a 4-step guide and general rubric for explaining phenomena, which can be used as a self-assessment and revision guide
    b. Grading tools provide scoring and Learning Progression level guidance
3. *Carbon TIME* post-tests
    a. Computer scoring of forced choice responses and downloadable, editable spreadsheets of class results (with tutorials) are available.
    b. Grading tools provide scoring and Learning Progression level guidance.

3. Accessibility for Diverse Learners

We have put intense effort into inclusion and differentiation in *Carbon TIME.* In this section we (a) describe how we have addressed inclusion and differentiation in the development process, (b) describe current and planned supports for inclusion and differentiation in *Carbon TIME* curriculum materials and PD, and (c) present evidence for the success of *Carbon TIME* in scaffolding diverse learners.

Addressing inclusion and differentiation in the development process. As described above we have paid careful attention to working with diverse schools, teachers, and learners throughout the development process. The 900 classrooms total in 94 schools include urban, suburban, and rural schools. There are 26 middle schools and 68 high schools, including

10 of the 11 Seattle high schools. The percentage of students in a school receiving free and reduced lunch ranges from 3% to 99%, with a mean of 41%. The percentage of underrepresented minority students in the participating schools ranges from 0% to 100%, with a mean of 43%.

Our research-practice partnership also includes teachers who work with English Language Learners such as Katherine Kelsey in Seattle and Jeremy Gaspar in Kentwood, MI, as well as special education teachers such as Tonya Elias in East Kentwood and Melinda Plaugher in Midland, MI. These teachers have provided important insights and resources. Their ideas contributed to the chapter we wrote on science assessment for English Language learners (Assessing Scientific Genres of Explanation, Argument, and Prediction, by Covitt and Anderson, cited in the 2018 Research publications: http://carbontime.bscs.org/articles-book-chapters).

Supports for inclusion and differentiation in *Carbon TIME* curriculum materials and PD. The Process Tools and their repetition within and across units is particularly helpful for all learners, especially those who need additional scaffolding. The Process Tools themselves support students in taking up the "second-language" of scientific discourse. Connected to the Process Tools, the *Carbon TIME* discourse routine is inclusive of all students because it starts with divergent ideas, which gives all students the opportunity to share their thinking. The subsequent discussions help bring that divergent thinking closer to the canonical consensus.

The materials also have many activities that include suggestions for accommodations or modifications (and we are planning to do this more systematically). These recommendations support learners who need additional practice with the material in order to take up the "second-language" of scientific discourse. Many of our repeated and optional activities serve this purpose as well, such as the additional practice students can get in Systems and Scale with methane.

Carbon TIME uses "Turtle Trails" (explained in the Educator Resources Library (http://carbontime.bscs.org/sites/default/files/educator_resources/Turtles_07.05.16-1.pdf) to designate more- and less-detailed and complex learning pathways within a unit. For example, the 1-turtle pathway in *Animals*, *Plants*, and *Decomposers* uses language such as "large and small organic molecules" while the 2-turtle pathway includes more detailed vocabulary for the polymers and their monomers. These choices are easily marked for teachers using a stacked turtle icon next to Activities and within Unit Read Me Files and Unit Overviews, and an explanation for the Turtle Trails is available in our Library.

We have also put substantial effort into educative resources associated with the units and PD activities that help teachers use learning progression research to understand and respond to their students. These include the Assessing and Grading Tools for all student written work (described in the Assessment section above) and PD activities that involve teachers in analyzing and responding to student work (described in the Instructional Planning and Support section below).

Evidence for the success of *Carbon TIME* in scaffolding diverse learners. We used hierarchical linear modeling (HLM) analyses to investigate associations between student learning gains and other variables associated with diversity in students and schools. An explanation of how we conducted these quantitative analyses of student learning gains can be found in the Research Technical Reports and working papers (http://carbontime.bscs.org/sites/default/files/research/technical_reports_working_papers/Quantitative_Analyses_of_Students_Learning_Gains.pdf). Separate analyses of 2015–16 and 2016–17 data show consistent patterns:

- *Carbon TIME reduced the achievement gap between higher-pretest and lower-pretest students within classrooms.* Within classes, students with lower pretest proficiencies showed significantly higher learning gains.
- *Carbon TIME was less successful in higher-poverty schools with fewer organizational resources.* The school percentage of free and reduced lunch was negatively associated with class-average learning gain. That is to say, classrooms from schools with higher percent of free and reduced lunch benefit less from implementing *Carbon TIME*. We interpret this finding as evidence that schools with more organizational resources are more successful in implementing *Carbon TIME*.
- *Other variables were not significantly associated with student learning gains.* We also investigated other variables, including grade band (middle school vs. high school), racial composition of students, and class average pretests. None of these variables added significantly to the predictive power of models that included the three key variables above: individual teachers, student pretest, and school percentage of free and reduced lunch. In other words, teachers and students in a wide range of classrooms were successful using *Carbon TIME.*

4. Evaluation of Bias Content

We believe that *Carbon TIME*'s best protection against bias in content comes from its iterative development process in a research-practice partnership and its extensive field testing in diverse classrooms. Many suggestions for reducing bias have been incorporated into *Carbon TIME* materials through this process. We also point to evidence from student learning data (cited in the sections on Standards Alignment and Accessibility for Diverse Learners, above) that students of different ages, genders, ethnicities, and social groups learn successfully from *Carbon TIME* materials.

We have also taken specific steps to reduce bias in *Carbon TIME* materials. For example:

- Storyline readings in each unit focus on scientists of different historical times, ethnicities, and genders. For example, see the *Systems and Scale* reading about Elizabeth Fulhame: http://carbontime.bscs.org/sites/default/files/system_scale/handouts/1.2_Systems_and_Scale_Storyline_Reading.pdf
- Student names in worksheets and assessments also include names associated with different ages, genders, and ethnicities. We also take care to have different fictional students articulate correct answers. For example, see the Assessing tool for the *Animals* Big Ideas probe: http://carbontime.org/WebContent/CTIME_Downloads/Animals/Assessing_Big_Idea_Probe_What_Happens_to_the_Fat.pdf .
- We work to use phenomena in the units that are either familiar to all students (e.g., children growing and moving) or unfamiliar to all students (e.g., growth of *Spartina*, a kind of marsh grass) and that support materials include information or experiences that familiarize students with the phenomena.

5. Instructional Planning and Support

Carbon TIME uses a "three legs of the stool" approach to supporting rigorous and responsive science classroom instruction. One leg is our research-based, three-dimensional curricular units. The other legs are coordinated professional development for teachers, provided through collegial networks. The professional development program supports teachers in understanding complex three-dimensional learning goals, in enacting *Carbon TIME* units designed to scaffold and assess these learning goals, in developing the kind of classroom

discourse that is required for equitable engagement in these learning goals, and in using student talk and writing to inform instructional decisions. Engaging in professional learning with local colleagues supports teachers in making sense of a new curriculum and learning and instructional goals in the context of their building and district norms and expectations.

Current *Carbon TIME* PD resources

Educative resources embedded in units and website. Instructional supports are embedded in *Carbon TIME*'s online curricular units, designed to be educative and teacher friendly. Each unit provides numerous resources to guide teachers through successful implementation, including unit overviews and Read Me files supporting activity-level decision making and teacher-facing educator resources that provide brief rationales and implementation suggestions (example: Grading and Assessing tools). The Educator Resources Library provides many additional resources (see discuss and links above).

PD course of study. Our grant-funded, 2-year professional development course of study supported new *Carbon TIME* teachers in orienting themselves to using the curriculum to meet three-dimensional learning goals for all students. The program and resources have been field-tested with over 150 teachers in Seattle, other Washington locations, Colorado, and Michigan. The two-year course of study included 35 hours of face-to-face PD and 35 hours of online PD. Evaluation reports indicate that teacher participants felt the professional development was both positive and highly effective in supporting teachers' rigorous and responsive, three-dimensional instruction. Feedback from teachers, leaders, and developers has been the source of iterative revisions and improvements. An outline of this course of study – as used in Seattle by pilot teachers over the last three years – is available as Appendix C.

Plan for Seattle schools

Our plans for future planning and instructional support for Seattle biology teachers build on and improve both the current educative resources on the website and the PD course of study, as well as providing ongoing support for all teachers through professional support networks.

Improved educative resources embedded in units and website. The outline for the final website in Appendix A includes our list for an expanded library with additional educative resources for teachers—see in particular the list of resources under Tab 6 in the outline. Each resource will be linked to curriculum features in the Units (Tab 3) and the PD Course of Study (Tab 4). Educative resources linked to curriculum features will include (a) a discussion of the nature and purpose of the curriculum feature, (b) a discussion of different options for how to use the feature in the classroom, and (c) suggestions for differentiation.

Continuing professional support networks for all biology teachers. Seattle Public Schools already has significant human resources available to support using *Carbon TIME* to meet NGSS expectations for student learning: about 25 of the 35 Biology teachers are engaged in or have completed the two-year professional development course of study. Teachers who have already completed the grant-funded two-year course of study would engage in ongoing professional learning experiences with colleagues, to deepen and extend practical knowledge of using *Carbon TIME* to scaffold and assess NGSS-aligned, three-dimensional performances.

Developing classroom discourse that supports complex three-dimensional learning goals is challenging and requires ongoing professional support. Additionally, changes in building and district expectations (including local goals, areas of focus, common student assessments) require teachers to work with collegial networks in order to successfully fit together myriad goals at the local context.

One-year course of study for biology teachers new to *Carbon TIME.* Based on estimates for teacher retention and shifts in assignments, we anticipate that about 10 teachers

will require new *Carbon TIME* training each school year. Our recommendation for professional development is to engage new *Carbon TIME* teachers in a 1-year cohort program. At the time of this writing, *Carbon TIME* is finalizing Professional Development modules to publish as a free resource on the *Carbon TIME* Website. These modules (outlined under Tab 3 in Appendix A below) will meet the needs of both of the audiences described above: a cohort of teachers new to *Carbon TIME* each year, and a larger group of experienced *Carbon TIME* educators.

These modules are intended for face-to-face delivery, and are designed with the potential for flexible and localized implementation. They are being developed based on information received from teachers who have experienced the original grant-funded program, including many in Seattle. They provide district and teacher leaders with tools to support PD for teachers new to *Carbon TIME* as well as PD for experienced teachers, who are able to analyze classroom artifacts (assessments, discussions, and written explanations) to more deeply address student thinking and 3-dimensional performances.

New Teachers	**Experienced *Carbon TIME* Teachers**
Pre-Implementation Summer (16 hours)	**Summer/School Year (16 hours)**
• *Carbon TIME*: 3-dimensional Vision, Storylines, and learning progression stance	• Rigorous & Responsive Classroom Discourse using discourse artifacts
• Understanding *Carbon TIME* through *Systems & Scale* (Foundational Unit)	• Studying Student Work to Understand Student Ideas and Select Instructional Responses using student work artifacts
• 3D (formative & summative) assessments through *Systems & Scale*	• 3D Classroom Assessments using student assessment artifacts
First School Year (16 hours)	• Updates to materials (repairing broken links, revisions, etc.)
• Reflect on *Systems & Scale*	
• *Animals & Decomposers*	
• *Plants*	
• *Ecosystems & Human Energy Systems*	

Other options. There are other possible designs for a Seattle *Carbon TIME* professional development network and course of study. For example, Seattle district leaders and/or lead teachers could draw on expertise already in the district to facilitate the field-tested version of PD (Appendix C) by continuing to engage new cohorts of *Carbon TIME* teachers through the developed two-year program, both face-to-face and online (Seattle's Schoology platform). With this option, Seattle could provide new cohorts of teachers with the original version of PD while continuing to develop teacher leaders within the district by recruiting teacher leaders to continue delivering the PD program to their colleagues.

Budget Explanation

All online *Carbon TIME* materials are free, so they are not included on the attached budget spreadsheet.

Initial cost: A complete list of hands-on materials needed for investigations and other activities is included in the Materials List tab of the budget spreadsheet. Sources and prices as of summer, 2018 are also included. The cost for all of these materials would be about $400 per teacher. However, many of the materials are already available in most high school laboratories, so costs for classrooms that have laboratory access will probably be less. We estimate that 10 teachers will need new materials at a cost of $400 and 25 teachers will need yearly replacements of consumables at a cost of $150.

Yearly costs: Estimates of yearly costs are calculated as follows:

- Costs for replacement of consumables and of materials that are lost or broken is estimated at $150 per year per teacher for 35 teachers each year.
- Cost of website maintenance, including updating broken links, minor revisions, and security upgrades (from web developer Rhiannon Villafuerte of SwarmingWest): $2400 per year.

Other expenses: Expenses associated with implementation of *Carbon TIME* that are not listed include:

- Costs of printing readings, worksheets, and posters.
- Costs of teacher salaries or substitute costs for PD
- Costs associated with student access to computers for online simulations or modeling activities in the *Ecosystems* and *Human Energy Systems* units
- Funding for the online assessment system will continue only through the 2018-19 school year, so an alternative to that system will be needed

Appendix A: Planned Final Organization of the *Carbon TIME* Website

The outline below is organized according to the planned tabs on the website. Only the "Contact" tab would be interactive; all other tabs would include material that is self-guided for users. The users could include:

- Individual teachers, who might start with the Units tab and access other resources through links from units and lesson plans
- PD leaders or district leaders, who might start with the Educator Resources > Courses of Study tab
- Researchers (probably especially interested in the Research tab)

Content Website

1. **Home**. Revise to provide overview of all the resources under different tabs.
2. **About**. Maybe some of the current content of this page could go on the Home page. Maybe organize around the theme of *scaffolding and assessing environmental science literacy/three-dimensional learning?*
   - 2.1. Introductions to *Carbon TIME:* Brochures, overview videos.
     - 2.1.1. Overview of website: Guided tour
     - 2.1.2. Three legs of the stool
     - 2.1.3. *Carbon TIME* and *NGSS*
     - 2.1.4. STEM for all video
   - 2.2. Evidence about effectiveness of *Carbon TIME:* What students will know and be able to do
     - 2.2.1. Research briefs with practitioner-oriented summaries of student achievement data.
     - 2.2.2. Results of ACHIEVE analysis
     - 2.2.3. Written or video testimonials from teachers, students, administrators. See 2.3.2.1 PD and Network Meetings > 2017-18 SY > 03.2018 AdvertisingMarketing Menu.docx & PublicVideosDropbox9.6.png.
   - 2.3. *Carbon TIME* people: Information about people who have worked on the project.
3. **Units**. Similar to current units tab, with the addition of links from the units to relevant educator resources.
   - 3.1. *Systems and Scale*
   - 3.2. *Animals*
   - 3.3. *Plants*
   - 3.4. *Decomposers*
   - 3.5. *Ecosystems*
   - 3.6. *Human Energy Systems*
4. **PD Courses of study or PD Toolkits.** These will be leader's guides that organize the resources in other tabs into plans for face-to-face workshops.
   - 4.1. *Carbon TIME* adoption tool kit. Suggested sequence of PD activities for a school district that is adopting *Carbon TIME. Resources designed for PD Leaders. Current ideas in 2.10 > PD COS Inventories*
     - 4.1.1. Modules A (overall vision and possible advertising/marketing type pieces)
       - 4.1.1.1. Module A1: The Carbon TIME Vision
     - 4.1.2. Modules B (unit-specific)
       - 4.1.2.1. Module B1: Systems & Scale Unit Highlights
       - 4.1.2.2. Module B2: Systems & Scale Unit Assessments

4.1.2.3. Module B3: Systems & Scale Unit Materials/Potential Issues
4.1.2.4. Module B4: Reflecting on Systems & Scale
4.1.2.5. Module B5: Systems & Scale Pre/Post-Tests Analysis
4.1.2.6. Module B6: AN & D Highlights/Materials/Potential Issues
4.1.2.7. Module B7: PL Highlights/Materials/Potential Issues
4.1.2.8. Module B8: ECO & HES

4.1.3. Modules C (uncoupled from units, but with unit suggestions)
4.1.3.1. Module C1: Discourse
4.1.3.2. Module C2: Studying Student Work
4.1.3.3. Module C3: 3D Assessments

5. **Research**. Keep more or less the same organization as the current research tab.
5.1. Publications
5.2. Conference papers and presentations
5.3. Technical reports and working papers. This section is currently the same as 4.4 Library, but the idea would be to use this section for more research-oriented materials, such as item pools, coding rubrics, descriptions of data, etc.

6. **Library**. This tab will include contents that are typically accessed from other tabs, especially the unit and PD tabs. Much of that content will be based on activities and handouts from our current F2F and online PD resources, but reorganized as self-guided (and often shorter) packages. A package might include (a) a Read Me or overview file with a written description of the resources, its goals, and its key ideas, (b) a short video or animated presentation, perhaps using something like VideoScribe to produce a visually interested animated slide show, (c) presentation materials like a PPT presentation, and/or (d) handouts, examples of student work, etc.
6.1. Unit-specific resources, based on current LMS unit introductions and on unit-specific F2F activities, restructured to be self-guided as described above, and cross-linked with lessons and activities on the Units page. There would be other links when these resources play a role in PD Courses of Study (4.3 below).
6.1.1. *Systems and Scale*
6.1.2. *Animals*
6.1.3. *Plants*
6.1.4. *Decomposers*
6.1.5. *Ecosystems*
6.1.6. *Human Energy Systems*
6.2. General resources. These would be short packages organized around recurring features of all or most units. The list below is preliminary brainstorming about some possible packages. These could be crosslinked to units and to PD courses of study (4.3 below).
6.2.1. Important general features of *Carbon TIME*
6.2.1.1. Assessing and scaffolding as complementary goals for three-dimensional learning
6.2.1.2. Student and content storylines
6.2.1.3. The Three Questions and the importance of crosscutting concepts
6.2.1.4. *Carbon TIME* discourse routines
6.2.2. Process Tools and tool-specific discourse routines
6.2.2.1. Expressing Ideas Tool
6.2.2.2. Predictions Tool
6.2.2.3. Evidence-based Arguments Tool
6.2.2.4. Explanation Tool
6.2.3. Recurring features, with rationales, key elements, and options for classroom routines for each feature

6.2.3.1. Starting lessons: Ways of using PPT instructional model slide, reviewing storylines using Driving Question Board, Learning Tracking Tool, Model Building Tool, responses to Exit Tickets from previous lessons
6.2.3.2. Concluding lessons: Ways of Ways of summarizing and looking forward using Driving Question Board, Learning Tracking Tool, Model Building Tool, responses to Exit Tickets from previous lessons
6.2.3.3. Discussing readings using Questions-Connections-Questions prompts and PPT slides
6.2.3.4. Big Ideas Probes: answering, voting, discussion, returning in later lessons
6.2.3.5. Groupwork routines, including routines where groups prepare and present models or conclusion and jigsaw routines. This could also include Back Pocket Questions and whiteboards.
6.2.3.6. Sharing results of investigations: Using spreadsheets and/or posters to record group results; reaching consensus about patterns; comparing patterns to example class patterns; connecting to EBA Tool and Three Questions.
6.2.3.7. Grading and assessing routines: Ways of engaging students in assessing and improving their own work or each other's work. This could include ways of using checklists, example responses, writing revisions in a different color. Maybe also whiteboards.

6.2.4. *Carbon TIME* assessment system
6.2.4.1. Purposes of assessment in *Carbon TIME*
6.2.4.2. Learning progression frameworks and assessments
6.2.4.2.1. Carbon LP Framework and assessments
6.2.4.2.2. Inquiry LP Framework and assessments
6.2.4.2.3. Large-scale LP Framework and assessments
6.2.4.3. Using the online assessment system

6.3. Other resources (formerly Library). As on the current website, this could be a place to put longer-form practitioner-oriented resources such as the *NGSS* PEs for different units, Instructional Model document, or *Carbon TIME* Content Simplifications document.

7. **Contact**. We will need to figure out what contact information to provide for people with different kinds of questions.

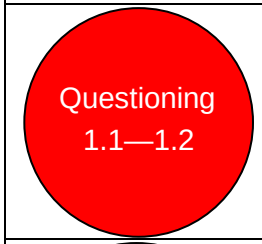
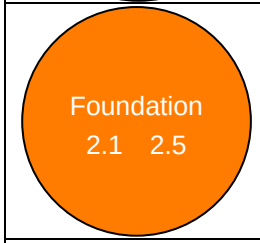
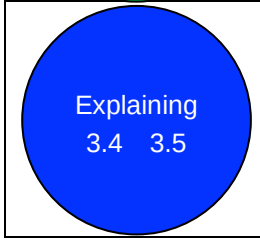
Assessment Website

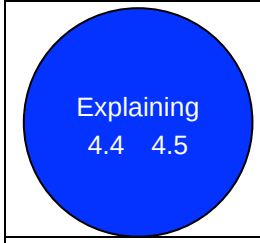
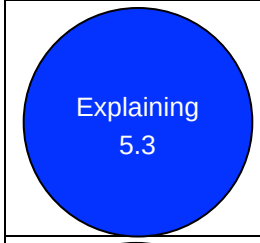
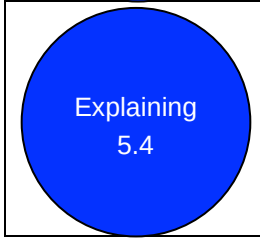
We will maintain this site in its current form through Year 5 (2018-19), but continuing to support it as an interactive online site is expensive and unsustainable unless we get additional sources of funding (which is something to actively pursue).

Here's an initial idea about a direction to go: I'm wondering if an alternative would be a pre-post item pool for each from which teachers could pick their own questions. I can see several advantages of making this a curated list of questions we have developed and questions that teachers have developed.

Appendix B: Learning Tracking Tool for Systems and Scale

Driving Question: __What happens when ethanol burns? _____

Activity Chunk	What did we do? Summarize key information and activities with a description and/or picture.	What Did We Figure Out? Summarize what we figured out about the phenomena that helps us answer the driving question.	What Are We Asking Now? What additional information do you need to answer the driving question?
	Take a pretest and share their initial ideas on the Expressing Ideas Tool about what happens when ethanol burns.	Ethanol burns and water does not. We have many initial ideas and questions.	What happens when ethanol burns?
	“Zoom into" air and explore how the world can be studied at multiple scales, including the atomic-molecular scale.	We can learn about the world at different scales. Three facts about atoms are: 1) Atoms last forever, 2) Atoms make up the mass of all materials, 3) Atoms are bonded to other atoms in molecules.	How can we use atoms and molecules to explain ethanol burning?
	Conduct an investigation to explore what happens when soda water fizzes. Use the Predictions Tool and the Evidence-Based Arguments Tool.	Soda water fizzing lost mass and made the BTB change from blue to yellow.	What happens to the molecules in soda water as it fizzes?
	Model the chemical change that occurs as soda water fizzes using molecular model kits and use the Explanations Tool to explain what happens when soda water fizzes.	The carbonic acid in soda water decomposes into carbon dioxide and water as it fizzes. No atoms are created or destroyed during the chemical change.	What happens to ethanol when it burns?

Activity Chunk	What did we do? Summarize key information and activities with a description and/or picture.	What Did We Figure Out? Summarize what we figured out about the phenomena that helps us answer the driving question.	What Are We Asking Now? What additional information do you need to answer the driving question?
	Conduct an investigation to explore what happens when ethanol burns. Use the Predictions Tool and the Evidence-Based Arguments Tool.	Ethanol burning lost mass and made the BTB change from blue to yellow. There was evidence of heat and light energy at the end of the chemical change.	What happens to the molecules of ethanol as it burns?
	Model the chemical change that occurs as ethanol burns using molecular model kits and use the Explanations Tool to explain what happens when ethanol burns.	In a flame the atoms in ethanol and oxygen rearrange to form carbon dioxide and water. Chemical energy is changed to heat and light energy when the high-energy C-C and C-H bonds of ethanol are changed to low-energy O-H and C=O bonds.	Why does ethanol burn and not water?
	“Zoom in” to ethanol, wood, and water to distinguish between organic materials (materials with high-energy C-C and C-H bonds) and inorganic materials (materials with other chemical bonds).	Ethanol and other organic materials have high energy C-C and C-H bonds. Water and other inorganic materials do not have C-C or C-H bonds.	What happens when other materials burn?
	Apply what we figured out about ethanol burning to explain other examples of organic materials burning.	The chemical change of combustion is similar for all organic materials. The organic material combines with oxygen to produce carbon dioxide and water. The chemical energy in the organic material is transformed into heat and light energy.	Why is combustion of organic materials important in the world?

Appendix C: *Carbon TIME* Two-Year Professional Development Course of Study

First-year Course of Study

1. Pre face-to-face (F2F) online PD (2 hours), available on Schoology
   - Orientation video introducing *Carbon TIME* and the course of study
   - Network Teacher Introductions
   - Unit Synopses: read & respond to synopses of six *Carbon TIME (CTIME)* units & watch videos of *CTIME* teachers' experience
   - Share hopes and goals for participation in C*TIME* network
   - Learning progression study: read & respond to an article on carbon learning progression published in *American Biology Teacher*
   - Practice accessing & completing *Systems & Scale* unit assessment in preparation for summer F2F PD
2. Summer F2F Professional Development Workshop (2 days)
   - General introduction to *CTIME* project goals, units, & Instructional Model
   - Exploration of *CTIME* 3-dimensional teaching & learning and NGSS alignment
   - Participation in key teaching & learning activities, including questioning, investigating, and explaining (inquiry & application) components
   - Introduction to online assessment system & practice evaluating student responses
   - Distribution of teaching materials
   - Planning timelines for unit teaching
3. Post-F2F online PD (6 hours), available on Schoology
   - Review & determine which pathways through unit materials & activities will be most appropriate for students
   - BTB tutorial: Practice mixing & calibrating a key classroom investigation tool, bromothymol blue
   - Practice investigations to prepare for teaching: select two unit investigations to try, troubleshoot, & discuss with colleagues, using materials provided at F2F workshops
4. School year online PD (13 hrs), available on Schoology.
   Teachers complete an online module for each unit they teach, including both pre-teaching & post-teaching activities

   Part A: Pre-Teaching modules
   - Examine unit goals & NGSS alignment; review unit pathways & plan activities sequence
   - Prepare to connect Discourse Routines, Process Tools & Instructional Model in teaching the Unit
   - Checklist for Unit Facilitation & Management
   - Prepare for teaching with Process Tools
   - Prepare for collecting student work
   - Discuss Unit Preparation with colleagues

   Part B: Post-Teaching modules
   - Save student work to bring to school year F2F
   - Reflect on individual student learning:
     - A) Individual student learning over time
     - B) Variation in student responses & instructional ideas
   - Reflect on class learning:
     - A) Identify knowledge & practice changes across a unit
     - B) Responsive planning for next unit & next year

- Unit implementation feedback survey
- Discuss Unit Implementation (tips, insights, questions) with colleagues

5. School year F2F Professional Development Workshop (1 day)
    - Reflect on & prepare for continued use of *CTIME* Instructional Model & Process Tools
        - Reflect on successes & challenges of implemented *CTIME* units
        - Build a storyline & unpack the NGSS 3-dimensions for *Plants* unit
        - Recognize purpose & importance of the phases of the Instructional Model, as well as sequence of lessons, for *Plants* unit
    - Understand *CTIME* goals & 3D science teaching & learning
        - Relate *CTIME* goals to Next Generation Science Standards.
        - Synthesize the general storyline across all *CTIME* units, including large scale units
        - Review & discuss *CTIME* research findings about productive discourse in *CTIME* classrooms
    - Engage in formative assessment using student work samples
        - Identify & discuss purposes of formative assessment supports within *CTIME* units
        - Practice using student Process Tool work samples to evaluate student understanding & plan instructional interventions
    - Prepare for Network participation
        - Further develop positive working relationships with network teachers & *CTIME* staff
        - Review Teacher Expectations & Year 1 & 2 courses of study
        - Consider new curricular supports & network opportunities

Second-year Course of Study

1. Pre-F2F online PD (4 hours), available on Schoology
    - Review *CTIME* network expectations & timelines
    - *CTIME* research update: watch video to explain how their work influenced project outcomes & revisions in current year
    - Revisit Goals & Plan for Year 2 Implementation
    - Establishing the problem for Year 2 professional learning: rigorous & responsive 3D science teaching is important, but hard to do
    - Uncovering & Using Student Ideas: Formative Assessment Probes & *Carbon TIME* teacher classroom video
    - *Carbon TIME* Discourse & Storylines: Review documents, share important learnings, & make connections to using student ideas
    - Looking Forward: discussion of formative assessment probes in *CTIME* classrooms & private assignment directly to network leader
2. Summer F2F Professional Development Workshop (1 day)
    - Understand *Carbon TIME* & 3D science teaching & learning goals
        - Consider *Carbon TIME* goals of rigorous & responsive teaching
        - Identify multiple dimensions in *Carbon TIME* assessments
        - Compare evidence-based argumentation & explanation practices
    - Identify components of productive classroom discourse & prepare for classroom enactment
        - Review & discuss video of productive discourse in *Carbon TIME* classrooms
        - Identify & engage with steps of *Carbon TIME* Discourse Routine & consider its role in assessment
    - Consider assessment purposes around *Carbon TIME* Process Tools

    - Identify assessment purposes of Process Tools & coordinated Discourse Routine
    - Engage with *Animals* Explanation tool & scaffolds for student writing
- Prepare for Network participation
    - Further develop positive working relationships with network teachers & *Carbon TIME* staff, & make connection plans for school year
    - Review Teacher Expectations & Year 2 Courses of Study
    - Consider new curricular supports & network opportunities
    - Make connections among *Carbon TIME* & other initiatives across levels (building, district, state), to meet similar goals

3. School year online PD, available on Schoology (10 hrs)
    - Part A: *Carbon TIME* Classroom Discourse & Discourse Routines
        - small group meetings to analyze classroom discourse artifacts (recordings) in a *CTIME* classroom discourse routine
    - *Part B: Assessment & Carbon TIME Student Work*
        - Reflecting on Student Work & identifying central purpose for studying student work with critical colleagues during SY F2F
        - Online discussion around student self-assessment as a purpose of classroom assessment
    - *Part C: Assessing & Grading Carbon TIME Pre/Posttests*
        - Review & discuss Carbon TIME Assessment Handout
        - Online discussion around *Carbon TIME* Pretest Assessment Purposes
        - Online discussion around *Carbon TIME* Posttest Assessment Purposes
4. School year F2F Professional Development Workshop (1 day)
    - Understand *Carbon TIME* & 3D science teaching & learning goals
        - Consider *Carbon TIME* goals of rigorous & responsive teaching
        - Identify & suggest components of rigor & responsiveness across *Carbon TIME* units
    - Explore productive classroom discourse in *Carbon TIME* classrooms
        - Identify divergent & convergent moments in Discourse Routines across a *Carbon TIME* unit
        - Consider ways of advancing student understanding through scaffolding discourse
    - Consider & engage in assessment purposes in *Carbon TIME*
        - Study *Carbon TIME* student work with colleagues for identified purposes
        - Identify & discuss strategies for classroom community insight
        - Identify & discuss strategies for student self-assessment
    - Develop & extend Network participation
        - Further develop positive working relationships with network teachers & *Carbon TIME* staff
        - Consider new curricular supports & future network opportunities
        - Consider analysis-of-practice professional development opportunities for building local system capacity
        - Make connections among *Carbon TIME* & other initiatives across levels (building, district, state) to meet similar goals

REQUEST FOR ESTIMATED PRICING RFI09808 HIGH SCHOOL SCIENCE ADDENDUM #1 ATTACHMENT #4			Please fill in all yellow highlighted spaces below
COMPANY NAME	*Carbon TIME* project, Michigan State University	Name of representative, please include email and phone number	Charles W. Anderson, andya@msu.edu, 517-432-4648
PRICING SHOULD INCLUDE STUDENT AND TEACHER MATERIALS.			
ACTUAL QUANTITIES MAY BE 75-125% OF CURRENT ENROLLMENT ESTIMATES			
QUANTITY	TITLE	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
	ALL ESSENTIAL ADOPTION YEAR 1 GRADE 9-12 STUDENT & TEACHER RELATED ITEMS, INCLUDING BUT NOT LIMITED TO HARD COPY & ELECTRONIC VERSIONS OF TEXTUAL MATERIALS, CONSUMABLE MATERIALS, HANDS ON MANIPULATIVE MATERIALS, TEACHER MATERIALS AND ONLINE ACCESS/RESOURCES AND PROFESSIONAL DEVELOPMENT		
##########	Grade 10 Biology A Student Materials	$400 per teacher, First year	$150 per year per teacher, after first ye
30	Grade 10 Biology A Teacher Materials		
#	Grade 10 Biology B Student Materials		
30	Grade 10 Biology B Teacher Materials		
QUANTITY	TITLE	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
	FIELD TESTING SUPPORT MATERIALS, ON-LINE RESOURCES, ETC		
216	SETS OF STUDENT FIELD TESTING MATERIALS/SERVICES (12 WEEK LONG FIELD TEST SESSION). IF THERE IS ANY USUAL/MANDATORY FEE FOR SUPPLYING THESE MATERIALS INDICATE PRICING ON A PER STUDENT BASIS GR 10 - BIOLOGY A & B		
150	SAME AS ABOVE ON LINE RESOURCES GRADE 10 - BIOLOGY A & B		
6	TEACHERS MATERIALS AND ON LINE RESOURES GRADE 10 - BIOLOGY A & B		
ESTIMATED PROCESSING/HANDLING CHARGES IF ANY TO MEET DISTRICT "PER SCHOOL"			
Estimated Freight Charges If Any			
Sales Tax 10.1% Nominal			
Total FOB SSD#1 Seattle Warehouse FOR YEAR 1 OF ADOPTION			
	TOTAL COST YEAR 1 OF ADOPTION		$7,750
	TOTAL COST YEAR 2		$7,650
	TOTAL COST YEAR 3		$7,650
	TOTAL COST YEAR 4		$7,650
	TOTAL COST YEAR 5		$7,650
	TOTAL COST YEAR 6		$7,650
	TOTAL COST YEAR 7		$7,650
	TOTAL COST YEAR 8		$7,650
	TOTAL COST YEAR 9		$7,650
	TOTAL COST YEARS 1 THRU 9		$68,950

RFP09808 Step 1 Science Adoption Grades 9-12: Responses for *Carbon TIME* Curriculum

Responses to questions are in red.

Attachment 4: Request for Estimated Pricing Form

The form is included as a separate spreadsheet. The first tab includes estimated costs. The second tab includes sources and current costs for hands-on materials.

Attachment 5: Vendor/publisher Questionnaire

1) **LIFE/DURATION OF ADOPTION**
   a) The District plans to support the adopted curriculum for approximately nine (9) years. Will prices for tangible, online, e-book, or any other quoted/delivered materials/services be held for nine years through the life of the adoption (Yes/No)

   b) If "No", please advise price escalation estimate/strategy.

   c) In order to not fall behind any future mandated requirements/products/technology advances, please confirm that you will support (by maintaining prices/terms) future product and service deliveries under the same prices/conditions as the originally offered adoption items. Will you provide future/advanced versions of products/services within the initial price offer (Yes/No)? We are currently implementing revisions that will be complete in summer, 2019. We plan additional minor revisions to be completed in summer, 2020. We have no plans for revisions after that time, though SPS personnel will be able to make additional revisions in these materials, which are in the public domain.

   d) In addition to first year adoption materials/services cost, please advise any ongoing/future years costs associated with your offering. (see Attachment 4) The materials list (Tab 2 of Attachment 4) lists current prices and sources for materials needed for each unit, estimated to be about $400 for classrooms where the materials were not currently available.

   e) Are there "consumables" that should be replaced over the course of the adoption? (see Attachment 4) We estimate costs of consumables and replacements to be $150 per classroom per year.

   f) Are there technology access fees that will apply to future years? (see Attachment 4) There are no technology access fees. Our web developer,

Rhiannon Villafuerte of StormingWest, estimates costs of routine maintenance and security updates as $2400/year.

2) TECHNOLOGY

a) With technology constantly changing, please provide a brief description of current applications and those planned for implementation over the next several years. Print materials are available in both PDF and Microsoft Word format. Presentations are in Microsoft PowerPoint format. The *Ecosystems* and *Human Energy Systems* units include online simulations and models designed to work with current web browsers.

b) Will staff and students be provided with unlimited access and capability to download and print electronic versions of all offered "hard copy" instruction materials? Yes

c) Are there any hard or soft costs associated with unlimited access or printing rights? No

d) Please indicate your firm's ability to supply any of the requested menus of titles in audio, e-book, or similar format. We do not have this capability.

e) Please advise any costs associated with supplying audio, e-book, etc.

f) Please advise availability/compatibility with current common educational technology/LMS standards like LMS Common Cartridge, Sharable Courseware Object Reference Model (SCORM), and Learning Tools Interoperability (LTI). Specifically, does your product currently support integration with Schoology without more than basic configuration? Seattle Public Schools are currently using *Carbon TIME* materials and sharing revisions and PD through Schoology.

g) The District strongly prefers a site-based license model. Does your firm, as part of this RFP response, offer site-based licensing? Since *Carbon TIME* materials are in the public domain, site-based licensing is not necessary.

h) The District requires single sign on with ADFS (Active Directory Federated Services). Does your firm offer ADFS as part of this RFP response? All materials except assessments are freely available without sign-in. We are currently working to make assessments available through the Illuminate platform.

i) The District requires rostering capability as part of this project. The District prefers rostering functionality via the Clever platform but can also accept verified One Roster support. Does your firm offer, as part of this RFP response, either Clever or verified One Roster support? No.

3) HARDCOVER VS. SOFTCOVER CURRICULUM MATERIALS

a) Our District prefers "hardcover" versions of teacher guides and student books, including books for: interactive read-aloud, guided/shared reading, core materials, and student independent reading materials. Please advise if any textual materials you are quoting are other than hardcover versions. If you desire to offer softcover pricing in addition to hardcover pricing, please clearly indicate on the attached Request for Quotation form. All *Carbon TIME* materials are in the public domain, so costs are limited to costs of printing.

4) ADOPTION MATERIALS DELIVERY SCHEDULE

a) If the district places an order with you firm by the end of May 2019, are there any offered materials (tangible, web-based, or otherwise) that would not arrive at the District by the end of July 2019? All materials are currently available, with planned revisions to be completed by the end of July, 2019.

b) Please list any items that would not be available by the end of July 2019.

5) TRAINING

a) Please provide a brief narrative of your training program. The *Carbon TIME* training program is described on pages 15-18 of our response to the Request for Information and in more detail in Appendix C of that response. It includes a one-year course of study for teachers new to *Carbon TIME* and ongoing support for all teachers. SPS personnel currently have the expertise to lead this program.

b) Please advise if any training will not occur by the deadline/time specified on the Narrative Attachment 1, page 2.

6) ORDER PROCESSING, SHIPMENT PREPARATION AND LOGISTICS

a) Our district requires special packaging, labeling, palletizing, and documentation on a per-school basis. Can publisher/vendor provide this level of service? No. *Carbon TIME* does not sell materials to users.

b) Please advise if there are any additional costs for the above special per-school packaging beyond prices quotes for adoption/implementation materials.

c) Referring to Attachment 7, Barcode information, please confirm that you can deliver barcoded materials according to District specifications.

7) WARRANTY/GUARANTEE

The District requires that the vendor for this project warrant/guarantee the performance of the product/books/services for the life of the adoption (beginning in school year 2019-2020 and continuing for nine years). Information should include a toll-free phone number and website/email address to contact for Warrantee/guarantee administration. This

administration shall be performed directly by our end user programs/sites communicating directly with the vendor's warranty administration staff. Product/book replacement under warranty/guarantee shall be done on an FOB Seattle Schools basis. The District believes the staff/shipping/ administrative cost to return single/small quantities of products/books that are of such low initial purchase price would cost more in human and administrative resources than the products are actually worth; therefore, no products/books claimed by the District under warranty/guarantee shall be returned to the vendor. District sites making claims of product failure shall provide digital images of failed products to vendor warranty administrators and shall also hold/make those failed products available (at District sites) to vendor sales reps/warranty administrators for physical inspection. Any District site warranty claims that are not resolved at the site level shall be brought to the attention of the District Purchasing Department. Replacement warrantee/guarantee products/books will be provided in the same specification/configuration as the originally supplied product. The District will not claim for any warranty/guarantee replacement products/books that have been obviously abused/misused. **Please advise if there is any additional cost for the District-described warranty/guarantee.** *Carbon TIME* does not sell materials to users; required materials will be printed by SPS.

TERMS AND CONDITIONS of purchase shall be Seattle School District No. 1 Standard Terms and Conditions may be viewed at:

http://www.seattleschools.org/cms/one.aspx?portalId=627&pageId=15916

8) Please advise any extra costs for providing goods/services according to District standard terms and conditions. None.

9) PURCHASE TERMS/PAYMENTS

a) District standard payment terms are net 30 days. Please advise if you offer a prompt payment discount for faster payments (Yes/No and amount) No payment will be required.

10) PURCHASE/SALE OR ADOPTION MATERIALS

a) Does your sales approach work on a publisher direct-to-District basis or through a book depository? *Carbon TIME* materials are freely available and not for sale.

b) Please advise pros and cons of your approach.

c) If your sales approach is through a depository, who takes contractual responsibility that deliverables (offered prices and delivery commitments) are met and one time?

d) With frequent sales and mergers of publishing companies being a concern for he District, please confirm that any commercial arrangements your firm may agree to with the District for this adoption will pass on to any future management/ownership of your current company.

11) ESTIMATED "PER STUDENT" COSTS FOR ADOPTION

a) Please advise your "per student" estimated first year cost for all combined student, teacher, technology access, consumables, freight and handling. No payments to

Carbon TIME are needed. If a teacher has about 100 students, costs for hands-on materials will be about $4 per student. There will also be printing costs for worksheets, readings, and posters.

b) Please estimate those same costs on a "per student" basis for years 2 through 9 of the adoption period as well as separated by course. If a teacher has about 100 students, costs for hands-on materials will be about $1.50 per student. There will also be printing costs for worksheets, readings, and posters. Full cost estimates are included in the Budget Explanation of our response to the RFI. For convenience, these estimates are copied below.

All online *Carbon TIME* materials are free, so they are not included on the attached budget spreadsheet.

Initial cost: A complete list of hands-on materials needed for investigations and other activities is included in the Materials List tab of the budget spreadsheet. Sources and prices as of summer, 2018 are also included. The cost for all of these materials would be about $400 per teacher. However, many of the materials are already available in most high school laboratories, so costs for classrooms that have laboratory access will probably be less. We estimate that 10 teachers will need new materials at a cost of $400 and 25 teachers will need yearly replacements of consumables at a cost of $150.

Yearly costs: Estimates of yearly costs are calculated as follows:

- Costs for replacement of consumables and of materials that are lost or broken is estimated at $150 per year per teacher for 35 teachers each year.
- Cost of website maintenance, including updating broken links, minor revisions, and security upgrades (from web developer Rhiannon Villafuerte of SwarmingWest): $2400 per year.

Other expenses: Expenses associated with implementation of *Carbon TIME* that are not listed include:

- Costs of printing readings, worksheets, and posters.
- Costs of teacher salaries or substitute costs for PD
- Costs associated with student access to computers for online simulations or modeling activities in the *Ecosystems* and *Human Energy Systems* units
- Funding for the online assessment system will continue only through the 2018-19 school year, so an alternative to that system will be needed

12) RISKS

a) If there are any areas of commercial/educational risk to the District that you are aware of and the District has not mentioned in our communications thus far, please share a brief explanation and identify any financial, or other, risks to the District. We are not aware of any risks.

13) RIGHT TO REPRODUCE

a) The District requires that "rights to reproduce for instructional purposes" be per mitted at no additional cost to the District. This shall include as a minimum, pdf files and blackline masters. Are these rights to reproduce included in your firm's year 1-9 pricing? Yes/No?

Attachment 9: Voluntary Product Accessibility Template

The *Carbon TIME* staff does not have the expertise to complete the VPAT or make all required changes in materials. If *Carbon TIME* is adopted by SPS, we will work with SPS to hire a consultant who can guide us through this process. Some revisions can be made by *Carbon TIME* or SPS staff, but we anticipate that some revisions will require additional technical expertise.

Carbon TIME materials are currently being used successfully in a wide variety of classrooms, including special education and ELL classes, and including classes in SPS. The diversity of current classrooms and evidence for success with diverse learners are described on Pages 13-15 of our responses to the Request for Information.

Carbon TIME Response to Seattle Request for Information

October, 2018

Contents

The development of *Carbon TIME* materials and assessments is supported in part by a grant from the National Science Foundation: Sustaining Responsive and Rigorous Teaching Based on *Carbon TIME* (NSF 1440988). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Accessing Teaching Materials and Assessments on the *Carbon TIME* Website

Carbon TIME is a freely accessible, tested and proven, NGSS-aligned program that includes curriculum, assessment, professional development, and professional networks. While most closely aligned with Life Sciences, *Carbon TIME* also integrates some core disciplinary ideas from Earth Sciences and Physical Sciences. All *Carbon TIME* curriculum materials and supporting research can be accessed through the *Carbon TIME* website: http://carbontime.bscs.org/. This site has a link to *Carbon TIME's* password-protected assessment site. In this section we summarize the resources available and provide directions for viewing password-protected resources.

The Carbon TIME Curriculum and Research Website

The website has materials accessible through five tabs, as well as a link to the password-protected assessment site. The contents of the five tabs are summarized in the following paragraphs.

Home: A brief overview of the *Carbon TIME* project.

About: An introduction to *Carbon TIME's* goals and units.

Units: *Carbon TIME's* six units (*Systems and Scale, Plants, Animals, Decomposers, Ecosystems,* and *Human Energy Systems*) are accessed through the drop-down menu for this tab. Each unit is designed for three to four weeks of instructional time. The introduction to each unit includes a list of materials needed for investigations and hands-on activities. All other materials are included in printable form on the website. The home page for each unit includes a link to download a Zip file containing all unit materials. More details about unit features and design are included in the Overview and Responses to Adoption Criteria, below.

Educator Resources: The drop-down menu for this tab includes two kinds of resources:

- Curriculum resources: This section provides access to educative resources for teachers that apply to all units. (In contrast, unit-specific resources are under the Units tab.)
- Library: Resources linked from this section provide additional information about the *Carbon TIME* project.

Research: One of the distinguishing features of *Carbon TIME* is its extensive research base, used both for development and for evaluation of the curriculum and PD. Much of this research is available through this tab. It has three drop-down sections:

- Published articles and book chapters: copyright laws prevent us from including copies of most articles on the website, but all are available by using the links provided for the author or the Environmental Literacy project: envlit@msu.edu.
- Conference papers and presentations: links to download the papers and presentations are included with citations in this section.
- Technical reports and working papers: this section includes technical information for teachers and researchers about our procedures for curriculum development and research methods.

Contact: This includes contact information for the project.

The Carbon TIME Assessment System

The *Carbon TIME* project includes an extensively validated online system for assessing students' three-dimensional science performances. This system is accessed through the Assessment Site button on the right of all pages of the *Carbon TIME* site. It is password-

protected to prevent students from accessing the tests and answer keys. It includes many features for both teachers and researchers. The key features are summarized below.

Registering and logging in to the assessment site. When you click on the Assessment button, you will go to a registration/login page. Teachers will get access within 24 hours, after their legitimacy as Seattle Public Schools teachers is confirmed.

Others who would like access to the assessments can send E-mail messages to one of the following addresses:

- Charles W. Anderson, andya@msu.edu , Principal Investigator of the *Carbon TIME* project
- MaryMargaret Welch, <mmwelch@seattleschools.org>, Science Program Manager for Seattle Public Schools
- Kirstin A. Holfelder kirstin@20pines.com , administrator of the *Carbon TIME* assessment website

Tutorials and FAQs: The bottom of every page has a link to Tutorials and FAQs page. This page includes three kinds of resources:

- *Detailed tutorials* introducing users to features of the site and explaining how to use them.
- *Assessment curriculum* with (a) the full item pool used for all *Carbon TIME* assessments, including tables showing which items are on which assessments, and (b) interpretation guides for the full test and each of the unit tests, including correct answers to each question, suggestions for grading or formative assessment, and interpretations of common student responses based on learning progression research.
- *Website FAQs* with frequently asked questions and responses.

Seeing tests from a student perspective. If you would like to take a test as a student, here's how:

- Click on Tests in the top menu bar.
- Click "Give Tests" for the class (Biology Period 1) that has been created for you.
- Choose the test you would like to give, and copy the passcode for that test.
- Click the "URL for students to take tests: http://carbontime.org/student" link at the top of the page.
- Copy the passcode and submit
- Enter any name and grade level that you would like
- Click the Start Exam button

Online Professional Development

Carbon TIME's PD course of study includes 35 hours of face-to-face workshops and 35 hours of online coursework. The online coursework can be accessed as follows:

- Go to https://bscs.sarus.io/
- Enter the following credentials
  - **Username**: user@carbontime.org
  - **PW:** Carbon2018
- The Dashboard with *Carbon TIME* courses (outlined in Appendix C) will be viewable
  - 1st course: *Carbon TIME* Year 1 preF2F (Summer Year 1 pre face-to-face)
  - 2nd course: *Carbon TIME* Year 1 Unit Investigations (Summer Year 1 post face-to-face)
  - 3rd course: *Carbon TIME* Year 1 PD (School Year 1)
  - 4th course: *Carbon TIME* Year 2 preF2F (Summer Year 2 pre face-to-face)
  - 5th course: *Carbon TIME* Year 2 PD (School Year 2)

- Click on any course to view content and tasks
- Move through online course tasks using the “Complete and Next” button on the top right or by using the vertical menu on the left-hand side

Overview of the *Carbon TIME* Curriculum and Research Support

Carbon TIME is a freely-accessible project that has been supported by a series of National Science Foundation (NSF) grants since 2005.[1] The project began with the general goal of supporting *environmental science literacy:* preparing students to use scientific knowledge and practices in their decisions about environmental issues.

We have used an iterative design cycle in which (a) goals for student learning are formulated, (b) assessments and instructional systems are designed to achieve those goals, and (c) designed innovations are tested in school settings, producing data that can be analyzed to inform revision of goals and a new cycle. Our design team is a research-practice partnership including university-based science education researchers, teachers, school administrators, and experts in professional development.

The Carbon TIME Program: Curriculum and Assessment, Professional Development, and Professional Support Networks

The *Carbon TIME* project has produced an extensive library of free resources organized around "three legs of the stool," each necessary but not sufficient for lasting improvements in science education: 1. Curriculum and assessment; 2. Professional development, and 3. Professional support networks that include research-practice partnerships.

1. Curriculum and assessment. *Carbon TIME* focuses on the science of carbon-transforming processes in socio-ecological systems at multiple scales: cellular and organismal metabolism in plants, animals, and decomposers; energy flow and carbon cycling at ecosystem and global scales; carbon sequestration; and, combustion of fossil fuels. The current imbalance among these processes is a primary driver of global climate change.

We have developed six three-week-long teaching units. Four units focus on macroscopic scale systems: *Systems and Scale, Animals, Plants,* and *Decomposers.* Two units focus on large-scale systems: *Ecosystems* and *Human Energy Systems* (which focuses on global carbon cycling). Unit synopses can be found in the Library on the website (http://carbontime.bscs.org/library). All of the units are organized around an instructional model that assesses and scaffolds students' three-dimensional engagement with phenomena. Information about the *Carbon TIME* instructional model and on how these units address NGSS performance expectations is provided in the section on Standards Alignment below.

All of the units are accompanied by an online assessment system that provides teachers with partially scored responses while simultaneously enabling us to collect and analyze student achievement data at scale. These assessments are discussed in detail in the section on Assessment below.

2. PD course of study. Both classroom observations and student learning data supported the design of a two-year course of study that includes 35 hours of face-to-face workshops and 35 hours of online PD. The development process was built on partnerships among teachers, researchers, and PD providers working together to develop the practical

[1] This research is supported in part by a grant from the National Science Foundation: Sustaining Responsive and Rigorous Teaching Based on *Carbon TIME* (NSF 1440988). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. Additional support comes from the Great Lakes Bioenergy Research Center (United States Department of Energy Office of Science BER DE-FC02-07ER64494), and the Dow Chemical Company Foundation.

knowledge that teachers need to understand students and enact the *Carbon TIME* instructional model. The course responds to the realities of teachers' current classroom communities while providing rationales, modeling, and support for what classroom communities that scaffold and assess three-dimensional science learning can look and sound like.

A core goal of our PD was to engage teachers and PD leaders in productive sensemaking that helped teachers make progress towards rigorous and responsive science teaching practices. The online coursework can be accessed through the links provided on page 3 above. The course of study is described in more detail in the section on Instructional Planning and Support below.

3. Professional support networks with research-practice partnerships. The final component of *Carbon TIME* involved development of research-practice partnerships to support sustained engagement by teachers, researchers, and school administrators. A key advantage of partnerships is that they provide a means for researchers and practitioners to work together to solve problems of implementation. In our partnerships there is a two-way street between researchers and practitioners, such that researchers, teachers, and administrators play essential but complementary roles. For example, grading rubrics developed by teachers led to strategies in the curriculum for assessing students' three-dimensional learning. Plans for continuing professional networks and research-practice partnerships are discussed in the section on Instructional Planning and Support below.

Research and Evaluation

Carbon TIME is unique among NGSS-based programs in its extensive use of research for understanding students, developing and field-testing materials and programs, and evaluating students' three-dimensional learning at scale. In this section we briefly introduce the main strands of *Carbon TIME* research.

Learning progression research. The *Carbon TIME* curriculum and assessments are built on a foundation of learning progression research. Here's a definition from the National Research Council report *Taking Science to School:* "Learning progressions are descriptions of the successively more sophisticated ways of thinking about a topic that can follow one another as students learn about and investigate a topic over a broad span of time." (NRC, 2007). Our learning progression research provides the foundation for curriculum development (described in the section on Standards Alignment below) and assessment development (described in the Assessment section below).

Developing and field-testing materials and programs. *Carbon TIME* materials and programs were developed using an iterative design cycle by a research-practice partnership that includes researchers, teachers, and administrators. Through the development process these materials and programs have been far more extensively field-tested than any other NGSS-aligned program.

We are in the last year of a five-year study; the full five years of the study will involve approximately 160 participating teachers working in diverse middle and high school classrooms, with each teacher and their students participating for two successive years (about 900 different classrooms total). The 94 schools participating to date include urban, suburban, and rural schools. There are 26 middle schools and 68 high schools, including 10 of the 11 Seattle high schools. The percentage of students in a school receiving free and reduced lunch ranges from 3% to 99%, with a mean of 41%. The percentage of underrepresented minority students in the participating schools ranges from 0% to 100%, with a mean of 43%.

Table 1 outlines major project data sources and quantities of data collected in the first three project years; the main years of project data collection are Years 2–5. We are currently analyzing data from Years 3 and 4.

Table 1. Data Sources for the *Carbon TIME* Project (First Three Years)

Data Source	Baseline Year (2014–5)	First Full Year (2015–6)	Second Full Year (2016–7)	Additional Data*
Full Data Set (120 participating middle and high school teachers in 2014-17)				
Participating teachers	17*	27	83	
Student tests (8/student)	2,920	21,058	60,371	244**
Teacher surveys (3/teacher each year)	104	169	294	
PD videos & field notes (3 days/cohort)	0	52 hrs.	95 hrs.	
Online PD (~10 hours/cohort)***	0	300 hrs.	450 hrs.	
Case Study Data Set (17 cases involving 14 teachers: 5 middle school, 9 high school)				
Participating teachers		8	9	
Student interviews (4 focus students/class)		40	65	52**
Teacher interviews (5/teacher)		22	47	
Classroom videos (~10 lessons/teacher, 2 videos/lesson)		195	197	
Student work (~12 examples/focus student)		472	498	

*Participating teachers in the baseline year implemented assessments with their students but did not implement *Carbon TIME* instruction.
** We also collected some interview and test data from college students for learning progression development.
*** We collected video, field notes, assignments, and discussion threads from 3 days of face-to-face and ~10 hours of online Professional Development (PD) each year for each teacher.

Evaluating students' three-dimensional learning at scale. The learning progression research provides the foundation for development of the *Carbon TIME* assessment system, described in more detail in the assessment section below. Because we have developed a system for online testing and automated scoring of students' constructed responses, we have been able to evaluate students' three-dimensional learning at a far larger scale than any other NGSS-aligned curriculum project (more than 1.1 million student *Carbon TIME* constructed responses have been scored so far). Two key findings from this research are as follows:

- The *Carbon TIME* program supports students' three-dimensional learning in a wide range of schools, as described above. It is far more effective than the curricula that teachers were using before they entered the program. These findings are discussed under Standards Alignment, below.
- *Carbon TIME* narrows the achievement gap between initially low-achieving students and initially higher-achieving students. These findings are discussed under Accessibility for Diverse Learners below.

Planned Final Revisions

The curriculum materials, assessments, and PD course of study currently on the website are from Year 4 of the five-year research and development project. We will not be making further changes in the assessments, but there will be additional changes in curriculum materials and the PD course of study. These changes are described in the sections below on Standards Alignment and Instructional Planning and Support. An outline describing the planned final contents of the website is included in Appendix A below.

Responses to Adoption Criteria

1. Standards Alignment

All *Carbon TIME* units are organized around a fundamental purpose: We want to provide teachers with the tools they need to lead classroom learning communities that *assess and scaffold students' three-dimensional engagement with phenomena.* We discuss the assessment tools below. In this section we focus on how the units scaffold students' engagement with phenomena. We discuss (a) NGSS coverage (b) learning progressions research, (c) the *Carbon TIME* instructional model and supporting resources, and (d) research evidence for success in supporting three-dimensional learning.

NGSS coverage

A full list of NGSS performance expectations addressed by *Carbon TIME* units can be found in the NGSS Mapping document in the Library on the website (http://carbontime.bscs.org/sites/default/files/educator_resources/NGSS_Mapping_CarbonTIME_2018.pdf). These performance expectations include all middle- and high-school performance expectations focused on matter and energy in living systems, from cellular metabolic processes to matter cycling and energy flow in ecosystems. These are about half of the life science performance expectations. The life science performance expectations not addressed by *Carbon TIME* focus on genetics, evolution, and community ecology.

The units also address physical science standards associated with matter, energy, and chemical change—essential prerequisites for understanding matter and energy in living systems. Finally, the units address Earth science expectations associated with global carbon cycling and climate change. In terms of the three dimensions of the NRC framework, the units focus on the following:

- All eight science practices, organized into three clusters: (a) asking questions; (b) inquiry (planning and carrying out investigations, analyzing and interpreting data, engaging in argument from evidence); and (c) application (developing and using models, constructing explanations, designing solutions).[2]
- All seven crosscutting concepts, with particular emphasis on: (a) scale, proportion, and quantity; (b) systems and system models; and (c) energy and matter: flows, cycles, and conservation.
- Disciplinary core ideas in the life sciences (LS1: From Molecules to Organisms: Structures and Processes; LS2: Ecosystems: Interactions, Energy, and Dynamics); Earth and space sciences (ESS2: Earth's Systems; ESS3: Earth and Human Activity); and physical sciences (PS1: Matter and Its Interactions; PS3: Energy).[3]

Learning progressions research

Our assessments show that only a tiny percentage of high-school biology students are initially able to achieve the NGSS performance expectations. The learning progressions research plays an essential role in analyzing how student make sense of phenomena and providing a basis for instructional design. An article from the *American Biology Teacher* titled,

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[2] Using mathematics and computational thinking; and obtaining, evaluating, and communicating information are included in all three clusters.

[3] The *Carbon TIME* Content Simplifications document in the Educator Resources Library (http://carbontime.bscs.org/library) explains ways in which we have simplified some explanations of chemical process that are compatible with NGSS, but may be criticized by chemists or physicists.

"Learning Progressions and Climate Change," introducing this research can be found through the link to Learning Progressions and Climate Change in the Educator Resources Library (http://carbontime.bscs.org/library).

We have developed three learning progressions, each focusing on a particular set of practices, disciplinary core ideas, and crosscutting concepts. These learning progressions are briefly described in Table 2 below. A deeper description of the three *Carbon TIME* learning progressions can be found in the chapter by Covitt and Anderson (Assessing Scientific Genres of Explanation, Argument, and Prediction, cited in the 2018 Research publications: http://carbontime.bscs.org/articles-book-chapters).

Table 2: *Carbon TIME* Learning Progressions

Learning Progression	***Practices***	***Disciplinary Core Ideas***	***Crosscutting Concepts***
Macroscopic explanation (carbon)	Explanation, using models	Carbon-transforming processes (combustion, photosynthesis, cellular respiration, digestion, biosynthesis) at multiple scales	Conservation, flows, cycles, of matter and energy Connecting systems at different scales
Macroscopic inquiry	Asking questions, analyzing data, arguments from evidence		
Large-scale systems	Data & model interpretation, explanation, prediction	Ecosystem & global carbon cycling & energy flow, climate change	

Each learning progression describes a succession of student performances as they engage with phenomena. Those phenomena include combustion, plant and animal growth and movement, and decay at the macroscopic scale; biomass pyramids and disturbances to ecosystems; global changes in carbon dioxide concentration and climate change. The performances include the kinds of questions students ask, the kinds of explanations they provide, and their approaches to investigations. The learning progressions provide an essential foundation for design of curriculum materials.

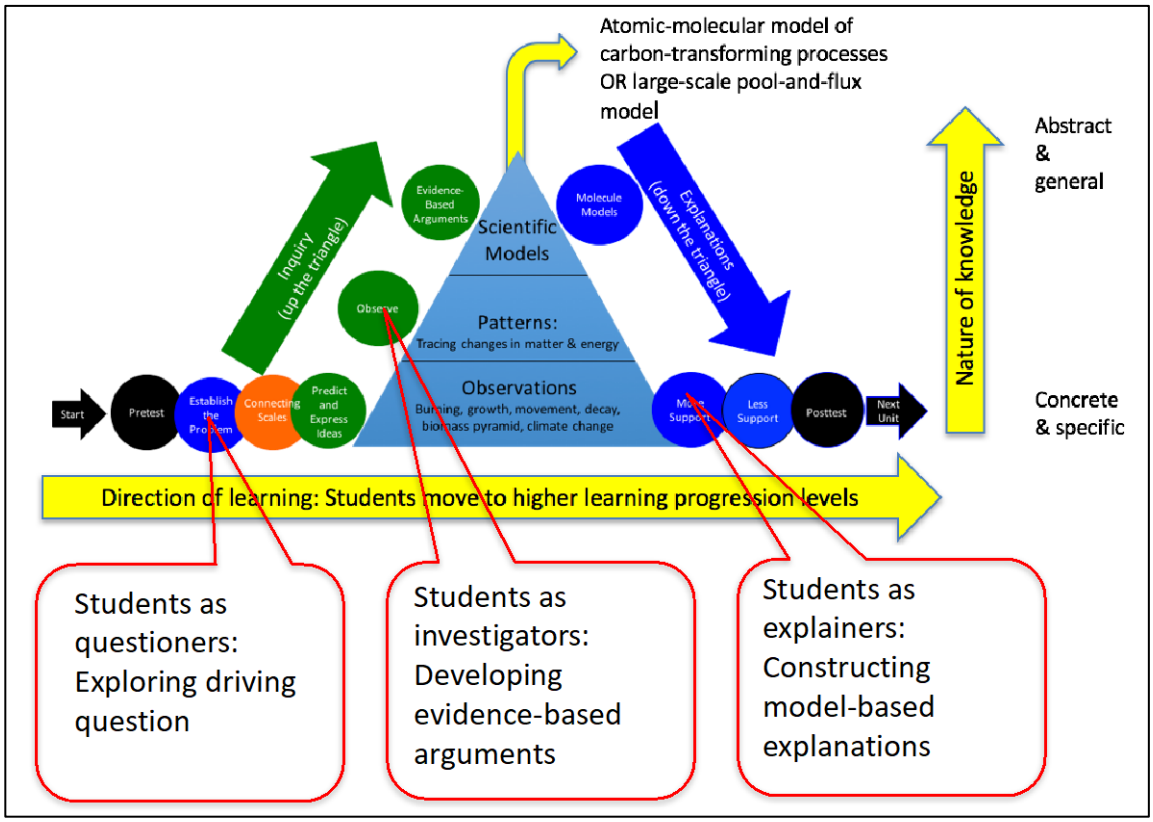
The *Carbon TIME* instructional model and supporting resources

All *Carbon TIME* units are organized around an instructional model and storyline, represented in Figure 1, below. A detailed discussion of the instructional model and its enactment in each unit can be found in the Educator Resources Library (http://carbontime.bscs.org/library). As Figure 1 shows, each unit is organized around a storyline that engages students in the three clusters of science practices described above. We first describe the basic sequence of practices, then the tools and recurring features that support those practices.

- *Students as questioners:* Each unit begins with a phenomenon and driving question. For example, in the *Systems and Scale* unit the teacher shows that ethanol burns but not water, and students consider the driving question: "What happens when ethanol burns?" Students use the Expressing Ideas Tool to record and discuss their ideas and questions. A key outcome of the discussion is a set of student questions about the phenomenon that they will answer during the unit.
- *Students as investigators:* In each unit the initial discussion leads first to a lesson providing students with foundational knowledge (scale, atoms, and molecules for

Systems and Scale), then to an investigation in which students trace matter and energy through systems. Students use the Predictions Tool and the Evidence-based Arguments Tool to record and discuss their ideas. They reach evidence-based conclusions and record unanswered questions to be addressed later in the unit.

- *Students as explainers:* Each unit concludes with a series of activities where students use molecular models to model the phenomena, then use the Explanations Tool to develop and discuss rigorous scientific explanations that answer the driving question. They then use what they have learned to explain other related phenomena (for example, burning methane, wood, gasoline, and propane in *Systems and Scale*).



Unit resources: tools and recurring features. First and foremost, we invite you to explore the extensive resources provided for each unit on the *Carbon TIME* website. Each unit provides teachers with a tool kit that they can use to tailor their teaching to the needs of their students. The Read Me document at the beginning of each unit (for example, http://carbontime.bscs.org/ss_read_me) helps teachers to make key choices about what activities and resources to use. *Carbon TIME* uses "Turtle Trails" (explained in the Educator Resources Library: http://carbontime.bscs.org/sites/default/files/educator_resources/Turtles_07.05.16-1.pdf) to designate more- and less-detailed and complex learning pathways within a unit.

Each unit is also organized around a set of tools and recurring features that are consistent across units, enabling students to build proficiency as they engage successive units. Explanations of many of these tools and recurring features can be found in the Educator Resources Library: http://carbontime.bscs.org/library .

- Process tools (Expressing Ideas Tool, Predictions Tool, Evidence-based Arguments Tool, Explanations Tool) provide scaffolding for students' engagement in the roles on questioners, investigators, and explainers.

- The Learning Tracking Tool is a new feature to be included in the final revision of the units. Students will construct a storyline of their learning by completing one row of the tool after key activities and discussing what they have written about their learning and questions to address in future lessons. A completed Learning Tracking Tool for *Systems and Scale* is included below as Appendix B. The color-coded circles track the progression of students' roles and practices.
- Big Ideas probes are included in every unit to support student self-assessment and public discussion of different ideas about the unit driving questions. A document in the Educator Resources Library discusses approaches to using them.
- The Three Questions are used to define rigorous scientific explanations and provide a checklist that students and teachers can use to evaluate student explanations (e.g., http://carbontime.bscs.org/sites/default/files/system_scale/handouts/Three_Questions_Handout.pdf).
- Discourse routines engage teachers and students in divergent and convergent discussions around each process tool. They are discussed in the Discourse Routines document in the Educator Resources Library.
- Readings are used for multiple purposes in the units. Those purposes and strategies for helping all students make sense of the readings are explained in the "Reading Strategies: Questions-Connections-Questions" document in the Educator Resources Library.
- Students use molecular models to construct model-based explanations of combustion and key metabolic processes—photosynthesis, cellular respiration, digestion, and biosynthesis.
- PowerPoint presentations serve multiple purposes. They scaffold class discussions, present information, and provide animations of the chemical changes in combustion and metabolic processes.
- Posters are used to remind students of key ideas and record data from investigations.
- Online videos accompany the investigations in the four macroscopic-scale units: *Systems and Scale, Animals, Plants,* and *Decomposers.*
- In the *Ecosystems* and *Human Energy Systems* units students use games, online simulations, and online models to investigate and explain matter cycling and energy flow in ecosystems and Earth systems.
- Formative and summative assessments are discussed in more detail in the Assessment Section below. They are explained in the "Assessment Purposes in *Carbon TIME*" document in the Educator Resources Library.

Cross-unit connections. Finally, we note that the units are all connected through an overall storyline, starting with the simplest of the core carbon-transforming processes—combustion—then moving to how living systems transform matter and energy at organismal and ecosystem scales, and concluding with global-scale carbon cycling and its implications for climate change. These connections are discussed in detail in three documents in the Educator Resources Library: http://carbontime.bscs.org/library .

- Unit synopses
- Carbon TIME FAQ: Which Units Should I Teach?
- *Carbon TIME* Instructional Model

Effects on student achievement

Research conducted over multiple years shows that teachers are enacting instruction that produces three-dimensional learning at scale. Figure 1 compares Item Response Theory (IRT)-based estimates of student pretest and posttest proficiencies with end of school year baseline levels (students of the same teacher the year before) for the first two years of this

study. For detailed methods and results see two documents in Technical Reports and Working Papers under the Research tab (http://carbontime.bscs.org/technical-reports-working-papers):

- Validation of *Carbon TIME* assessments
- Quantitative analyses of students' learning gains

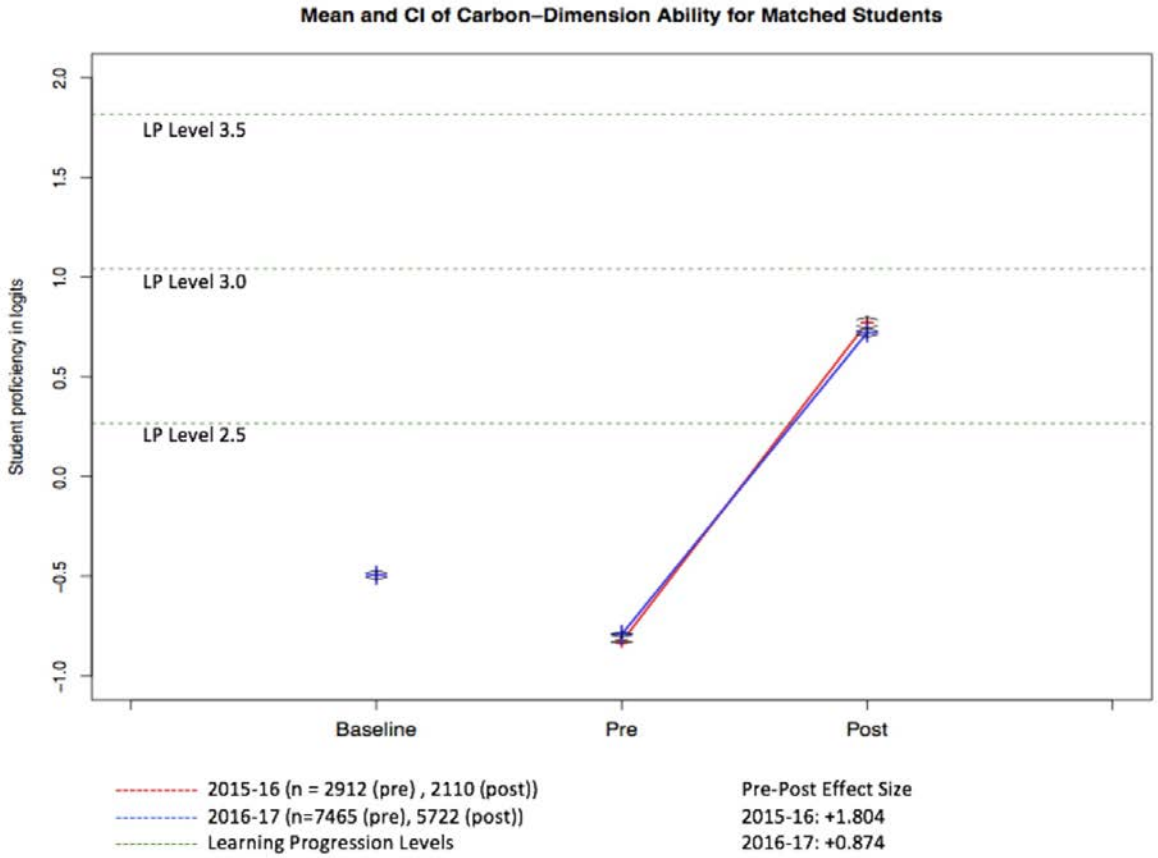


Figure 2: Mean learning progression (LP) levels of students in Carbon TIME and baseline (classes of participating teachers the year before they started using Carbon TIME). Error bars represent 95% confidence intervals. LP Level 4 is equivalent to full achievement of NGSS performance expectations in this domain.

These results from over 10,000 students show that students improved significantly compared to both pretest and baseline performances. In other studies we have shown that high school students participating in *Carbon TIME* show higher proficiency on learning progression-based assessments than college science majors in biology courses (Rice, Doherty, & Anderson, 2014).

2. Assessments

The Carbon TIME program includes both classroom assessments and large-scale or monitoring assessments that are valid, reliable, and efficient. We have devoted many research and development cycles to creating, testing, and improving *Carbon TIME* assessment systems. In this section we first describe the online assessment system, then discuss the array of resources for classroom formative and summative assessment in *Carbon TIME.*

Online assessment system

The core of the *Carbon TIME* assessment system is an online testing platform that includes an overall test to be taken by students at the beginning and end of the school year as well as pretests and posttests for each of the six *Carbon TIME* units.[4] Directions for assessing and using this password-protected system are above. Since the tests are capable of eliciting student responses across learning progression levels, the same tests are used for both middle- and high-school students. Teachers can download student responses in full test or spreadsheet format. In both formats, forced-choice portions of responses are automatically scored by the system. Anonymized responses are also shared with researchers.

The learning progression frameworks and assessment systems are the products of multiple cycles of development and revision. We have developed validity evidence that these systems measure students' three-dimensional learning. Through the 2017-18 school year, the *Carbon TIME* assessment system has been used by more than 30,000 students who have taken more than 160,000 unit tests and overall tests. Our automated scoring system has assessed more than 1.1 million student written explanations. This system is an important tool for classroom teachers, and it has provided essential data for our research and design work.

The Research tab of the website contains a several reports on the development and validation of this system, including the following:

- The complete item list for *Carbon TIME* assessments is available on the Tutorials and FAQs page of the password-protected Assessment site (see instructions for access on pages 2-3 above).
- Validity evidence for assessments: http://carbontime.bscs.org/sites/default/files/research/technical_reports_working_papers/CarbonTIMEAssessmentValidation.pdf
- Methods for analysis of quantitative assessment data: http://carbontime.bscs.org/sites/default/files/research/technical_reports_working_papers/Quantitative_Analyses_of_Students_Learning_Gains.pdf
- Description of how the automated scoring system was developed and used: See the poster by Thomas and Draney on the 2018 Conference Presentations page: http://carbontime.bscs.org/2018-conference-presentations

Classroom formative assessment and grading

Recent research on classroom assessment has generally focused on formative assessment. Teachers, however, are also legitimately concerned with grading and holding students accountable for their performances. We have worked to design classroom assessment systems that serve both of these purposes, as well as the important purpose of helping students assess the quality of their own work. The Educator Resources Library has a document describing resources for each of these purposes of assessment and how they can be used: http://carbontime.bscs.org/sites/default/files/research/technical_reports_working_papers/Assessment_in_Carbon_TIME.pdf . Key points from that document are summarized below.

Formative assessment: Insight into students' knowledge and practice. *Carbon TIME* materials are designed to enable productive classroom discourse, in which talk, writing, and norms of interaction support figuring out phenomena. Process Tools and pre- and post-assessments are designed, in part, to elicit *interesting wrong answers*. That is, the questions aim to reveal how students are thinking even if they don't fully understand the science.

Every *Carbon TIME* resource that involves student writing—tests, quizzes, process tools, Big Ideas probes, and worksheets—is accompanied by an Assessing tool or a Grading

[4] Funding for this system in its current form will continue only through the 2018-19 school year.

tool that documents highlight common patterns in students' ideas to help teachers begin to identify these patterns in their own classrooms. For example the Assessing tool for the *Systems and Scale* Expressing Ideas Tool is at http://carbontime.org/WebContent/CTIME_Downloads/SystemsAndScale/1.2_Assessing_Expressing_Ideas_Tool_for_Ethanol_Burning.pdf . Additionally, discussing the various ideas that exist in the classroom fosters shared curiosity and supports individual students in better understanding their own thinking.

Student self-assessment. Students are often not aware of their own prior knowledge and preconceptions. In order for effective learning to occur, student must be given opportunities to articulate these ideas and compare them to the scientific explanations they learn through classroom activities. In addition, throughout a unit, students need to be able to assess the quality of their arguments and explanations, in order to improve them. The Three Questions, the *Carbon TIME* discourse routines, and shared checklists and rubrics are all designed to involve students in assessing their own thinking and writing.

We have found that having students revisit earlier tools helps them to identify how their thinking has changed over the course of a unit. Teachers have also found Big Ideas Probes useful for helping students to see how their ideas are changing as they progress through a unit. For example, see the Assessing tool for the *Systems and Scale* Big Ideas probe: http://carbontime.org/WebContent/CTIME_Downloads/SystemsAndScale/Assessing_Big_Idea_Probe_Filler_Up.pdf .

Grading and accountability. Grading provides a means of communicating with students about *what matters* in *the* classroom: What they are accountable for, and why their talk and writing is important. *Carbon TIME* has supports for this assessment purpose throughout each unit.

1. *Students as questioners and investigators.*
    a. Expressing Ideas and Predictions Tools – students are accountable for articulating their initial ideas, for listening and responding to others' ideas and questions, and for returning to earlier ideas later in the unit and noticing how ideas have changed.
    b. Evidence-Based Arguments Tool – students are held accountable for key evidence, arguments, and unanswered questions by the end of the lesson
    c. Assessment tools provide Learning Progression level guidance.
2. *Explanations Tools and general explanations lessons: Students as explainers.*
    a. The Three Questions provide a 4-step guide and general rubric for explaining phenomena, which can be used as a self-assessment and revision guide
    b. Grading tools provide scoring and Learning Progression level guidance
3. *Carbon TIME* post-tests
    a. Computer scoring of forced choice responses and downloadable, editable spreadsheets of class results (with tutorials) are available.
    b. Grading tools provide scoring and Learning Progression level guidance.

3. Accessibility for Diverse Learners

We have put intense effort into inclusion and differentiation in *Carbon TIME.* In this section we (a) describe how we have addressed inclusion and differentiation in the development process, (b) describe current and planned supports for inclusion and differentiation in *Carbon TIME* curriculum materials and PD, and (c) present evidence for the success of *Carbon TIME* in scaffolding diverse learners.

Addressing inclusion and differentiation in the development process. As described above we have paid careful attention to working with diverse schools, teachers, and learners throughout the development process. The 900 classrooms total in 94 schools include urban, suburban, and rural schools. There are 26 middle schools and 68 high schools, including

10 of the 11 Seattle high schools. The percentage of students in a school receiving free and reduced lunch ranges from 3% to 99%, with a mean of 41%. The percentage of underrepresented minority students in the participating schools ranges from 0% to 100%, with a mean of 43%.

Our research-practice partnership also includes teachers who work with English Language Learners such as Katherine Kelsey in Seattle and Jeremy Gaspar in Kentwood, MI, as well as special education teachers such as Tonya Elias in East Kentwood and Melinda Plaugher in Midland, MI. These teachers have provided important insights and resources. Their ideas contributed to the chapter we wrote on science assessment for English Language learners (Assessing Scientific Genres of Explanation, Argument, and Prediction, by Covitt and Anderson, cited in the 2018 Research publications: http://carbontime.bscs.org/articles-book-chapters).

Supports for inclusion and differentiation in *Carbon TIME* curriculum materials and PD. The Process Tools and their repetition within and across units is particularly helpful for all learners, especially those who need additional scaffolding. The Process Tools themselves support students in taking up the "second-language" of scientific discourse. Connected to the Process Tools, the *Carbon TIME* discourse routine is inclusive of all students because it starts with divergent ideas, which gives all students the opportunity to share their thinking. The subsequent discussions help bring that divergent thinking closer to the canonical consensus.

The materials also have many activities that include suggestions for accommodations or modifications (and we are planning to do this more systematically). These recommendations support learners who need additional practice with the material in order to take up the "second-language" of scientific discourse. Many of our repeated and optional activities serve this purpose as well, such as the additional practice students can get in Systems and Scale with methane.

Carbon TIME uses "Turtle Trails" (explained in the Educator Resources Library (http://carbontime.bscs.org/sites/default/files/educator_resources/Turtles_07.05.16-1.pdf) to designate more- and less-detailed and complex learning pathways within a unit. For example, the 1-turtle pathway in *Animals*, *Plants*, and *Decomposers* uses language such as "large and small organic molecules" while the 2-turtle pathway includes more detailed vocabulary for the polymers and their monomers. These choices are easily marked for teachers using a stacked turtle icon next to Activities and within Unit Read Me Files and Unit Overviews, and an explanation for the Turtle Trails is available in our Library.

We have also put substantial effort into educative resources associated with the units and PD activities that help teachers use learning progression research to understand and respond to their students. These include the Assessing and Grading Tools for all student written work (described in the Assessment section above) and PD activities that involve teachers in analyzing and responding to student work (described in the Instructional Planning and Support section below).

Evidence for the success of *Carbon TIME* in scaffolding diverse learners. We used hierarchical linear modeling (HLM) analyses to investigate associations between student learning gains and other variables associated with diversity in students and schools. An explanation of how we conducted these quantitative analyses of student learning gains can be found in the Research Technical Reports and working papers (http://carbontime.bscs.org/sites/default/files/research/technical_reports_working_papers/Quantitative_Analyses_of_Students_Learning_Gains.pdf). Separate analyses of 2015–16 and 2016–17 data show consistent patterns:

- *Carbon TIME reduced the achievement gap between higher-pretest and lower-pretest students within classrooms.* Within classes, students with lower pretest proficiencies showed significantly higher learning gains.
- *Carbon TIME was less successful in higher-poverty schools with fewer organizational resources.* The school percentage of free and reduced lunch was negatively associated with class-average learning gain. That is to say, classrooms from schools with higher percent of free and reduced lunch benefit less from implementing *Carbon TIME*. We interpret this finding as evidence that schools with more organizational resources are more successful in implementing *Carbon TIME*.
- *Other variables were not significantly associated with student learning gains.* We also investigated other variables, including grade band (middle school vs. high school), racial composition of students, and class average pretests. None of these variables added significantly to the predictive power of models that included the three key variables above: individual teachers, student pretest, and school percentage of free and reduced lunch. In other words, teachers and students in a wide range of classrooms were successful using *Carbon TIME.*

4. Evaluation of Bias Content

We believe that *Carbon TIME*'s best protection against bias in content comes from its iterative development process in a research-practice partnership and its extensive field testing in diverse classrooms. Many suggestions for reducing bias have been incorporated into *Carbon TIME* materials through this process. We also point to evidence from student learning data (cited in the sections on Standards Alignment and Accessibility for Diverse Learners, above) that students of different ages, genders, ethnicities, and social groups learn successfully from *Carbon TIME* materials.

We have also taken specific steps to reduce bias in *Carbon TIME* materials. For example:

- Storyline readings in each unit focus on scientists of different historical times, ethnicities, and genders. For example, see the *Systems and Scale* reading about Elizabeth Fulhame: http://carbontime.bscs.org/sites/default/files/system_scale/handouts/1.2_Systems_and_Scale_Storyline_Reading.pdf
- Student names in worksheets and assessments also include names associated with different ages, genders, and ethnicities. We also take care to have different fictional students articulate correct answers. For example, see the Assessing tool for the *Animals* Big Ideas probe: http://carbontime.org/WebContent/CTIME_Downloads/Animals/Assessing_Big_Idea_Probe_What_Happens_to_the_Fat.pdf .
- We work to use phenomena in the units that are either familiar to all students (e.g., children growing and moving) or unfamiliar to all students (e.g., growth of *Spartina*, a kind of marsh grass) and that support materials include information or experiences that familiarize students with the phenomena.

5. Instructional Planning and Support

Carbon TIME uses a "three legs of the stool" approach to supporting rigorous and responsive science classroom instruction. One leg is our research-based, three-dimensional curricular units. The other legs are coordinated professional development for teachers, provided through collegial networks. The professional development program supports teachers in understanding complex three-dimensional learning goals, in enacting *Carbon TIME* units designed to scaffold and assess these learning goals, in developing the kind of classroom

discourse that is required for equitable engagement in these learning goals, and in using student talk and writing to inform instructional decisions. Engaging in professional learning with local colleagues supports teachers in making sense of a new curriculum and learning and instructional goals in the context of their building and district norms and expectations.

Current *Carbon TIME* PD resources

Educative resources embedded in units and website. Instructional supports are embedded in *Carbon TIME*'s online curricular units, designed to be educative and teacher friendly. Each unit provides numerous resources to guide teachers through successful implementation, including unit overviews and Read Me files supporting activity-level decision making and teacher-facing educator resources that provide brief rationales and implementation suggestions (example: Grading and Assessing tools). The Educator Resources Library provides many additional resources (see discuss and links above).

PD course of study. Our grant-funded, 2-year professional development course of study supported new *Carbon TIME* teachers in orienting themselves to using the curriculum to meet three-dimensional learning goals for all students. The program and resources have been field-tested with over 150 teachers in Seattle, other Washington locations, Colorado, and Michigan. The two-year course of study included 35 hours of face-to-face PD and 35 hours of online PD. Evaluation reports indicate that teacher participants felt the professional development was both positive and highly effective in supporting teachers' rigorous and responsive, three-dimensional instruction. Feedback from teachers, leaders, and developers has been the source of iterative revisions and improvements. An outline of this course of study – as used in Seattle by pilot teachers over the last three years – is available as Appendix C.

Plan for Seattle schools

Our plans for future planning and instructional support for Seattle biology teachers build on and improve both the current educative resources on the website and the PD course of study, as well as providing ongoing support for all teachers through professional support networks.

Improved educative resources embedded in units and website. The outline for the final website in Appendix A includes our list for an expanded library with additional educative resources for teachers—see in particular the list of resources under Tab 6 in the outline. Each resource will be linked to curriculum features in the Units (Tab 3) and the PD Course of Study (Tab 4). Educative resources linked to curriculum features will include (a) a discussion of the nature and purpose of the curriculum feature, (b) a discussion of different options for how to use the feature in the classroom, and (c) suggestions for differentiation.

Continuing professional support networks for all biology teachers. Seattle Public Schools already has significant human resources available to support using *Carbon TIME* to meet NGSS expectations for student learning: about 25 of the 35 Biology teachers are engaged in or have completed the two-year professional development course of study. Teachers who have already completed the grant-funded two-year course of study would engage in ongoing professional learning experiences with colleagues, to deepen and extend practical knowledge of using *Carbon TIME* to scaffold and assess NGSS-aligned, three-dimensional performances.

Developing classroom discourse that supports complex three-dimensional learning goals is challenging and requires ongoing professional support. Additionally, changes in building and district expectations (including local goals, areas of focus, common student assessments) require teachers to work with collegial networks in order to successfully fit together myriad goals at the local context.

One-year course of study for biology teachers new to *Carbon TIME.* Based on estimates for teacher retention and shifts in assignments, we anticipate that about 10 teachers

will require new *Carbon TIME* training each school year. Our recommendation for professional development is to engage new *Carbon TIME* teachers in a 1-year cohort program. At the time of this writing, *Carbon TIME* is finalizing Professional Development modules to publish as a free resource on the *Carbon TIME* Website. These modules (outlined under Tab 3 in Appendix A below) will meet the needs of both of the audiences described above: a cohort of teachers new to *Carbon TIME* each year, and a larger group of experienced *Carbon TIME* educators.

These modules are intended for face-to-face delivery, and are designed with the potential for flexible and localized implementation. They are being developed based on information received from teachers who have experienced the original grant-funded program, including many in Seattle. They provide district and teacher leaders with tools to support PD for teachers new to *Carbon TIME* as well as PD for experienced teachers, who are able to analyze classroom artifacts (assessments, discussions, and written explanations) to more deeply address student thinking and 3-dimensional performances.

New Teachers	**Experienced *Carbon TIME* Teachers**
Pre-Implementation Summer (16 hours)	**Summer/School Year (16 hours)**
• *Carbon TIME*: 3-dimensional Vision, Storylines, and learning progression stance	• Rigorous & Responsive Classroom Discourse using discourse artifacts
• Understanding *Carbon TIME* through *Systems & Scale* (Foundational Unit)	• Studying Student Work to Understand Student Ideas and Select Instructional Responses using student work artifacts
• 3D (formative & summative) assessments through *Systems & Scale*	• 3D Classroom Assessments using student assessment artifacts
First School Year (16 hours)	• Updates to materials (repairing broken links, revisions, etc.)
• Reflect on *Systems & Scale*	
• *Animals & Decomposers*	
• *Plants*	
• *Ecosystems & Human Energy Systems*	

Other options. There are other possible designs for a Seattle *Carbon TIME* professional development network and course of study. For example, Seattle district leaders and/or lead teachers could draw on expertise already in the district to facilitate the field-tested version of PD (Appendix C) by continuing to engage new cohorts of *Carbon TIME* teachers through the developed two-year program, both face-to-face and online (Seattle's Schoology platform). With this option, Seattle could provide new cohorts of teachers with the original version of PD while continuing to develop teacher leaders within the district by recruiting teacher leaders to continue delivering the PD program to their colleagues.

Budget Explanation

All online *Carbon TIME* materials are free, so they are not included on the attached budget spreadsheet.

Initial cost: A complete list of hands-on materials needed for investigations and other activities is included in the Materials List tab of the budget spreadsheet. Sources and prices as of summer, 2018 are also included. The cost for all of these materials would be about $400 per teacher. However, many of the materials are already available in most high school laboratories, so costs for classrooms that have laboratory access will probably be less. We estimate that 10 teachers will need new materials at a cost of $400 and 25 teachers will need yearly replacements of consumables at a cost of $150.

Yearly costs: Estimates of yearly costs are calculated as follows:

- Costs for replacement of consumables and of materials that are lost or broken is estimated at $150 per year per teacher for 35 teachers each year.
- Cost of website maintenance, including updating broken links, minor revisions, and security upgrades (from web developer Rhiannon Villafuerte of SwarmingWest): $2400 per year.

Other expenses: Expenses associated with implementation of *Carbon TIME* that are not listed include:

- Costs of printing readings, worksheets, and posters.
- Costs of teacher salaries or substitute costs for PD
- Costs associated with student access to computers for online simulations or modeling activities in the *Ecosystems* and *Human Energy Systems* units
- Funding for the online assessment system will continue only through the 2018-19 school year, so an alternative to that system will be needed

Appendix A: Planned Final Organization of the *Carbon TIME* Website

The outline below is organized according to the planned tabs on the website. Only the "Contact" tab would be interactive; all other tabs would include material that is self-guided for users. The users could include:

- Individual teachers, who might start with the Units tab and access other resources through links from units and lesson plans
- PD leaders or district leaders, who might start with the Educator Resources > Courses of Study tab
- Researchers (probably especially interested in the Research tab)

Content Website

1. **Home**. Revise to provide overview of all the resources under different tabs.
2. **About**. Maybe some of the current content of this page could go on the Home page. Maybe organize around the theme of *scaffolding and assessing environmental science literacy/three-dimensional learning?*
   - 2.1. Introductions to *Carbon TIME:* Brochures, overview videos.
     - 2.1.1. Overview of website: Guided tour
     - 2.1.2. Three legs of the stool
     - 2.1.3. *Carbon TIME* and *NGSS*
     - 2.1.4. STEM for all video
   - 2.2. Evidence about effectiveness of *Carbon TIME:* What students will know and be able to do
     - 2.2.1. Research briefs with practitioner-oriented summaries of student achievement data.
     - 2.2.2. Results of ACHIEVE analysis
     - 2.2.3. Written or video testimonials from teachers, students, administrators. See 2.3.2.1 PD and Network Meetings > 2017-18 SY > 03.2018 AdvertisingMarketing Menu.docx & PublicVideosDropbox9.6.png.
   - 2.3. *Carbon TIME* people: Information about people who have worked on the project.
3. **Units**. Similar to current units tab, with the addition of links from the units to relevant educator resources.
   - 3.1. *Systems and Scale*
   - 3.2. *Animals*
   - 3.3. *Plants*
   - 3.4. *Decomposers*
   - 3.5. *Ecosystems*
   - 3.6. *Human Energy Systems*
4. **PD Courses of study or PD Toolkits.** These will be leader's guides that organize the resources in other tabs into plans for face-to-face workshops.
   - 4.1. *Carbon TIME* adoption tool kit. Suggested sequence of PD activities for a school district that is adopting *Carbon TIME. Resources designed for PD Leaders. Current ideas in 2.10 > PD COS Inventories*
     - 4.1.1. Modules A (overall vision and possible advertising/marketing type pieces)
       - 4.1.1.1. Module A1: The Carbon TIME Vision
     - 4.1.2. Modules B (unit-specific)
       - 4.1.2.1. Module B1: Systems & Scale Unit Highlights
       - 4.1.2.2. Module B2: Systems & Scale Unit Assessments

4.1.2.3. Module B3: Systems & Scale Unit Materials/Potential Issues
4.1.2.4. Module B4: Reflecting on Systems & Scale
4.1.2.5. Module B5: Systems & Scale Pre/Post-Tests Analysis
4.1.2.6. Module B6: AN & D Highlights/Materials/Potential Issues
4.1.2.7. Module B7: PL Highlights/Materials/Potential Issues
4.1.2.8. Module B8: ECO & HES

4.1.3. Modules C (uncoupled from units, but with unit suggestions)
4.1.3.1. Module C1: Discourse
4.1.3.2. Module C2: Studying Student Work
4.1.3.3. Module C3: 3D Assessments

5. **Research**. Keep more or less the same organization as the current research tab.
5.1. Publications
5.2. Conference papers and presentations
5.3. Technical reports and working papers. This section is currently the same as 4.4 Library, but the idea would be to use this section for more research-oriented materials, such as item pools, coding rubrics, descriptions of data, etc.

6. **Library**. This tab will include contents that are typically accessed from other tabs, especially the unit and PD tabs. Much of that content will be based on activities and handouts from our current F2F and online PD resources, but reorganized as self-guided (and often shorter) packages. A package might include (a) a Read Me or overview file with a written description of the resources, its goals, and its key ideas, (b) a short video or animated presentation, perhaps using something like VideoScribe to produce a visually interested animated slide show, (c) presentation materials like a PPT presentation, and/or (d) handouts, examples of student work, etc.
6.1. Unit-specific resources, based on current LMS unit introductions and on unit-specific F2F activities, restructured to be self-guided as described above, and cross-linked with lessons and activities on the Units page. There would be other links when these resources play a role in PD Courses of Study (4.3 below).
6.1.1. *Systems and Scale*
6.1.2. *Animals*
6.1.3. *Plants*
6.1.4. *Decomposers*
6.1.5. *Ecosystems*
6.1.6. *Human Energy Systems*
6.2. General resources. These would be short packages organized around recurring features of all or most units. The list below is preliminary brainstorming about some possible packages. These could be crosslinked to units and to PD courses of study (4.3 below).
6.2.1. Important general features of *Carbon TIME*
6.2.1.1. Assessing and scaffolding as complementary goals for three-dimensional learning
6.2.1.2. Student and content storylines
6.2.1.3. The Three Questions and the importance of crosscutting concepts
6.2.1.4. *Carbon TIME* discourse routines
6.2.2. Process Tools and tool-specific discourse routines
6.2.2.1. Expressing Ideas Tool
6.2.2.2. Predictions Tool
6.2.2.3. Evidence-based Arguments Tool
6.2.2.4. Explanation Tool
6.2.3. Recurring features, with rationales, key elements, and options for classroom routines for each feature

6.2.3.1. Starting lessons: Ways of using PPT instructional model slide, reviewing storylines using Driving Question Board, Learning Tracking Tool, Model Building Tool, responses to Exit Tickets from previous lessons
6.2.3.2. Concluding lessons: Ways of Ways of summarizing and looking forward using Driving Question Board, Learning Tracking Tool, Model Building Tool, responses to Exit Tickets from previous lessons
6.2.3.3. Discussing readings using Questions-Connections-Questions prompts and PPT slides
6.2.3.4. Big Ideas Probes: answering, voting, discussion, returning in later lessons
6.2.3.5. Groupwork routines, including routines where groups prepare and present models or conclusion and jigsaw routines. This could also include Back Pocket Questions and whiteboards.
6.2.3.6. Sharing results of investigations: Using spreadsheets and/or posters to record group results; reaching consensus about patterns; comparing patterns to example class patterns; connecting to EBA Tool and Three Questions.
6.2.3.7. Grading and assessing routines: Ways of engaging students in assessing and improving their own work or each other's work. This could include ways of using checklists, example responses, writing revisions in a different color. Maybe also whiteboards.

6.2.4. *Carbon TIME* assessment system
6.2.4.1. Purposes of assessment in *Carbon TIME*
6.2.4.2. Learning progression frameworks and assessments
6.2.4.2.1. Carbon LP Framework and assessments
6.2.4.2.2. Inquiry LP Framework and assessments
6.2.4.2.3. Large-scale LP Framework and assessments
6.2.4.3. Using the online assessment system

6.3. Other resources (formerly Library). As on the current website, this could be a place to put longer-form practitioner-oriented resources such as the *NGSS* PEs for different units, Instructional Model document, or *Carbon TIME* Content Simplifications document.

7. **Contact**. We will need to figure out what contact information to provide for people with different kinds of questions.

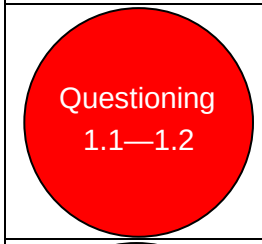
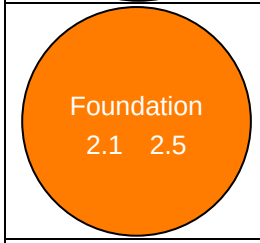
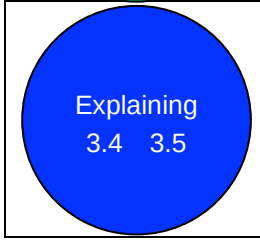
Assessment Website

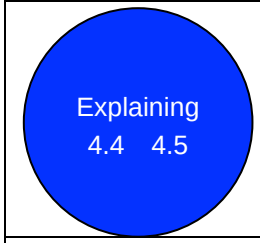
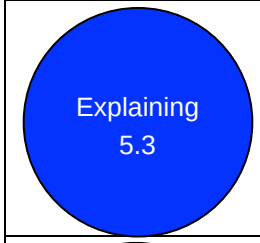
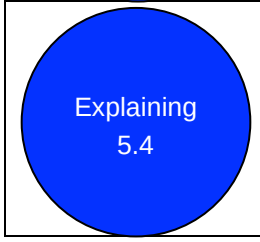
We will maintain this site in its current form through Year 5 (2018-19), but continuing to support it as an interactive online site is expensive and unsustainable unless we get additional sources of funding (which is something to actively pursue).

Here's an initial idea about a direction to go: I'm wondering if an alternative would be a pre-post item pool for each from which teachers could pick their own questions. I can see several advantages of making this a curated list of questions we have developed and questions that teachers have developed.

Appendix B: Learning Tracking Tool for Systems and Scale

Driving Question: __What happens when ethanol burns? _____

Activity Chunk	What did we do? Summarize key information and activities with a description and/or picture.	What Did We Figure Out? Summarize what we figured out about the phenomena that helps us answer the driving question.	What Are We Asking Now? What additional information do you need to answer the driving question?
	Take a pretest and share their initial ideas on the Expressing Ideas Tool about what happens when ethanol burns.	Ethanol burns and water does not. We have many initial ideas and questions.	What happens when ethanol burns?
	“Zoom into" air and explore how the world can be studied at multiple scales, including the atomic-molecular scale.	We can learn about the world at different scales. Three facts about atoms are: 1) Atoms last forever, 2) Atoms make up the mass of all materials, 3) Atoms are bonded to other atoms in molecules.	How can we use atoms and molecules to explain ethanol burning?
	Conduct an investigation to explore what happens when soda water fizzes. Use the Predictions Tool and the Evidence-Based Arguments Tool.	Soda water fizzing lost mass and made the BTB change from blue to yellow.	What happens to the molecules in soda water as it fizzes?
	Model the chemical change that occurs as soda water fizzes using molecular model kits and use the Explanations Tool to explain what happens when soda water fizzes.	The carbonic acid in soda water decomposes into carbon dioxide and water as it fizzes. No atoms are created or destroyed during the chemical change.	What happens to ethanol when it burns?

Activity Chunk	What did we do? Summarize key information and activities with a description and/or picture.	What Did We Figure Out? Summarize what we figured out about the phenomena that helps us answer the driving question.	What Are We Asking Now? What additional information do you need to answer the driving question?
	Conduct an investigation to explore what happens when ethanol burns. Use the Predictions Tool and the Evidence-Based Arguments Tool.	Ethanol burning lost mass and made the BTB change from blue to yellow. There was evidence of heat and light energy at the end of the chemical change.	What happens to the molecules of ethanol as it burns?
	Model the chemical change that occurs as ethanol burns using molecular model kits and use the Explanations Tool to explain what happens when ethanol burns.	In a flame the atoms in ethanol and oxygen rearrange to form carbon dioxide and water. Chemical energy is changed to heat and light energy when the high-energy C-C and C-H bonds of ethanol are changed to low-energy O-H and C=O bonds.	Why does ethanol burn and not water?
	“Zoom in” to ethanol, wood, and water to distinguish between organic materials (materials with high-energy C-C and C-H bonds) and inorganic materials (materials with other chemical bonds).	Ethanol and other organic materials have high energy C-C and C-H bonds. Water and other inorganic materials do not have C-C or C-H bonds.	What happens when other materials burn?
	Apply what we figured out about ethanol burning to explain other examples of organic materials burning.	The chemical change of combustion is similar for all organic materials. The organic material combines with oxygen to produce carbon dioxide and water. The chemical energy in the organic material is transformed into heat and light energy.	Why is combustion of organic materials important in the world?

Appendix C: *Carbon TIME* Two-Year Professional Development Course of Study

First-year Course of Study

1. Pre face-to-face (F2F) online PD (2 hours), available on Schoology
   - Orientation video introducing *Carbon TIME* and the course of study
   - Network Teacher Introductions
   - Unit Synopses: read & respond to synopses of six *Carbon TIME (CTIME)* units & watch videos of *CTIME* teachers' experience
   - Share hopes and goals for participation in C*TIME* network
   - Learning progression study: read & respond to an article on carbon learning progression published in *American Biology Teacher*
   - Practice accessing & completing *Systems & Scale* unit assessment in preparation for summer F2F PD
2. Summer F2F Professional Development Workshop (2 days)
   - General introduction to *CTIME* project goals, units, & Instructional Model
   - Exploration of *CTIME* 3-dimensional teaching & learning and NGSS alignment
   - Participation in key teaching & learning activities, including questioning, investigating, and explaining (inquiry & application) components
   - Introduction to online assessment system & practice evaluating student responses
   - Distribution of teaching materials
   - Planning timelines for unit teaching
3. Post-F2F online PD (6 hours), available on Schoology
   - Review & determine which pathways through unit materials & activities will be most appropriate for students
   - BTB tutorial: Practice mixing & calibrating a key classroom investigation tool, bromothymol blue
   - Practice investigations to prepare for teaching: select two unit investigations to try, troubleshoot, & discuss with colleagues, using materials provided at F2F workshops
4. School year online PD (13 hrs), available on Schoology.
   Teachers complete an online module for each unit they teach, including both pre-teaching & post-teaching activities

   Part A: Pre-Teaching modules
   - Examine unit goals & NGSS alignment; review unit pathways & plan activities sequence
   - Prepare to connect Discourse Routines, Process Tools & Instructional Model in teaching the Unit
   - Checklist for Unit Facilitation & Management
   - Prepare for teaching with Process Tools
   - Prepare for collecting student work
   - Discuss Unit Preparation with colleagues

   Part B: Post-Teaching modules
   - Save student work to bring to school year F2F
   - Reflect on individual student learning:
     - A) Individual student learning over time
     - B) Variation in student responses & instructional ideas
   - Reflect on class learning:
     - A) Identify knowledge & practice changes across a unit
     - B) Responsive planning for next unit & next year

- Unit implementation feedback survey
- Discuss Unit Implementation (tips, insights, questions) with colleagues

5. School year F2F Professional Development Workshop (1 day)
    - Reflect on & prepare for continued use of *CTIME* Instructional Model & Process Tools
        - Reflect on successes & challenges of implemented *CTIME* units
        - Build a storyline & unpack the NGSS 3-dimensions for *Plants* unit
        - Recognize purpose & importance of the phases of the Instructional Model, as well as sequence of lessons, for *Plants* unit
    - Understand *CTIME* goals & 3D science teaching & learning
        - Relate *CTIME* goals to Next Generation Science Standards.
        - Synthesize the general storyline across all *CTIME* units, including large scale units
        - Review & discuss *CTIME* research findings about productive discourse in *CTIME* classrooms
    - Engage in formative assessment using student work samples
        - Identify & discuss purposes of formative assessment supports within *CTIME* units
        - Practice using student Process Tool work samples to evaluate student understanding & plan instructional interventions
    - Prepare for Network participation
        - Further develop positive working relationships with network teachers & *CTIME* staff
        - Review Teacher Expectations & Year 1 & 2 courses of study
        - Consider new curricular supports & network opportunities

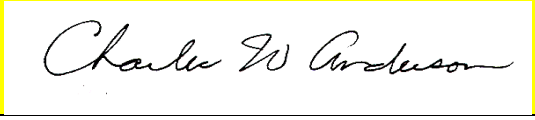
Second-year Course of Study

1. Pre-F2F online PD (4 hours), available on Schoology
    - Review *CTIME* network expectations & timelines
    - *CTIME* research update: watch video to explain how their work influenced project outcomes & revisions in current year
    - Revisit Goals & Plan for Year 2 Implementation
    - Establishing the problem for Year 2 professional learning: rigorous & responsive 3D science teaching is important, but hard to do
    - Uncovering & Using Student Ideas: Formative Assessment Probes & *Carbon TIME* teacher classroom video
    - *Carbon TIME* Discourse & Storylines: Review documents, share important learnings, & make connections to using student ideas
    - Looking Forward: discussion of formative assessment probes in *CTIME* classrooms & private assignment directly to network leader
2. Summer F2F Professional Development Workshop (1 day)
    - Understand *Carbon TIME* & 3D science teaching & learning goals
        - Consider *Carbon TIME* goals of rigorous & responsive teaching
        - Identify multiple dimensions in *Carbon TIME* assessments
        - Compare evidence-based argumentation & explanation practices
    - Identify components of productive classroom discourse & prepare for classroom enactment
        - Review & discuss video of productive discourse in *Carbon TIME* classrooms
        - Identify & engage with steps of *Carbon TIME* Discourse Routine & consider its role in assessment
    - Consider assessment purposes around *Carbon TIME* Process Tools

    - Identify assessment purposes of Process Tools & coordinated Discourse Routine
    - Engage with *Animals* Explanation tool & scaffolds for student writing
- Prepare for Network participation
    - Further develop positive working relationships with network teachers & *Carbon TIME* staff, & make connection plans for school year
    - Review Teacher Expectations & Year 2 Courses of Study
    - Consider new curricular supports & network opportunities
    - Make connections among *Carbon TIME* & other initiatives across levels (building, district, state), to meet similar goals

3. School year online PD, available on Schoology (10 hrs)
    - Part A: *Carbon TIME* Classroom Discourse & Discourse Routines
        - small group meetings to analyze classroom discourse artifacts (recordings) in a *CTIME* classroom discourse routine
    - *Part B: Assessment & Carbon TIME Student Work*
        - Reflecting on Student Work & identifying central purpose for studying student work with critical colleagues during SY F2F
        - Online discussion around student self-assessment as a purpose of classroom assessment
    - *Part C: Assessing & Grading Carbon TIME Pre/Posttests*
        - Review & discuss Carbon TIME Assessment Handout
        - Online discussion around *Carbon TIME* Pretest Assessment Purposes
        - Online discussion around *Carbon TIME* Posttest Assessment Purposes
4. School year F2F Professional Development Workshop (1 day)
    - Understand *Carbon TIME* & 3D science teaching & learning goals
        - Consider *Carbon TIME* goals of rigorous & responsive teaching
        - Identify & suggest components of rigor & responsiveness across *Carbon TIME* units
    - Explore productive classroom discourse in *Carbon TIME* classrooms
        - Identify divergent & convergent moments in Discourse Routines across a *Carbon TIME* unit
        - Consider ways of advancing student understanding through scaffolding discourse
    - Consider & engage in assessment purposes in *Carbon TIME*
        - Study *Carbon TIME* student work with colleagues for identified purposes
        - Identify & discuss strategies for classroom community insight
        - Identify & discuss strategies for student self-assessment
    - Develop & extend Network participation
        - Further develop positive working relationships with network teachers & *Carbon TIME* staff
        - Consider new curricular supports & future network opportunities
        - Consider analysis-of-practice professional development opportunities for building local system capacity
        - Make connections among *Carbon TIME* & other initiatives across levels (building, district, state) to meet similar goals

RFP09808 STEP 2 SCIENCE ADOPTION 9-12
ATTACHMENT 3 Carbon TIME
VENDOR/PUBLISHER QUESTIONNAIRE

NAME AND CONTACT INFO (PHONE & EMAIL ADDRESS) FOR VENDOR REP AUTHORIZED TO SUBMIT RFP RESPONSE IN THE YELLOW HIGHLIGHTED COLUMN TO THE RIGHT	**Charles W. Anderson** **andya@msu.edu** **517-432-4648**
SIGNATURE OF VENDORS AUTHORIZED REPRESENTATIVE IN THE YELLOW COLUMN TO THE RIGHT	

1. TECHNOLOGY

a) With technology constantly changing, please provide a description of current applications and those planned for implementation over the next several years.

Print materials are available in both PDF and Microsoft Word format. Presentations are in Microsoft PowerPoint format. The *Ecosystems* and *Human Energy Systems* units include online simulations and models designed to work with current web browsers.

b) Please indicate your firm's ability to supply any of the requested menus of titles in audio, e-book or similar format.

We do not have this capability.

c) Please advise any costs associated with supplying audio, eBook, etc. that are not already submitted on the Request for Quotation Form.

NA

d) Please advise availability/compatibility with current common eBook formats. i.e. .DOCX, .PDF, .EPUB, .pdb, .ibooks, etc.

NA

e) The District requires that finalist vendor/publishers clearly identify within their RFP Step 2 responses how they will meet the ADA and related requirements as set forth in Section 508 of the Rehabilitation Act of 1973 (29 U.S.C. 794d), as amended, all other regulations promulgated under Title II of the Americans with Disabilities Act, and the accessibility standards of the Web Content

Accessibility Guidelines ("WCAG") 2.0 AA. Please review RFP09808 Step 2 attachment 8, 9 and attachment 10 in particular for additional information. Please identify materials and products only available through a web-based platform and not included in hard copy form. Describe plans to make these available in hard copy.

The *Carbon TIME* staff does not have the expertise to complete the VPAT or make all required changes in materials. If *Carbon TIME* is adopted by SPS, we will work with SPS to hire a consultant who can guide us through this process. Some revisions can be made by *Carbon TIME* or SPS staff, but we anticipate that some revisions will require additional technical expertise.

Carbon TIME materials are currently being used successfully in a wide variety of classrooms, including special education and ELL classes, and including classes in SPS. The diversity of current classrooms and evidence for success with diverse learners are described on Pages 13-15 of our responses to the Request for Information.

f) Referring to RFP09808 Step 2 Attachment 4 Request for Quote Form, please identify (ISBN# and description) and price out materials that are **essential** to offered curriculum that are required by ADA/VPAT/WCAG. Accessibility needs to be available not only to students, but also to others with disabilities, such as parents, guardians, tutors, community members, etc.

See above.

2. PROFESSIONAL DEVELOPMENT

Each set of instructional resources will require professional development for all teachers utilizing the resources, staffed by a Washington state PD provider. The professional development provided to teachers should at least two (2) days at six-and-a-half (6.5) hours per day per instructional materials set. The Professional development should include: an orientation to the resources including the online teaching platform; a dive into the various components of the instructional materials; and assessment features within the text and online.

Professional development should be available from July 2019 to February 2020.

For each set of instructional materials adopted, staff developers must be available to deliver mutually-determined professional development sessions in the following timeframe options:

1. Two (2) days at six-and-a-half (6.5) hours per day of professional development during the school day
2. Four (4) after-school sessions of professional development (3.5 hours each)
3. Two (2) days at six-and-a-half (6.5) hours of professional development on consecutive Saturdays

All high school biology teachers (approximate numbers provided in Attachment 1 of RFP Step 1) will be included in the professional development. Maximum number of participants for each session will concur with the maximum number of participants allowed.

The professional development will take place at the John Stanford Center for Educational Excellence or at an alternative, mutually-determined and agreed-upon local site. All sites will have presentation stations and Wi-Fi.

3. TERMS AND CONDITIONS of any future purchase shall be Seattle School District No. 1 Standard Terms and Conditions. Please refer to the attached Standard Terms and Conditions Document, Attachment 7.

4. PURCHASE/SALE OF ADOPTION MATERIALS

a) Does your sales approach work on a publisher direct-to-District basis or through a book depository?

Carbon TIME materials are freely available and not for sale.

b) Please advise pros and cons.

NA

c) If your sales approach is through a depository, **who takes contractual responsibility** that deliverables (offered prices and delivery commitments) are met and on time throughout the lifetime of the adoption?

NA

5. ESTIMATED "PER STUDENT" COSTS FOR ADOPTION

a) Please advise the "**per student**" estimated **first year cost** for **all** combined student, teacher, technology access, consumable, freight and handling. (Excluding tax)

No payments to *Carbon TIME* are needed. If a teacher has about 100 students, costs for hands-on materials will be about $4 per student. There will also be printing costs for worksheets, readings, and posters.

b) Please estimate those same costs on a per student basis for years 2 through 9 of the adoption period.

If a teacher has about 100 students, costs for hands-on materials will be about $1.50 per student. There will also be printing costs for worksheets, readings, and posters. Full cost estimates are included in the Budget Explanation of our response to the RFI. For convenience, these estimates are copied below.

- All online *Carbon TIME* materials are free, so they are not included on the attached budget spreadsheet.
- **Initial cost:** A complete list of hands-on materials needed for investigations and other activities is included in the Materials List tab of the budget spreadsheet. Sources and prices as of summer, 2018 are also included. The cost for all of these materials would be about $400 per teacher. However, many of the materials are already available in most high school laboratories, so costs for classrooms that have laboratory access will probably be less. We estimate that 10 teachers will need new materials at a cost of $400 and 25 teachers will need yearly replacements of consumables at a cost of $150.

Yearly costs: Estimates of yearly costs are calculated as follows: Costs for replacement of consumables and of materials that are lost or broken is estimated at $150 per year per teacher for 35 teachers each year. Cost of website maintenance, including updating broken links, minor revisions, and security upgrades (from web developer Rhiannon Villafuerte of SwarmingWest): $2400 per year.

Other expenses: Expenses associated with implementation of *Carbon TIME* that are not listed include:

- Costs of printing readings, worksheets, and posters.
- Costs of teacher salaries or substitute costs for PD
- Costs associated with student access to computers for online simulations or modeling activities in the *Ecosystems* and *Human Energy Systems* units
- Funding for the online assessment system will continue only through the 2018-19 school year, so an alternative to that system will be needed

6. RISKS

c) If there are any areas of commercial/educational risk to the District that you are aware of and the District has not mentioned in our communications thus far, please share a brief explanation and identify any financial or other risks to the District.

We are not aware of any risks.

RFP09808 STEP 2 SCIENCE ADOPTION GR 9-12

~~ATTACHMENT 3A~~ **V**	**TIONNAIRE** **YES OR NO ANSWERS ONLY**	PLEASE FILL IN ALL "YELLOW" HIGHLIGHTED AREAS BELOW
NAME AND CONTACT INFO (PHONE & EMAIL ADDRESS)FOR VENDOR AUTHORIZED TO SUBMIT RFP STEP 2 RESPONSE		**Charles W. Anderson** **andya@msu.edu** **517-432-4648**
SIGNATURE OF VENDORS AUTHORIZED REPRESENTATIVE		
Question #	**VENDOR/PUBLISHER QUESTIONS**	**REPLY WITH A YES OR NO RESPONSE IN THE BELOW YELLOW FIELD(S)** **For any "NO" responses, please clarify/answer on the separate ATTACHMENT 3B Vendor/Publisher Questionnaire**
1	Is your product/service/pricing based on a **model that uses primarily "hard cover" student textbooks** that are to be reused by multiple students/classes over the course of the District's historical 9 year adoption cycle?	**No**
2	Does your product/service offering/pricing include **"hard cover" student books** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**No**
3	Does your product/service/pricing include **"consumable" student materials** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**Yes**
4	Does your product/service/pricing include **electronic copies of student materials** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**Yes**
5	Does your product/service/pricing include **hard copies of teacher materials** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**No**
6	Does your product/service/pricing include **electronic copies of teacher materials** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**Yes**
7	Does your product/service/pricing include all **student web access/unlimited downloads** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**Yes**
8	Does your product/service/pricing include all necessary **teacher web access/unlimited downloads** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**Yes**
9	Does your product/service/pricing include all District identified **professional development** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**Yes**
10	With frequent sales and **mergers of publishing companies** being a concern for the District, please confirm that any **commercial arrangement**s your firm may agree to with the District for this adoption will pass on to any future management/ownership of your current company.	**N/A**
11	Do you agree that your below product/service offering/pricing and any possible/future purchase order/contract that might be issued as a result of the District's RFP Step 1/RFP step 2 curriculum adoption process will be **based solely on the District's standard terms and conditions? The District reserves the right to reject any firm that is not willing to accept the District's Standard Terms and Conditions.**	**Yes**
12	Do you agree that your below product/service offering/pricing includes acceptance of the **District's stated warranty/guarantee requirements of 9 years?**	**No**
13	Do you agree that your below product/service/pricing offered for the first/initial/adoption year will be held/apply to **any future and/or upgraded items** for any individual/subsequent/future purchases of any quantity that may be made in years 2-9 following the adoption?	**Yes**
14	Do you agree that your below product/service/pricing offered for the first/initial/adoption year and years 2-9 following the adoption **shows/includes all costs to be paid for by the District** for any subsequent purchases for the life of the adoption cycle?	**Yes**

~~ATTACHMENT 3A~~ V TIONNAIRE	YES OR NO ANSWERS ONLY	PLEASE FILL IN ALL "YELLOW" HIGHLIGHTED AREAS BELOW
NAME AND CONTACT INFO (PHONE & EMAIL ADDRESS)FOR VENDOR AUTHORIZED TO SUBMIT RFP STEP 2 RESPONSE		**Charles W. Anderson** **andya@msu.edu** **517-432-4648**
SIGNATURE OF VENDORS AUTHORIZED REPRESENTATIVE		
Question #	**VENDOR/PUBLISHER QUESTIONS**	**REPLY WITH A YES OR NO RESPONSE IN THE BELOW YELLOW FIELD(S)** **For any "NO" responses, please clarify/answer on the separate ATTACHMENT 3B Vendor/Publisher Questionnaire**
15	Do you agree that your product/service/pricing offered for the first/initial/adoption year and years 2-9 following the adoption shows/includes all costs to be paid for by the District for **special packaging/parcel labeling, palletizing and documentation on a per school basis** according to District standards for any subsequent purchases for the life of the adoption cycle?	**Yes**
16	District standard payment terms are net 30 days. Do you offer **prompt payment terms/discounts** for faster than standard payments?	**N/A**
17	Will all products/services offered for "Field Testing" **arrive at the District** no later than January 9, 2019?	**Yes**
18	Does your product/service/pricing include all **government, NIMAS, NIMAC, etc. required content** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	
19	Does your product/service/pricing include all **government, ADA, VPAT, WCAG, etc. required content** for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	
20	The District requires that finalist vendors/publishers provide a copy of their fully completed VPAT-Voluntary Product Accessability Template forms (RFP attachment 13) . Does your RFP09808 Step 2 response include a fully completed copy of this VPAT form?	**No**
21	Does your product/service/pricing include **Spanish language content** for all student, teacher materials(hard copy and online) for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**No**
22	Does your product/service/pricing include **Chinese language content** for all student, teacher materials (hard copy and online) for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**No**
23	Does your product/service/pricing include **Japanese language content** for all student, teacher materials (hard copy and online) for first year adoption/implementation as well as ongoing requirements for supporting the adoption for years 2-9 of the adoption cycle?	**No**
24	If you do not provide your instructional materials in a language needed by the District to support its Language Immersion programs, will you give written permission to the District to perform, at its expense, translations of your materials into the required languages?	
25	In addition to the subjects the District has inquired about during our RFP Step 1/RFP Step 2 process, **are there any other issues or comments to share with the District** that might result in extra/future costs for the District (besides items being offered below) over years 1-9 of the estimated adoption period?	**No**
26	Will your company provide a **single username and password**, **or an authenticated referral page** (secured behind our password protected resource page) that students can use to access the student digital text? We typically use either method to provide students secure access to our online databases without the management issues of separate individual passwords.	NA

-

"NO" ANSWER RESPONSE FORM

Please use this form if you answered NO to any of the questions on Attachment 3-A

NAME AND CONTACT INFO (PHONE & EMAIL ADDRESS)FOR VENDOR REP AUTHORIZED TO SUBMIT RFP RESPONSE IN THE YELLOW HIGHLIGHED COLUMN TO THE RIGHT	**Charles W. Anderson andya@msu.edu 517-432-4648**
SIGNATURE OF VENDORS AUTHORIZED REPRESENTATIVE IN THE YELLOW COLUMN TO THE RIGHT	Charles W Anderson

QUESTION #	ANSWER/EXPLANTION
1	Textbooks not used
2	Textbooks not used
5	Materials are free to use, only costs associated are cost of printing and classroom materials ($400 for first year, $150 per subsequent year)
10	There will be no commercial arrangements with the *Carbon TIME* project
12	All *Carbon TIME* materials are in the public domain, and SPS will have editable versions of all materials, so SPS teachers and staff will be able to update or modify materials as needed.
16	No payments will be made to the *Carbon TIME* project.
18	The *Carbon TIME* staff does not have the expertise to complete the VPAT or make all required changes in materials. If *Carbon TIME* is adopted by SPS, we will work with SPS to hire a consultant who can guide us through this process. Some revisions can be made by *Carbon TIME* or SPS staff, but we anticipate that some revisions will require additional technical expertise.
19	The *Carbon TIME* staff does not have the expertise to complete the VPAT or make all required changes in materials. If *Carbon TIME* is adopted by SPS, we will work with SPS to hire a consultant who can guide us through this process. Some revisions can be made by *Carbon TIME* or SPS staff, but we anticipate that some revisions will require additional technical expertise.
20	The *Carbon TIME* staff does not have the expertise to complete the VPAT or make all required changes in materials. If *Carbon TIME* is adopted by SPS, we will work with SPS to hire a consultant who can guide us through this process. Some revisions can be made by *Carbon TIME* or SPS staff, but we anticipate that some revisions will require additional technical expertise.
21	Non-English content currently not supported by curriculum materials
22	Non-English content currently not supported by curriculum materials
23	Non-English content currently not supported by curriculum materials

25	Materials are free to use, only costs associated are cost of printing and classroom materials ($400 for first year, $150 per subsequent year)
26	There is no password-protected student digital text

RFP09808 STEP 2 9-12 SCIENCE
REQUEST FOR PRICING - ATTACHMENT 4

ADDENDUM #1

REQUEST FOR PRODUCT NUMBERS (ISBN's) AND PRICING

COMPANY NAME	*Carbon TIME* project, Michigan State University	NAME OF REPRESENTATIVE (INCLUDE CONTACT INFORMATION)	Charles W. Anderson, andya@msu.edu, 517-432-4648

PRICING SHOULD INCLUDE STUDENT AND TEACHER MATERIALS.
ACTUAL POTENTIAL QUANTITIES MAY BE 75%-125% OF CURRENT ENROLLMENT ESTIMATES.

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
2250	GRADE 9 PHYSICS A STUDENT PRODUCTS AND SERVICES			
		ONLINE ACCESS	$ -	$ -
		STUDENT WORKBOOKS	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**
30	GRADE 9 PHYSICS A TEACHER PRODUCTS AND SERVICES			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		ONLINE ACCESS	$ -	$ -
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	$ -	$ -
		ASSESSMENTS	$ -	$ -
		PROFESSIONAL DEVELOPMENT	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**
30	GRADE 9 PHYSICS A CLASSROOM PRODUCTS AND SERVICES			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		PRINTED MATERIALS (I.E. READERS)	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	$ -

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
2250	GRADE 9 CHEMISTRY A STUDENT PRODUCTS AND SERVICES			
		ONLINE ACCESS	$ -	$ -
		STUDENT WORKBOOKS	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**
30	GRADE 9 CHEMISTRY A TEACHER PRODUCTS AND SERVICES			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		ONLINE ACCESS	$ -	$ -
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	$ -	$ -
		ASSESSMENTS	$ -	$ -
		PROFESSIONAL DEVELOPMENT	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**
30	GRADE 9 CHEMISTRY A CLASSROOM PRODUCTS AND SERVICES			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		PRINTED MATERIALS (I.E. READERS)	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
2250	GRADE 10 BIOLOGY A STUDENT PRODUCTS AND SERVICES			
		ONLINE ACCESS	$ -	$ -
		STUDENT WORKBOOKS	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**
30	GRADE 10 BIOLOGY A TEACHER PRODUCTS AND SERVICES			
$400 per teacher (10 teachers), First year		SUPPLIES AND EQUIPMENT	$ 400.00	$ 7,750.00
$150 per year per teacher (25 teachers), after first year		ONLINE ACCESS	$ -	$ -
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	$ -	$ -

ADDENDUM #1

ASSESSMENTS	$ -	$ -
PROFESSIONAL DEVELOPMENT	$ -	$ -
OTHER (SPECIFY)	$ -	$ -
TOTAL	**$ 400.00**	**$ 7,750.00**

30	**GRADE 10 BIOLOGY A CLASSROOM PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		PRINTED MATERIALS (I.E. READERS)	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**
QUANTITY	**TITLE**	**DETAIL**	**PRICE PER STUDENT OR TEACHER**	**EXTENDED PRICING**
2250	**GRADE 10 BIOLOGY B STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	$ -	$ -
		STUDENT WORKBOOKS	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**

30	**GRADE 10 BIOLOGY B TEACHER PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		ONLINE ACCESS	$ -	$ -
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	$ -	$ -
		ASSESSMENTS	$ -	$ -
		PROFESSIONAL DEVELOPMENT	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**

30	**GRADE 10 BIOLOGY B CLASSROOM PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		PRINTED MATERIALS (I.E. READERS)	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**
QUANTITY	**TITLE**	**DETAIL**	**PRICE PER STUDENT OR TEACHER**	**EXTENDED PRICING**
2250	**GRADE 11 PHYSICS B STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	$ -	$ -
		STUDENT WORKBOOKS	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**

30	**GRADE 11 PHYSICS B TEACHER PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		ONLINE ACCESS	$ -	$ -
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	$ -	$ -
		ASSESSMENTS	$ -	$ -
		PROFESSIONAL DEVELOPMENT	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**

30	**GRADE 11 PHYSICS B CLASSROOM PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	$ -	$ -
		PRINTED MATERIALS (I.E. READERS)	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**
QUANTITY	**TITLE**	**DETAIL**	**PRICE PER STUDENT OR TEACHER**	**EXTENDED PRICING**
2250	**GRADE 11 CHEMISTRY B STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	$ -	$ -
		STUDENT WORKBOOKS	$ -	$ -
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
		OTHER (SPECIFY)	$ -	$ -
		TOTAL	**$ -**	**$ -**

ADDENDUM #1

30	**GRADE 11 CHEMISTRY B TEACHER PRODUCTS AND SERVICES**		
	SUPPLIES AND EQUIPMENT	$ -	$ -
	ONLINE ACCESS	$ -	$ -
	PRINTED MATERIALS (I.E. TEACHER GUIDES)	$ -	$ -
	ASSESSMENTS	$ -	$ -
	PROFESSIONAL DEVELOPMENT	$ -	$ -
	OTHER (SPECIFY)	$ -	$ -
	TOTAL	**$ -**	**$ -**

30	**GRADE 11 CHEMISTRY B CLASSROOM PRODUCTS AND SERVICES**		
	SUPPLIES AND EQUIPMENT	$ -	$ -
	PRINTED MATERIALS (I.E. READERS)	**$ -**	$ -
	MATERIALS IN MULTIPLE LANGUAGES (LIST)	$ -	$ -
	OTHER (SPECIFY)	$ -	$ -
	TOTAL	**$ -**	**$ -**
TOTAL VALUE OF TEACHER, STUDENT AND CLASSROOM GOODS AND SERVICES			**$ 7,750.00**
	BARCODING OF TEACHER AND STUDENT MATERIALS FOR MAIN ADOPTION	$	-
	ESTIMATED PROCESSING/HANDLING CHARGES IF ANY TO MEET DISTRICT "PER SCHOOL" PACKAGING, LABELING, PALLETIZING REQUIREMENTS	$	-
	ESTIMATED FREIGHT CHARGES, IF ANY	$	-
	SALES TAX: 10.1% NOMINAL	$	-
	TOTAL FOB SSD#1 SEATTLE WAREHOUSE FOR YEAR 1 OF ADOPTION	**$**	**-**

TOTAL COST FOR YEAR 1 OF ADOPTION	$ 7,750.00
TOTAL COST FOR YEAR 2 OF ADOPTION	$ 7,650.00
TOTAL COST FOR YEAR 3 OF ADOPTION	$ 7,650.00
TOTAL COST FOR YEAR 4 OF ADOPTION	$ 7,650.00
TOTAL COST FOR YEAR 5 OF ADOPTION	$ 7,650.00
TOTAL COST FOR YEAR 6 OF ADOPTION	$ 7,650.00
TOTAL COST FOR YEAR 7 OF ADOPTION	$ 7,650.00
TOTAL COST FOR YEAR 8 OF ADOPTION	$ 7,650.00
TOTAL COST FOR YEAR 9 OF ADOPTION	$ 7,650.00
TOTAL YEARS 1-9	**$ 68,950.00**

Attachment A2: BIO B Proposal

Proposal Overview and Revisions

Due to the fact that the BIO B program was developed by District teachers in collaboration with university partners, there was no formal entity that responded to Seattle Public School's Request for Proposal (RFP). The BIO B program is a free and open educational resource, constantly improved by educators and university partners. As such, the only foreseeable financial costs to the District for an Adoption are related to professional development and ADA compliance.

Attachment A3: CHEM A Proposal

Proposal Overview and Revisions

Due to the fact that the CHEM A program was developed by District teachers in collaboration with university partners, there was no formal entity that responded to Seattle Public School's Request for Proposal (RFP). The CHEM A program is a free and open educational resource, constantly improved by educators and university partners. As such, the only foreseeable financial costs to the District for an Adoption are related to professional development and ADA compliance.

Attachment A4: PEER Proposal

Proposal Overview and Revisions

In response to Seattle Public School's Request for Proposal (RFP) Steps 1 and 2, the University of Colorado Boulder, the publisher of PEER, submitted the proposal on the following pages. The proposal included costs for student and teacher access to online content and tools, student textbooks, and teacher guides, over the course of nine years. The only financial costs of the program are the student and teacher guides, purchased up front, and professional development.

Following the recommendation to purchase PEER, Seattle Public Schools' Purchasing Office will request a third round of pricing options from the University of Colorado Boulder.

Partial Report - Full Report available upon request.

PEER physics

PHYSICS THROUGH EVIDENCE

Empowerment through Reasoning

Request for Proposal No. RFP09808 Step 1
Seattle Public Schools High School Science

9th Grade Physics A

C *charge*

W *waves*

M *magnetism*

11th Grade Physics B

E *energy*

F *force*

G *gravitation*

PEER Physics Executive Team

Valerie Otero	Executive Director
Shelly Belleau	Director of Curriculum and Assessment; Curriculum Chief Editor
Emily Quinty	Director of Professional Development; Teacher's Guide Chief Editor

University of Colorado **Boulder**

www.physicsthroughevidence.org

PEER physics

PHYSICS THROUGH EVIDENCE

Empowerment through Reasoning

RFP No. RFP09808

11th Grade Physics B

PhysicsThroughEvidence.org

Please direct questions to:

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SPS RFP09808 HIGH SCHOOL SCIENCE

PHYSICS THROUGH EVIDENCE

Empowerment through Reasoning

Credits

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Special thanks to the *Physics and Everyday Thinking* developers who envisioned inclusive learning environments where students **develop, share, critique, argue, and revise evidence-based ideas — principles upon which PEER is based**.

Response to Questionnaire

Attachment 5

RFP No. RFP09808

11th Grade Physics B

PEER

Responses to Vendor/Publisher Questionnaire

1. LIFE/DURATION OF ADOPTION

a. Will prices for tangible, online, e-book, or any other quoted/delivered materials/services be held for nine years through the life of the adoption?

No, PEER Physics is unable to offer prices that can be held for nine years through the life of the adoption.

b. If "No", please advise price escalation estimate/strategy.

PEER Physics rates will take into account inflationary increase for existing tangible, online, e-book, or any other quoted/delivered materials/services by no more than 3% annually.

c. [Re: technology advances] Will you provide future/advanced versions of products/services within the initial price offer?

PEER Physics will launch a new digital content on the VitalSource platform (see Appendix A, Section B) during Spring 2019. Through this type of platform, participating districts and sites who purchase digital licenses will gain access to digital Student Guides and Teacher's Guides (e-books) that can be accessed on different devices (including phones, tablets, and computers) with or without access to the internet. This platform will provide note-taking and highlighting tools and a read-aloud function. The e-books will be updated periodically and costs for 9-year licenses are provided in the Request for Estimated Pricing (see Tab 2). We project that future versions will also provide unique interactive opportunities for students and teachers. Districts that purchase digital licensing will gain access to future versions of the virtual Student Guides, Teacher's Guides and interactive features during the licensing period.

PEER Physics is committed to providing student and teacher resources that are responsive to the needs of teachers and students in a wide range of high school settings. While we anticipate that the printed Student Guides will only undergo minor changes, we do predict that the resources provided on the PEER Physics Teacher Resources website will continue to develop and expand. All participating PEER Physics instructors will have access to these materials on the teacher resources website and will therefore be provided with future/advanced versions of all products provided within this site.

For example, throughout the 2018-19 school year, teachers are gaining access to experimental videos as they become available. In an inquiry-based learning environment, one of the challenges teachers face is how to support students who miss the *Collecting and Interpreting Evidence* component of the learning cycle. These short video clips provide teachers with a way of supporting absent students or

providing extra support for students who did not observe the phenomenon. They also provide teachers with support in implementing experiments that may be challenging to conduct (i.e. electrostatics experiments in humid Seattle).

Future resources may include the following: additional anchoring phenomena (to allow teachers to select from a menu of phenomena, each which may be interwoven into the storyline developed throughout the chapter), extensions and teaching tools submitted by PEER Physics teachers and vetted by a committee of experienced PEER Physics teachers and facilitators, and other supports, including Scientists' Ideas readings in Spanish and in a lower Lexile level.

d. In addition to first year adoption materials/services cost, please advise any ongoing/future years costs associated with your offering.

Ongoing Professional Development: Other than costs mentioned elsewhere in this questionnaire, there are additional costs associated with providing ongoing professional development in years 2-9 (see Explanation of Costs in Tab 2). To ensure that teachers receive sustained support, PD sessions are scheduled throughout each school year and continue for 3-5 years. The PD is flexible and customizable to meet the needs of the teachers in order to build capacity in teacher leaders to sustain the teacher community and implementation of PEER Physics. For more information about the PEER Physics PD program, see Appendix B, Section D of this RFP response.

e. Are there "consumables" that should be replaced over the course of the adoption?

A list of materials can be found in Appendix A, Section C. These materials are relatively minor and consist of items like balloons, cellophane tape, and aluminum pie tins.

f. Are there technology access fees that will apply to future years?

Digital Licensing: If the 9-year digital license is purchased, there will be no additional costs associated with e-books (see Tab 2). Should the District decide to purchase future releases of print versions of the Student Guides or Teacher's Guides, they will receive a discounted rate.

2. TECHNOLOGY

a. With technology constantly changing, please provide a brief description of current applications and those planned for implementation over the next couple years.

Current Technology Applications: The PEER Physics Teacher Resources website (https://physicsthroughevidence.org/ – accessed by logging in) contains downloadable PDF files for anchoring phenomena, 3D assessments, handouts, and protocols, as well as downloadable Word files for customizable lined documents and

additional assessment questions. Teachers can also access links to PhET simulations and other visualizations (as described below), and other resources. The following list outlines resources that are currently included on the PEER Physics Teacher Resources website:

- **Anchoring Phenomena and Storylines (Word and PDF)** PEER Physics uses storylines, anchoring phenomena, and a learning cycle approach to address the NGSS Performance Expectations. Three-dimensional assessments, engineering design challenges, authentic assessments, and pre/post content assessments are included for each chapter. Anchoring phenomena are included separately with each chapter and integrate easily with each chapter's storyline. There are several reasons that the anchoring phenomena are separate from the highly researched storylines (which focus on development of cross-cutting concepts, core concepts, and science and engineering practices). First, teachers are authors and experts in their own right, and generally need to personalize any instructional materials. The anchoring phenomena are included to provide choices for teachers as they make decisions how to address their specific population of students, given their knowledge of their students and their own interests and strengths. Second, there are regional and other population differences throughout a district, state, and nation. In order to adapt to these differences, the storyline cannot depend too heavily on any specific anchoring phenomena since the purpose of the anchoring phenomena is to capture the attention of the specific students in one's class, given their interests and backgrounds. Thus, we provide socially and/or timely, relevant phenomena with associated assessments that run throughout the storyline, but could be changed and modified with the performance expectations still being solidly addressed through the storylines. As we move forward, we expect that we will provide a library of anchoring phenomena that integrate seamlessly with the storyline of each chapter.
- **Summarizing Questions (PDF):** Summarizing Questions guide students in generating claims from their evidence. SQs may be completed individually or in groups. The summarizing questions are not a summative assessment; they are carefully developed questions to help students process the evidence they collected.
- **Scientists' Ideas Readings (PDF and MP3 Audio):**
    - **Readings:** Throughout the learning cycle, students are guided toward developing generalizable scientific principles from multiple experiments. These principles are formalized at the end of each activity through Scientists' Ideas readings, which are made available to students after they have generated their own final ideas. After students collect and interpret evidence in the laboratory activities and come to consensus as a learning community, they read about scientific representations, terminology, and other formalisms that they could not generate on their own. Scientists' Ideas generally map directly to

the ideas that students have generated on their own through the process of experimenting, making claims, and building consensus.

- **Audio Recordings:** Audio recordings of the Scientists' Ideas readings are provided in downloadable MP3 files. Students may benefit from following along with the text as they listen to the audio recording.

- **Lined documents in two different formats (Word):** These editable documents are designed to accompany the *Collecting Interpreting Evidence* component of the PEER Physics learning cycle. One version is provided with space for students to record their responses to all questions within experiments. A second version is provided with space for students to record responses to only the starred questions (some teachers find it more efficient to have students discuss all questions but only write answers to the starred questions). Additionally, the lined documents include the necessary graph axes and graphic organizers such as tables. While instructors may choose not to use these resources (especially when using laboratory notebooks or digital recording), teachers can use these resources to support students with learning how to record their findings. Some instructors find it helpful to add in sentence starters within these documents for their linguistically diverse students or learners who could benefit from these scaffolds.
- **Simulations and Visualizations:** Most of the simulations utilized in PEER Physics are from the PhET collection. These simulations and visualizations are included on the experimental materials lists within the Student Guides, when appropriate.
- **Slow Motion Videos:** Slow motion videos help students observe phenomena that are difficult to see in real time. These videos are included on the experimental materials lists within the Student Guides, when appropriate. Implementation of these videos vary; teachers may find it useful to show the video to the entire class or to provide students with a link to the video.
- **Videos of Experiments:** When students are absent, they may miss the opportunity to collect evidence first hand. Using the videos provided, students can catch up by watching the videos of data being collected in order to make observations and respond to the questions in the experiment. These videos are also helpful in instances when instructors need to efficiently demonstrate an experimental phenomenon or point out nuanced observations to students.
- **Mathematical Model Building:** The PEER Physics Teacher Resource website includes scaffolds for the mathematical model building activities, such as fill-in-the blank questions (at the beginning of the practice problems) and challenge problems that can serve as an extension for students who are more comfortable with mathematical reasoning. Keys are also provided for teachers.

Technology Plans for Upcoming Years:

- **Digital Platform for Student Materials:** PEER Physics plans to launch digital licensing using VitalSource (or similar platform) during Spring 2019. This will provide Student and Teacher's Guides that can be accessed on different devices (including phones, tablets, and computers), with or without access to the internet. Students and teachers will gain access to tools that offer access offline, personal annotation, shared annotation, collaborative planning, and integration with Schoology and Clever. We project that future versions will also provide additional interactive features. For more information on the benefits of the VitalSource platform, see Appendix A, Section B.
- **Teacher Resources Web-Based Materials:** Planned updates to the PEER Physics Teacher Resources website with anticipated release dates are outlined in the list below. Please note that this list is likely not comprehensive, as new types of resources are consistently being proposed by practicing PEER Physics teachers and considered by the PEER Physics Team. The PEER Physics program is devoted to providing resources that are responsive to teacher and district needs. We welcome ideas about supplementary resources that can enhance PEER Physics implementation for different student populations.
    - Scientists' Ideas readings in Spanish (release Summer 2019)
    - Scientists' Ideas readings in a lower Lexile Level (release 2019-20 school year)
    - Experimental videos (with optional audio and written explanations)
        - These videos are currently posted for Chapter C.
        - Videos for Chapters M and E will be released by Dec. 2019.
        - Videos for Chapters F, G, and W will be released by Feb. 2019.
        - Optional audio and written explanations will be released by Summer 2019).
    - Updated resources for implementing anchoring phenomena and three-dimensional assessments (release ongoing)
    - Additional Engineering Design Challenges (release ongoing)
    - PhET simulations (see "PhET Simulations" below)
    - Extensions and teaching tools submitted by PEER Physics teachers and vetted by a committee of experienced PEER Physics teachers and facilitators (release 2020).
- **PhET Simulations:** The PhET project is currently in the process of converting Java based simulations to HTML5. As these updates become available, the links to the simulations provided on the Teacher Resources website will be updated.
- **Single-source sign on with ADFS:** PEER Physics plans to add single source sign on with ADFS within the upcoming year.

b. Will staff and students be provided with unlimited access and capability to download and print electronic versions of all offered "hard copy" instruction materials?

Partnering PEER Physics teachers will have unlimited access and capability to download and print electronic versions of all of the instructional materials offered on the PEER Physics Teacher Resources website.

Per the PEER Physics copyright policy associated with the University of Colorado Boulder, hard copies of the Student and Teacher's Guides are not offered as electronic files and may not be reproduced. Alternatively, districts may purchase digital licenses to access the Student and Teacher's Guides on a digital platform that will allow access with or without internet access on a variety of devices.

c. Are there any hard or soft costs associated with unlimited access or printing rights?

Unlimited access to the PEER Physics Teacher Resources website is included when districts purchase the PEER Physics curricular materials and professional development. Costs associated with accessing this website are incorporated into the existing package. SPS will not have additional charges for access to the teacher resources website.

d. Please indicate your firm's ability to supply any of the requested menus of title in audio, e-book, or similar format.

Currently teachers are provided with access to audio files for the Scientists' Ideas readings (posted on the PEER Teacher Resources website). All Student and Teacher's Guides will be available as e-books on the VitalSource platform by January 2019 and will be available for use during the field test.

e. Please advise any costs associated with supplying audio, e-book, etc.

Digital materials, including audio MP3 files and e-books on the VitalSource platform, will run on smartphones, tablets, and computers. Therefore, additional costs associated with using the digital materials may include a class set of such devices. Audio for Scientists' Ideas readings is included on the teacher resources website for no extra costs. Costs for 9-year digital licenses are provided in the Request for Estimated Pricing (see Tab 2).

f. Please advise availability/compatibility with current common educational technology/LMS standards… Specifically, does your product currently support integration with Schoology without more than basic configuration.

By January 2019, all PEER Physics Student Guides and Teacher's Guides will be available on the VitalSource platform. VitalSource seamlessly integrates with Schoology.

g. The District strongly prefers a site-based license model. Does your firm, as part of this RFP response, offer site-based licensing?

Multiple licensing configurations can be used to access the e-books, including site-based licensing. The pricing for a 9-year digital license to access PEER Physics Student Guide e-books are included on the request for Estimated Pricing (see Tab 2). Note that the Teacher's Guide e-books are included at no additional cost.

h. The District requires single sign on with ADFS. Does your firm offer ADFS as part of this RFP response?

Currently teachers access the PEER Physics Teacher Resources website by signing in using the Google platform. The PEER Physics program does not currently offer single sign on with ADFS but is working toward this functionality to be available in Spring 2019.

i. The District requires rostering capability as part of this product (prefers Clever platform). Does your firm offer, as part of this RFP response, either Clever or verified One Roster support?

By January 2019, all PEER Physics Student Guides and Teacher's Guides will be available on the VitalSource platform. VitalSource seamlessly integrates with Clever.

3. HARDCOVER VS SOFTCOVER CURRICULUM MATERIALS

a. District prefers "hardcover" versions of teacher guides and student books. If you desire to offer softcover pricing in addition to hardcover pricing, please clearly indicate on the attached Request for Quotation form.

The PEER Physics printed materials consist of a Student Guide for each chapter. Student Guides guide students through the *Collecting and Interpreting Evidence* process. While we are able to meet the SPS request to print these laboratory manuals with hardcovers and spine binding, we recommend soft cover and spiral binding. Not only is this a more cost-effective method, but we have found that the Student Guides are more easily accessed and used by students in this format. Also, hard covers will require that all chapters be bound together. We have found it much easier for students and teachers to work with one chapter at a time. The Request for Estimated Pricing (see Tab 2) indicates pricing for spiral bound books. There is an additional fee of $10/book for hardbound books, as indicated on the Request for Estimated Pricing.

Please note that hardcover printing will require outsourcing the printing (we currently utilize in-house printing through the University of Colorado Boulder). This will result in us being unable to meet the request to pre-label the student and teacher materials before they are shipped. This is addressed further in question 6a.

4. ADOPTION MATERIALS DELIVERY SCHEDULE

a. If the district places an order with your firm by the end of May 2019, are there any materials (tangible, web-based, or otherwise) that would not arrive at the district by the end of July 2019?

If Seattle Public Schools places and order with PEER Physics by May 2019, all Student Guides and Teacher's Guides will be delivered by the end of July 2019. Access to web-based teacher resources will also be provided at this time, given that Seattle Public Schools provide PEER Physics with a list of participating teachers names and Google-based email addresses.

Please note that Seattle Public Schools will need to order any laboratory materials that they do not already have (see Tab 2 and Appendix A, Section C). Most schools already possess most of the items used in PEER Physics, though there will be a few things that will need to be purchased. PEER Physics offers lists of recommended materials that are necessary to facilitate PEER Physics activities. However, due to the unique materials needs and the diversity of vendors, districts (or schools) are responsible for conducting inventories of current materials and placing orders for any needed materials. PEER Physics is not responsible for the timing of the order or delivery of these materials.

b. Please list any items that would not be available by the end of July 2019.

None

5. TRAINING

a. Please provide a brief narrative of your training program.

Professional development is a cornerstone of the PEER Physics Suite. PEER Physics professional development involves cultivating a community of PEER Physics teachers that meets for several years to hone their practice for their specific contexts. Targeted professional development materials are intended for practice-based reflection/planning and building theoretical and philosophical underpinnings.

This professional development community engages in-person and through video conferencing over several years as teachers become aware of their personal challenges and strengths in NGSS-style instruction. In addition to engaging in rich discussions and collaborative problem-solving, teachers also work through several structured experiences intended to immerse them in inducing principles from data and arguing from evidence in a classroom environment. In PEER Physics PD, teachers also engage in intellectual discussions about various aspects of NGSS-style instruction, such as transferring epistemic agency to students, engaging students in consensus discussions, and helping students transition from scientific argumentation with respect to specific experimental results to establishing more generalizable physics principles from multiple experiments. These professional development communities meet multiple times each year and collaborate through

online discussions. Teachers have reported that they greatly enjoy and value these meetings and come away feeling like they both learned and contributed much.

PEER Physics recommends a partnership that includes three to five years of professional development facilitated by a PEER Physics Facilitator (see response to Question 5b below for further details). After the initial PEER Physics Institute (2-3 days during the summer prior to the first year of implementation), these professional development sessions may be conducted either in person (we will send PEER Physics Facilitators to Seattle) or virtually. The virtual PD allows teachers to gather locally and PEER Physics Facilitators will utilize the Zoom virtual meeting platform in a unique way that allows the facilitator to interact with small groups and the whole group. The number of hours of virtual PD will be negotiated. There are also facilitator trainings provided virtually that allow select teachers from partner districts to learn how to facilitate PEER Physics PD for teachers in their district. Here are some reflections from teachers who participated in our PD offerings:

- "I appreciated that you could work at each table as we worked -- popping in like you would if you were here. I appreciated that you treated your presence like you were here physically, not getting distracted by the distance." *(virtual participant)*
- "I appreciate this method of teaching. I find it more equitable and engaging."
- "This is wonderful, what the PEER Physics group is doing is amazing and truly can change the way society and future generations view science and are involved in science."
- "Thank you! Your workshops are always engaging, informative, and useful!"
- "This reinforces many things I do in my classroom and reminds me to be intentional about the focus on evidence. I like the phrase about shifting from teacher-based to evidence-based learning."

The PEER Physics PD includes opportunities for teachers to build a teaching repertoire for enacting cutting edge, three-dimensional learning environments. Customize the PD that best fits the needs of your teachers and goals of your project using the menu of options (see Appendix B, Section D). Implementation of PEER Physics is most successful when:

- The PD experiences are strategically spread out over the course of the school year in order to cultivate a cycle of learning, implementing, reflecting, and refining.
- Teachers are encouraged to collaborate with each other and try out pedagogical approaches experienced in the PD between visits.
- The partnership with PEER Physics extends for 3-5 years in order to affect systemic change. The goal is to develop sustainable structures that foster teacher growth in their instructional practices and invite new PEER Physics teachers into this learning community.

Explanation of the recommended PD for the Seattle Public School adoption
(pricing provided in the Request for Estimated Pricing in Tab 2):

- Year 1 adoption includes a required 2-day PEER Physics Institute onsite in SPS for teachers to become grounded in the pedagogical underpinnings of the PEER Physics Learning Cycle and curricular resources. It also includes ongoing PD to help establish a learning community that continues the work of making pedagogical shifts and assessing student understanding.
- Years 2-5 include onsite PD and ongoing PD to help teachers deepen their instructional practice and explore problems of practice. During this timeframe, it is recommended to train a few teachers in the district to become PEER Physics Facilitators and/or PEER Physics lab hosts. Developing these teacher leaders builds sustainable structures within the district to help manage new teacher hires, turnover, and ongoing teacher communities within schools and the district.

b. Please advise if any training will not occur by the deadline/time specified on the Attachment 1, page 2.

While PEER Physics provides professional development prior to teachers beginning implementation, it is essential for teachers to engage in ongoing PD throughout the first 3-5 years. The design and maintenance of learning environments in which students cohesively engage in three dimensions of science to induce scientific principles requires fluency in scientific knowledge building, content expertise, and disciplinary-specific instructional techniques (NRC, 2012; Penuel, Harris & Debarger, 2015). Building these skills takes time. Even though most science teachers have strong expertise in their content area, and in some cases also in laboratory experience, neither their science or education courses have prepared them for the awesome task of implementing 3-dimensional learning environments. In our many years of working with teachers, and as teachers ourselves, we have found that more than one year of professional development is needed to fine-tune the skills needed to provide a learning environment in which students induce principles from evidence, come to consensus on the main principles that explain the data, and establish appropriate connections with mathematics (both conceptually and algorithmically). To meet this need and ensure that teachers have the opportunity to reflect and refine their practice, PEER Physics recommends a partnership that includes three to five years of targeted professional development facilitated by a specially trained PEER Physics Facilitator. For more information about the PEER Physics PD program, see Appendix B, Section D. Below is an outline of the recommended PD schedule for years 1-9.

- **Recommended year 1 PD schedule:**
  - Summer 2019: 2-3 full days
  - Fall 2019: 1 full day (or two ½ days)
  - Spring 2020: 1 full day (or two ½ days)

- **Recommended year 2 PD schedule:**
  - Summer 2020: 2 full days onsite
  - Fall 2020: 1 full day (or two ½ days)
  - Spring 2021: 1 full day (or two ½ days)
- **Recommended year 3 PD schedule:**
  - Summer 2021: 2 full days
  - Fall 2021: 1 full day (or two ½ days)
  - Spring 2022: 1 full day (or two ½ days)
- **Recommended facilitator trainings during years 2-3:**
  - 16 hours of facilitator trainings
  - Co-facilitation (including planning, implementing and reflecting) with a Certified PEER Physics Facilitator.
  - Trained district facilitators lead PD for teachers new to teaching PEER Physics (ongoing)
  - Ongoing facilitator support and collaboration

6. ORDER PROCESSING, SHIPMENT PREPARATION AND LOGISTICS

a. Our district requires special packaging, labeling, palletizing, and documentation on a per-school basis. Can publisher/vendor provide this level of service?

Packaging, labeling, palletizing, and documentation on a per-school basis can be provided with the purchase of soft-cover spiral bound Student and Teacher's Guides. If hardcover books are purchased, we will be unable to issue unique barcode labels for each book prior to shipping. In this case, PEER Physics can send printed labels separately to be adhered by SPS personnel or a PEER Physics representative can travel to Seattle to assist with the labeling.

b. Please advise if there are any additional costs for the above special per-school packaging beyond prices quoted for adoption/implementation materials.

The costs provided in the Request for Estimated Pricing (see Tab 2) do not include shipping. Standard shipping rates will apply for palletized shipping. Shipping costs will be paid by SPS.

Additional costs include the costs for shipping/packaging laboratory materials that the district does not already possess (as described in the response to Question 4a). PEER Physics offers lists of materials needed for each chapter, which include suggested vendors and pricing (see Appendix A). In most cases, schools already possess many of the materials and equipment (e.g. motion detectors) listed.

c. Referring to Attachment 7, Barcode information, please confirm that you can deliver barcoded materials according to District specifications.

Barcoding materials can be provided with the purchase of soft-cover spiral bound Student and Teacher's Guides according to District specifications (see response to Question 6a for further information). To meet the barcode requirement outlined in Attachment 7 of SPS RFP09808, PEER Physics will purchase sequentially numbered barcode labels from DestinyExpress (https://www.destinyexpress.com/product_barcodes.cfm?type=rolls). According to DestinyExpress, these barcodes are compatible with the Follet Textbook Manager Program and meet the fourteen character specifications outlined in Attachment 7 of SPS RFP09808. PEER Physics will adhere the labels after printing is completed using protectors from DEMCO, meeting the specifications requested by SPS.

Attachment 7 of SPS RFP09808 requests that a barcode sample is provided to ensure it is compatible with the Follet Textbook Manager Program. PEER Physics will purchase the barcodes when the partnership becomes finalized. At this time, we are able to offer a screenshot and terminology provided on the DestinyExpress website that indicates compatibility. Please note that the sample barcode from the screenshot below shows a check digit. We recognize that SPS does not use a check digit; barcodes ordered will adhere to the barcode symbology outlined in Attachment 7 of SPS RFP09808.

Note that PEER Physics is willing to negotiate other barcoding options with SPS, if the plan outlined in this RFP is not desired.

Barcode Labels

Follett laminated barcodes are of exceptional quality. These barcode labels are made from long-lasting polypropylene material with a clear protective layer for maximum durability. In addition they have an acid free archival adhesive backing that allows for easy repositioning initially that ultimately cures and bonds to the surface material. In addition these labels meet or exceed all AIM* standards for strength, adhesion, heat/cold, fading, opacity, durability and wear. In addition they have been given the highest ANSI* **Grade A** rating.

*AIM - Association for Automatic Identification & Mobility Image Durability Guidelines
ANSI - American National Standards Institute

7. WARRANTY/GUARANTEE

The University does not guarantee specific results. PEER Physics will provide deliverables as detailed in our response to the RFP.

TERMS AND CONDITIONS

As noted in the exceptions letter included in Appendix A, Section A, the University's longstanding position is that contracts for our faculty should include provisions customary to a public, nonprofit, research institution of higher education. We address here two of the *Seattle Public Schools Standard Terms and Conditions* that we will need to negotiate should an award be made.

- *Article 10: The Vendor agrees to protect the Seattle School District No. 1 against all claims for patent or franchise infringement arising from the purchase, installation, or use of the material ordered on this contract, and to assume all expense and damage arising for such claims.*
    - All intellectual property developed by the University and provided under this agreement is provided to Seattle Public Schools "as is."
- Article 23: *Governing Law: These Terms and Conditions shall be governed by and construed in accordance with the laws of the State of Washington, without regard to conflicts of laws rules.*
    - As an institution of the State of Colorado, the University of Colorado is prohibited from accepting the laws of another state. We can agree to make a reference to being governed by applicable federal, state, and local law. Otherwise, the University can agree to remain silent regarding governing law.

8. PLEASE ADVISE ANY EXTRA COSTS FOR PROVIDING GOODS/SERVICES ACCORDING TO DISTRICT STANDARD TERMS AND CONDITIONS

There are no extra costs for providing goods/services according to District standard terms and conditions beyond those mentioned elsewhere in this questionnaire.

9. PURCHASE TERMS/PAYMENTS

a. District standard payment terms are net 30 days. Please advise if you offer a prompt payment discount for faster payments (yes/no and amount)

No

10. PURCHASE/SALE OF ADOPTION MATERIALS

a. Does your sales approach work on a publisher direct-to-district basis or through a book depository?

Direct-to-district basis

b. Please advise pros and cons of your approach.

Pros: We partner directly with districts on curricular materials and on related professional development. It is important for us to build relationships with districts. Additionally, we feel the need to be responsive to teacher and district feedback.

Cons: There is a possibility that we could decrease costs by adopting a book depository, but this would not provide the flexibility necessary to meet teacher needs.

c. If your sales approach is through a depository, who takes contractual responsibility that deliverables (offered prices and delivery commitments) are met and on time?

N/A

d. With frequent sales and mergers of publishing companies being a concern for the District, please confirm that any commercial arrangements your firm may agree to with the district for this adoption will pass on to any future management/ownership of your current company.

PEER Physics is a product of the University of Colorado Boulder. The University of Colorado Boulder is a public institution that was founded in 1876 and is the flagship institution in the state of Colorado. The University serves over 30,000 students each year and employs almost 5,000 faculty and 4,500 staff. There is a low risk of the University merging or being sold.

11. ESTIMATED "PER STUDENT" COSTS FOR ADOPTION

a. Please advise your "per student" estimated first year cost for all combined student, teacher, technology access, consumables, freight, and handling.

Per student estimated first year cost are given below (includes cost for field tests).

Year	**Physics A & B** (per student; 5500 total)	**Physics A** (per student; 3000 total)	**Physics B** (per student; 2500 total)
Year 1	$70.46	$71.93	$68.70

b. Please estimate those same costs on a "per student" basis for years 2 through 9 of the adoption period as well as separated by course.

Estimated ranges for per student cost given below. *Actual cost will depend on the customizable professional development package chosen.*

Year	**Physics A & B** (per student; 5500 total)	**Physics A** (per student; 3000 total)	**Physics B** (per student; 2500 total)
Year 2	$3.09 - $5.96	$2.89 - $5.47	$3.40 - $6.56
Year 3	$3.09 - $5.96	$2.89 - $5.47	$3.40 - $6.56
Year 4	$3.09 - $5.96	$2.89 - $5.47	$3.40 - $6.56
Year 5	$3.09 - $5.96	$2.89 - $5.47	$3.40 - $6.56
Year 6	$0 - $5.96	$0 - $5.47	$0 - $6.56
Year 7	$0 - $5.96	$0 - $5.47	$0 - $6.56
Year 8	$0 - $5.96	$0 - $5.47	$0 - $6.56
Year 9	$0 - $5.96	$0 - $5.47	$0 - $6.56

12. RISKS

a. If there are any areas of commercial/educational risk to the District that you are aware of and the District has not mentioned in our communications thus far, please share a brief explanation and identify any financial, or other, risks to the District.

Any lab experiment involves some limited risks (e.g. launching projectiles or working with electricity). Our curriculum and Teacher's Guides specify safety precautions and strongly suggest that those precautions be followed. The University can only advise and cannot be held liable to the acts of SPS personnel. Otherwise, there are no known commercial, educational, or financial risks to the District.

13. RIGHT TO REPRODUCE

a. The District requires that "rights to reproduce for instructional purposes" be permitted at no additional cost to the District. This shall include as a minimum, pdf files and blackline masters. Are these rights to reproduce included in your firm's year 1-9 pricing? Yes/No?

Yes. Partnering PEER Physics teachers will have unlimited access and capability to download and print electronic versions of all of the instructional materials offered on the PEER Physics Teacher Resources website.

Per the PEER Physics copyright policy associated with the University of Colorado Boulder, hard copies of student and teacher manuals are not offered as electronic files and may not be reproduced. Alternatively, districts may purchase site licenses to access student and teacher manuals on a digital platform that will allow access with or without internet access on a variety of devices.

References

National Research Council. (2012). A framework for K-12 science education: Practices, crosscutting concepts, and core ideas. National Academies Press.

Penuel, W. R., Harris, C. J., & DeBarger, A. H. (2015). Implementing the next generation science standards. Phi Delta Kappan, 96(6), 45-49.

EXPLANATION OF PRICING

RFP No. RFP09808

11th Grade Physics B

Explanation of Pricing

Below is important information pertaining to the pricing estimates provided in the spreadsheet entitled Request for Estimated Pricing, RFP09808, High School Science (see Tab 2, Section B).

Professional Development

Associated costs will be determined based on the desired outcomes of the partnership, particularly in years 2-9. Onsite and virtual professional development options are available. For long-distance partnerships, travel expenses for PEER Physics facilitators will be reimbursed by SPS after these expenses are incurred. Cost ranges for years 2-9: The low end of the price ranges corresponds to a combination of 2 days of onsite PD and 10 hours of virtual PD sessions spread throughout the year. The upper end of the price range corresponds to a combination of onsite and virtual PD sessions, virtual facilitator trainings, and virtual coaching sessions. Other options and custom packages are available. For more information about the PEER Physics PD program, see Appendix B, Section D and Question 5 in the Vendor Questionnaire.

Book to Student Ratio

The pricing spreadsheet (see Tab 2, Section B) provides pricing for class sets of 30 Student Guides. This number of books per class offers flexibility for teachers implementing PEER Physics.

The printed curricular resources from PEER Physics are unlike traditional textbooks. For example, some components of the PEER Physics Learning Cycle are intended for students to engage with independently, such as *Initial Ideas* or *Mathematical Model Building Practice Problems*, prior to discussing in small groups. However, during the *Collecting and Interpreting Evidence* component, students work collaboratively using one or two Student Guides per group throughout the data collection process. PEER Physics teachers norm the process of students reading laboratory questions aloud, discussing all group members' ideas, and establishing a group consensus on the basis of shared evidence. This process is enhanced when students are sharing student guides for the *Collecting and Interpreting Evidence* process. Some of the resources during the laboratory component of the learning cycle are necessary for each individual student – including handouts and lined documents (an alternative to using a laboratory notebook, which is up to the discretion of the instructor). These resources are provided on the teacher resources website.

Students will each need a copy of the *Summarizing Questions* (following the laboratory activity) and the *Scientists' Ideas* readings (which follow class consensus building at the end of the learning cycle). These resources are provided on the teacher resources website for instructors to either provide digital copies for students using a course website or platform like *Schoology* or to provide print copies for students.

Book Cover and Binding

The PEER Physics printed materials include Student Guides for each chapter, which guide students through the process of developing science *concepts and principles* through experimentation. While we are able to meet the SPS request to print these laboratory manuals with hardcovers, we recommend soft cover spiral bound books for each chapter. Not only is this a more cost-effective method, but we have found that the Student Guides are more easily used by students in this format, as it allows for the books to lay flat on the table. It is possible to have spiral bound (or hardcover) books that contain all chapters in the course (e.g. Physics A could have all three chapters bound in one book or separate books for each chapter). A benefit of getting all three chapters bound together is that the spiral binding is somewhat stronger, however, a drawback is that the books will be handled more frequently. Pricing provided in the Request for Estimated Pricing (see Tab 2, Section B) is for spiral bound, soft cover books for each individual chapter. There is an additional fee of $10/book for hardbound books, as indicated on the Request for Estimated Pricing.

Materials

While PEER Physics has already begun discussions with physics materials vendors to compile materials kits for schools and districts, these kits will likely not be available until the 2020-2021 school year. These kits will be customizable based on the specific needs of the districts and schools.

Currently we offer detailed materials lists (see Appendix A, Section C). This allows partnering schools to order the needed materials for their site, promoting schools to use technology that is already integrated within their school (for example, utilizing iPads rather than purchasing LabQuest2 Data Collection devices in instances where schools already have access to these tablets). This approach also allows schools to utilize the physics materials that are already within their departments, saving the district time and money. Please refer to Appendix A for the detailed materials list, projected costs for each item and a class set, and preferred vendors.

PRICING SPREADSHEET

Request for Pricing ATT#4

RFP No. RFP09808

11th Grade Physics B

REQUEST FOR ESTIMATED PRICING

COMPANY NAME	**PEER Physics** *Physics through Evidence:* *Empowerment through Reasoning*	NAME OF REPRESENTATIVE (INCLUDE CONTACT INFORMATION)	**Shelly Belleau, Director of Curriculum** shelly.belleau@peerphysics.org 970-231-7567

PRICING SHOULD INCLUDE STUDENT AND TEACHER MATERIALS.
ACTUAL POTENTIAL QUANTITIES MAY BE 75%-125% OF CURRENT ENROLLMENT ESTIMATES.

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
3,000	**GRADE 9 PHYSICS A STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	$45.00	$135,000.00
		STUDENT WORKBOOKS	NA	NA
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	$45.00	$135,000.00
30	**GRADE 9 PHYSICS A TEACHER PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		ONLINE ACCESS	included	included
		PRINTED MATERIALS (I.E. TEACHER GUIDES)**	$105.00	$3,150.00
		ASSESSMENTS	included	included
		PROFESSIONAL DEVELOPMENT	$516.67	$15,500.00
		OTHER (SPECIFY)	NA	NA
		TOTAL*	$621.67	$18,650.00
30	**GRADE 9 PHYSICS A CLASSROOM PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		PRINTED MATERIALS (I.E. READERS)**	$18.00	$54,000.00
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL*	$18.00	$54,000.00

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING

2,250	**GRADE 9 CHEMISTRY A STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	NA	NA
		STUDENT WORKBOOKS	NA	NA
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA
30	**GRADE 9 CHEMISTRY A TEACHER PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		ONLINE ACCESS	NA	NA
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	NA	NA
		ASSESSMENTS	NA	NA
		PROFESSIONAL DEVELOPMENT	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA
30	**GRADE 9 CHEMISTRY A CLASSROOM PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		PRINTED MATERIALS (I.E. READERS)	NA	NA
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
2,250	**GRADE 9 BIOLOGY A STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	NA	NA
		STUDENT WORKBOOKS	NA	NA
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA
30	**GRADE 9 BIOLOGY A TEACHER PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		ONLINE ACCESS	NA	NA
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	NA	NA
		ASSESSMENTS	NA	NA
		PROFESSIONAL DEVELOPMENT	NA	NA
		OTHER (SPECIFY)	NA	NA

		TOTAL	NA	NA
30	**GRADE 9 BIOLOGY A CLASSROOM PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		PRINTED MATERIALS (I.E. READERS)	NA	NA
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
2,250	**GRADE 10 BIOLOGY B STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	NA	NA
		STUDENT WORKBOOKS	NA	NA
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA
30	**GRADE 10 BIOLOGY B TEACHER PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		ONLINE ACCESS	NA	NA
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	NA	NA
		ASSESSMENTS	NA	NA
		PROFESSIONAL DEVELOPMENT	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA
30	**GRADE 10 BIOLOGY B CLASSROOM PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		PRINTED MATERIALS (I.E. READERS)	NA	NA
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
2,500	**GRADE 11 PHYSICS B STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	$45.00	$112,500.00
		STUDENT WORKBOOKS	NA	NA

		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	$45.00	$112,500.00
20	**GRADE 11 PHYSICS B TEACHER PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		ONLINE ACCESS	included	included
		PRINTED MATERIALS (I.E. TEACHER GUIDES)**	$130.00	$2,600.00
		ASSESSMENTS	Included	Included
		PROFESSIONAL DEVELOPMENT	$775.00	$15,500.00
		OTHER (SPECIFY)	NA	NA
		TOTAL*	$905.00	$18,100.00
20	**GRADE 11 PHYSICS B CLASSROOM PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		PRINTED MATERIALS (I.E. READERS)**	$14.40	$36,000.00
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL*	$14.40	$36,000.00

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
2,250	**GRADE 11 CHEMISTRY B STUDENT PRODUCTS AND SERVICES**			
		ONLINE ACCESS	NA	NA
		STUDENT WORKBOOKS	NA	NA
		MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA
30	**GRADE 11 CHEMISTRY B TEACHER PRODUCTS AND SERVICES**			
		SUPPLIES AND EQUIPMENT	NA	NA
		ONLINE ACCESS	NA	NA
		PRINTED MATERIALS (I.E. TEACHER GUIDES)	NA	NA
		ASSESSMENTS	NA	NA
		PROFESSIONAL DEVELOPMENT	NA	NA
		OTHER (SPECIFY)	NA	NA
		TOTAL	NA	NA
30	**GRADE 11 CHEMISTRY B CLASSROOM PRODUCTS AND SERVICES**			

SUPPLIES AND EQUIPMENT	NA	NA
PRINTED MATERIALS (I.E. READERS)	NA	NA
MATERIALS IN MULTIPLE LANGUAGES (LIST)	NA	NA
OTHER (SPECIFY)	NA	NA
TOTAL	NA	NA

QUANTITY	TITLE	DETAIL	PRICE PER STUDENT OR TEACHER	EXTENDED PRICING
	GRADE 9 PHYSICS A FIELD TEST PRODUCTS AND SERVICES			
	JANUARY-FEBRUARY 2019	MATERIALS (ALL)**		$1,395.00
	FOR ONE SELECTED UNIT OF INSTRUCTION	ONLINE ACCESS		Included
	2-3 TEACHERS	PROFESSIONAL DEVELOPMENT (12/17-18)		$4,000.00
	300-450 STUDENTS	OTHER (SPECIFY) - Travel Expenses		$1,250.00
		TOTAL*		$6,645.00
	GRADE 9 CHEMISTRY A FIELD TEST PRODUCTS AND SERVICES			
	JANUARY-FEBRUARY 2019	MATERIALS (ALL)		NA
	FOR ONE SELECTED UNIT OF INSTRUCTION	ONLINE ACCESS		NA
	2-3 TEACHERS	PROFESSIONAL DEVELOPMENT (12/17-18)		NA
	300-450 STUDENTS	OTHER (SPECIFY)		NA
		TOTAL		NA
	GRADE 10 BIOLOGY A FIELD TEST PRODUCTS AND SERVICES			
	JANUARY-FEBRUARY 2019	MATERIALS (ALL)		NA
	FOR ONE SELECTED UNIT OF INSTRUCTION	ONLINE ACCESS		NA
	2-3 TEACHERS	PROFESSIONAL DEVELOPMENT (12/17-18)		NA
	300-450 STUDENTS	OTHER (SPECIFY)		NA
		TOTAL		NA
	GRADE 10 BIOLOGY B FIELD TEST PRODUCTS AND SERVICES			
	JANUARY-FEBRUARY 2019	MATERIALS (ALL)		NA
	FOR ONE SELECTED UNIT OF INSTRUCTION	ONLINE ACCESS		NA
	2-3 TEACHERS	PROFESSIONAL DEVELOPMENT (12/17-18)		NA
	300-450 STUDENTS	OTHER (SPECIFY)		NA
		TOTAL		NA
	GRADE 11 PHYSICS B FIELD TEST PRODUCTS AND SERVICES			
	JANUARY-FEBRUARY 2019	MATERIALS (ALL)**		$1,395.00
	FOR ONE SELECTED UNIT OF INSTRUCTION	ONLINE ACCESS		Included
	2-3 TEACHERS	PROFESSIONAL DEVELOPMENT (12/17-18)		$4,000.00
	300-450 STUDENTS	OTHER (SPECIFY) - Travel Expenses		$1,250.00
		TOTAL*		$6,645.00

BARCODING OF TEACHER AND STUDENT MATERIALS FOR MAIN ADOPTION	$2,000.00
ESTIMATED PROCESSING/HANDLING CHARGES IF ANY TO MEET DISTRICT "PER SCHOOL" PACKAGING, LABELING, PALLETIZING REQUIREMENTS	NA
ESTIMATED FREIGHT CHARGES, IF ANY	NA
SALES TAX: 10.1% NOMINAL	NA
TOTAL FOB SSD#1 SEATTLE WAREHOUSE FOR YEAR 1 OF ADOPTION	$389,540.00

Shipping costs will be paid by SPS

**Pricing for printed materials is for spiral bound books (Hardcover books are an additional $10/book)

TOTAL COST FOR YEAR 1 OF ADOPTION	$389,540.00
TOTAL COST FOR YEAR 2 OF ADOPTION	$17,000 - $32,800
TOTAL COST FOR YEAR 3 OF ADOPTION	$17,000 - $32,800
TOTAL COST FOR YEAR 4 OF ADOPTION	$17,000 - $32,800
TOTAL COST FOR YEAR 5 OF ADOPTION	$17,000 - $32,800
TOTAL COST FOR YEAR 6 OF ADOPTION	$0 - $32,800
TOTAL COST FOR YEAR 7 OF ADOPTION	$0 - $32,800
TOTAL COST FOR YEAR 8 OF ADOPTION	$0 - $32,800
TOTAL COST FOR YEAR 9 OF ADOPTION	$0 - $32,800
TOTAL YEARS 1-9	**$455,540 - $649,940**

ACCESSIBILITY EXPLANATION

Attachment 3 Pages 3-4

RFP No. RFP09808

11th Grade Physics B

Accessibility Explanation

Vendors shall submit the following:

1) **Their most recent WCAG 2.0AA accessibility testing results**

   The PEER Physics website, curricular materials, and assessments are currently undergoing accessibility testing through the Accessibility and Usability Lab at the University of Colorado Boulder. This testing is built upon WCAG 2.0 and flags any content that is not compliant. Results will be available in January 2019.

2) **Specification of web content and software conforming to relevant legal standards that govern accessibility, and identification of equipment, devices, or hardware that may be used by, and therefore are accessible to, individuals with disabilities.**

   These specifications will be reported by the Accessibility and Usability Lab at the University of Colorado Boulder. Results will be available in January 2019.

3) **Agreement to amend nonconforming web content and software to conform with relevant legal standards governing accessibility, and to make equipment, devices, and hardware usable by individuals with disabilities.**

   PEER Physics agrees to amend nonconforming web content and software to conform with relevant legal standards governing accessibility to the greatest extent possible. PEER Physics products include the public facing and teacher resources websites, student guides, Scientists' Ideas Readings, and all videos and visualizations produced by PEER Physics. PEER Physics activities utilize PhET simulations, which are currently undergoing accessibility testing and modifications. PEER Physics is unable to guarantee the timeline in which these simulations are amended. Learn more about PhET accessibility at: https://phet.colorado.edu/en/accessibility.

4) **If the vendor cannot so agree, then a statement detailing how it will support SPS in providing equally effective, alternate access for nonconforming web content and software as well as usable equipment, devices, and hardware.**

   If there are situations in which PEER Physics is unable to amend content, we will produce a statement for how we will support SPS in providing equally effective, alternative access to content.

5) Agreement to assist SPS in the resolution of accessibility complaints and indemnify and hold SPS harmless in the event of claims arising from inaccessibility.

As included in the exceptions letter in Appendix A, in accordance with laws of the State of Colorado, we are not authorized to indemnify other parties. The University will, however, agree to be responsible for the acts and omissions of our employees.

6) Agreement to provide closed captioning for any video content.

PEER Physics will provide captioning, alternative audio, and audio transcripts for all video content. Estimated completion of captioning, audio, and transcripts is Summer 2019.

7) Documentation that their web content has been independently evaluated and tested for "web accessibility", using WAVE (http:/wave.webaim.org/) or a similar evaluation tool, resulting in a minimum Level AA Conformance.

PEER Physics materials are undergoing testing by the Accessibility and Usability Lab at the University of Colorado Boulder. The official, written report will be available in January 2019 and will be made available to SPS. The manual testing provided by the Accessibility and Usability Lab at the University of Colorado Boulder will provide a more in-depth analysis of the accessibility of PEER Physics materials than the automated testing by WAVE. However, PEER Physics has independently evaluated the accessibility of the public facing and teacher resources websites using WAVE. Minimal errors were found. All errors and alerts will be discussed with a representative from the Accessibility and Usability Lab at the University of Colorado Boulder following the receipt of the final accessibility testing report in January 2019. A comprehensive list of revisions needed (on the basis of the Accessibility Lab's testing results, the VPAT, and WAVE results) will be communicated with the web developer for appropriate web revisions.

VPAT

Attachment 3 Pages 3-4

RFP No. RFP09808

11th Grade Physics B

[Company] Accessibility Conformance Report

Revised Section 508 Edition

VPAT® Version 2.2 – July 2018

Name of Product/Version: PEER Physics

Product Description: PEER Physics web-based materials and electronic documents.

Web-Based Materials: *The public-facing website and teacher resources website were evaluated on this VPAT.*

1. **Public-Facing Website:** this site (physicsthroughevidence.org) is primarily used for informing the public about the PEER Suite. Potential clients, parents, and the general public can access the site.
2. **Teacher Resources Website:** by logging in to the PEER public facing site, PEER teachers gain access to all of the downloadable electronic documents (explained the *Electronic Documents* section below), associated simulations, videos, and assessment resources.
3. **Digital Student Resources (estimated launch in Spring 2019):** PEER is in the process of conducting negotiations with VitalSource, a platform that provides students with access to text resources with or without internet access. The anticipated launch of PEER materials on the VitalSource platform is Spring 2019. These materials are not evaluated on this VPAT. More information can be obtained about the VitalSource platform and accessibility here: https://get.vitalsource.com/accessibility

Electronic Documents: *All electronic documents found on the PEER Teacher Resources website listed below were evaluated on this VPAT.*

- Summarizing Questions (PDF)
- Scientists' Ideas Readings (PDF)
- Audio Files for Scientists' Ideas Readings (MP3)
- Handouts (PDF)

- Lined Documents (DOC)
- Video Resources (MP4 or videos on the YouTube platform)
    - (1) videos required for evidence collection;
    - (2) supplementary videos;
    - (3) experimental technique instructional videos;
    - (4) experimental videos (these are short video clips of the experiments that are most commonly used for absent students).
- Math Activities (PDF)
- Math Activity Key (PDF)

Date: November 27, 2018

Contact information:

Shelly Belleau
PEER Curriculum Chief Editor | Director of Assessment
(970)231-7567
shelly.belleau@peerphysics.org
Physics through Evidence Suite (PEER)

Notes:

The PEER website, curricular materials, and assessments are currently undergoing accessibility testing through the Accessibility and Usability Lab at the University of Colorado, Boulder. This testing is built upon WCAG 2.0. Within this manual testing, native assistive technology users (individuals with disabilities) determine accessibility of PEER Physics web-based platforms and electronic resources. Results will be available in January 2018.

Evaluation Methods Used: To complete the VPAT (Table 1 and Table 2), the PEER curriculum development team worked collaboratively with the PEER web developer and an ICT Accessibility Specialist through the Accessibility and Usability Lab at the University of Colorado, Boulder.

Applicable Standards/Guidelines

This report covers the degree of conformance for the following accessibility standard/guidelines:

Standard/Guideline	Included In Report
Web Content Accessibility Guidelines 2.0, at *http://www.w3.org/TR/2008/REC-WCAG20-20081211/*	Level A (Yes) Level AA (Yes) Level AAA (No)
Revised Section 508 standards as published by the U.S. Access Board in the Federal Register on January 18, 2017 Corrections to the ICT Final Rule as published by the US Access Board in the Federal Register on January 22, 2018	(Yes)

Terms

The terms used in the Conformance Level information are defined as follows:

- **Supports**: The functionality of the product has at least one method that meets the criterion without known defects or meets with equivalent facilitation.
- **Partially Supports**: Some functionality of the product does not meet the criterion.
- **Does Not Support**: The majority of product functionality does not meet the criterion.
- **Not Applicable**: The criterion is not relevant to the product.
- **Not Evaluated**: The product has not been evaluated against the criterion. This can be used only in WCAG 2.0 Level AAA.

WCAG 2.0 Report

Tables 1 and 2 also document conformance with:

- Chapter 5 – 501.1 Scope, 504.2 Content Creation or Editing
- Chapter 6 – 602.3 Electronic Support Documentation

Note: When reporting on conformance with the WCAG 2.0 Success Criteria, they are scoped for full pages, complete processes, and accessibility-supported ways of using technology as documented in the WCAG 2.0 Conformance Requirements.

Table 1: Success Criteria, Level A

Notes:

Criteria	Conformance Level	Remarks and Explanations
1.1.1 Non-text Content (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Partially Supports	Web: The PEER public-facing and teacher resources website includes alternate text and descriptions for pictures and graphics. Electronic Docs: Electronic documents (consisting of Summarizing Questions, Scientists' Ideas readings, and handouts) include non-text content throughout. Descriptions of all graphics within these documents will be completed by spring 2019. Video resources are posted on the teacher resources site and we continue to add to the video library. Currently we have the following types of videos: (1) videos required for evidence collection; (2) supplementary videos; (3) experimental technique instructional videos; (4) experimental videos (these are short video clips of the experiments that are most commonly used for absent students). Alt text is being added to all videos with an estimated completion of March 2019.
1.2.1 Audio-only and Video-only (Prerecorded) (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Partially Supports	Web: The website itself does not include audio or video components. It does include links to electronic documents (including both audio and video files). See below. Electronic Docs: Audio Only: Audio only files are provided for the Scientists' Ideas readings (and posted on the teacher resources website). These audio files correspond to the associated reading. The reading provides an alternative for the audio and vice versa.

Criteria	Conformance Level	Remarks and Explanations
		Video Only: Video resources are posted on the teacher resources site and we continue to add to the video library. Alt text is being added to all videos with an estimated completion of March 2019. (see 1.1.1).
1.2.2 Captions (Prerecorded) (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Not Applicable and Partially Supports	Web: Not Applicable Electronic Docs: PEER audio files are a media alternative for text and are labeled as such (therefore not applicable). All videos are either captioned or in the process of being captioned.
1.2.3 Audio Description or Media Alternative (Prerecorded) (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Does Not Support	Web: Not Applicable Electronic Docs: Audio descriptions and transcripts for pre-recorded videos will be completed in Spring 2019.
1.3.1 Info and Relationships (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Not Applicable	Web: Information and relationships on the website are preserved when the format of the site changes. Electronic Docs: Not Applicable
1.3.2 Meaningful Sequence (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Supports	Web: While content throughout the website is presented vertically, the meaning of the content does not depend on its sequence. Electronic Docs:
1.3.3 Sensory Characteristics (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool)	Web: Supports Electronic Docs: Supports	Web: Website operation is not dependent upon sensory characteristics. Electronic Docs: Navigation of electronic documents (consisting of Summarizing Questions, Scientists' Ideas readings, and handouts) is not dependent upon sensory

Criteria	Conformance Level	Remarks and Explanations
• 602.3 (Support Docs)		characteristics.
1.4.1 Use of Color (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Not Applicable	Web: The website uses minimal color indicators. For example, links are provided in a different color. However, these links are also indicated by underline when hovered over by a cursor. Electronic Docs: All electronic documents were created to be printed in black and white or in color. Therefore color indicators are not included.
1.4.2 Audio Control (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Not Applicable	Web: Electronic Docs:
2.1.1 Keyboard (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Supports	Web: Electronic Docs:
2.1.2 No Keyboard Trap (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Supports	Web: Electronic Docs:
2.2.1 Timing Adjustable (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Supports	Web: The website does not include time sensitive content. Electronic Docs: Audio and video content can be played at fast and slow speeds and paused by the viewer.

Criteria	Conformance Level	Remarks and Explanations
2.2.2 Pause, Stop, Hide (Level A) Also applies to: • Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Not Applicable	Web: Moving, blinking, or scrolling are either not included on the website or are not done automatically. Electronic Docs:
2.3.1 Three Flashes or Below Threshold (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Not Applicable	Web: Electronic Docs:
2.4.1 Bypass Blocks (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) – Does not apply to non-web software • 504.2 (Authoring Tool) • 602.3 (Support Docs) – Does not apply to non-web docs	Web: Supports Electronic Docs: Not Applicable	Web: The website does not include repeated material other than the header, navigation bar, and footer. We intentionally do not want these to be bypassed Electronic Docs:
2.4.2 Page Titled (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Not Applicable	Web: Website page titles are descriptive. Electronic Docs:
2.4.3 Focus Order (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Not Applicable	Web: Electronic Docs:
2.4.4 Link Purpose (In Context) (Level A) Also applies to:	Web: Supports Electronic Docs: Not	Web: Links are either descriptive within the text itself or if the link is a graphic, the graphic includes alternative

Criteria	Conformance Level	Remarks and Explanations
Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Applicable	text and a description that provides additional information about the purpose of the graphic and the link. Electronic Docs:
3.1.1 Language of Page (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Partially supports	Web: In the source code, a default language is stated. WordPress does this automatically and this is supported by the site's accessibility plugin. Electronic Docs: PEER Physics materials are currently undergoing the changes needed to meet 3.1.1. Language of Page for electronic documents will be completed by Spring 2019.
3.2.1 On Focus (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Not applicable	Web: Electronic Docs:
3.2.2 On Input (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Not applicable	Web: Electronic Docs:
3.3.1 Error Identification (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Not applicable	Web: Error reporting does not display on the PEER website. Electronic Docs:
3.3.2 Labels or Instructions (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software)	Web: Supports Electronic Docs: Supports	Web: The PEER public-facing website includes a contact form, which complies with 3.3.2. The teacher resources site includes links to Google Forms, which also comply with 3.3.2.

Criteria	Conformance Level	Remarks and Explanations
• 504.2 (Authoring Tool) • 602.3 (Support Docs)		Electronic Docs: The nature of the student materials themselves provide labels and instructions for all content that requires input from the students.
4.1.1 Parsing (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Partially Supports	Web: Electronic Docs: The ordering of tables throughout PDF files may need to be addressed. Accessibility testing will inform PEER Physics of changes that need to be made (testing report in January 2019 and resolutions are anticipated by Summer 2019).
4.1.2 Name, Role, Value (Level A) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Supports	Web: Electronic Docs:

Table 2: Success Criteria, Level AA

Notes:

Criteria	Conformance Level	Remarks and Explanations
1.2.4 Captions (Live) (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not Applicable Electronic Docs: Not Applicable	Web: Live audio is not included. Electronic Docs: Not Applicable
1.2.5 Audio Description (Prerecorded) (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software)	Web: Not Applicable Electronic Docs: Does Not Support	Web: Electronic Docs: Audio descriptions will be provided for all prerecorded videos by Spring 2019.

Criteria	Conformance Level	Remarks and Explanations
• 504.2 (Authoring Tool) • 602.3 (Support Docs)		
1.4.3 Contrast (Minimum) (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Partially Supports Electronic Docs: Supports	Web: The website includes an accessibility plugin that allows a toolbar for toggling between high contrast, large print, and desaturated views. This allows a viewer to select a high contrast mode that satisfies the requirements of 1.4.3. Electronic Docs: Text in electronic documents is in black and white.
1.4.4 Resize text (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Supports	Web: Electronic Docs:
1.4.5 Images of Text (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Partially supports	Web: Text is used whenever possible. In cases where text cannot not used (i.e. text within a graphic), alternative text and descriptions are provided. Electronic Docs: In some cases, graphics are pictures that include text labels. Descriptions of all graphics within the electronic documents will be completed by Spring 2019.
2.4.5 Multiple Ways (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) – Does not apply to non-web software • 504.2 (Authoring Tool) • 602.3 (Support Docs) – Does not apply to non-web docs	Web: Supports Electronic Docs: Not applicable	Web: 2.4.5 is satisfied by the navigation menu on the website. Electronic Docs:
2.4.6 Headings and Labels (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool)	Web: Supports Electronic Docs: Supports	Web: Electronic Docs:

Criteria	Conformance Level	Remarks and Explanations
• 602.3 (Support Docs)		
2.4.7 Focus Visible (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports Electronic Docs: Not applicable	Web: The PEER Physics website provides a focus indicator. Electronic Docs: Electronic documents do not include form elements
3.1.2 Language of Parts (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Supports and Not Applicable Electronic Docs: Not applicable	Web: The website includes a single default language English and does not switch languages. Electronic Docs: Currently the electronic documents are in a single language. Even in the future when electronic documents are provided in other languages, each document will only be in one language.
3.2.3 Consistent Navigation (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) – Does not apply to non-web software • 504.2 (Authoring Tool) • 602.3 (Support Docs) – Does not apply to non-web docs	Web: Supports Electronic Docs: Not applicable	Web: Toolbar and navigation fields are the same on each page. Electronic Docs:
3.2.4 Consistent Identification (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) – Does not apply to non-web software • 504.2 (Authoring Tool) • 602.3 (Support Docs) – Does not apply to non-web docs	Web: Supports Electronic Docs: Not applicable	Web: Icons and buttons are consistent throughout the site. Electronic Docs:
3.3.3 Error Suggestion (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not applicable and partially supports Electronic Docs: Not applicable	Web: 3.3.3 primarily does not apply to the website, as the site does not primarily communicate errors. Errors may be received in the forms on the site (contact form on the public facing site and the Google Forms linked on the teacher resources page). As it is currently set up, the contact form does not provide a detailed error explanation. This is a straightforward modification, if necessary. Google Forms satisfy 3.3.3.

Criteria	Conformance Level	Remarks and Explanations
		Electronic Docs:
3.3.4 Error Prevention (Legal, Financial, Data) (Level AA) Also applies to: Revised Section 508 • 501 (Web)(Software) • 504.2 (Authoring Tool) • 602.3 (Support Docs)	Web: Not applicable Electronic Docs: Not applicable	Web: Electronic Docs:

Table 3: Success Criteria, Level AAA

Notes:

Criteria	Conformance Level	Remarks and Explanations
1.2.6 Sign Language (Prerecorded) (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
1.2.7 Extended Audio Description (Prerecorded) (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
1.2.8 Media Alternative (Prerecorded) (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
1.2.9 Audio-only (Live) (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
1.4.6 Contrast Enhanced (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
1.4.7 Low or No Background Audio (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
1.4.8 Visual Presentation (Level AAA)	Web:	Web:

Criteria	Conformance Level	Remarks and Explanations
Also applies to: Revised Section 508 – Does not apply		
1.4.9 Images of Text (No Exception) Control (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
2.1.3 Keyboard (No Exception) (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
2.2.3 No Timing (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
2.2.4 Interruptions (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
2.2.5 Re-authenticating (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
2.3.2 Three Flashes (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
2.4.8 Location (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
2.4.9 Link Purpose (Link Only) (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
2.4.10 Section Headings (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
3.1.3 Unusual Words (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
3.1.4 Abbreviations (Level AAA)	Web:	Web:

Criteria	Conformance Level	Remarks and Explanations
Also applies to: Revised Section 508 – Does not apply		
3.1.5 Reading Level (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
3.1.6 Pronunciation (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
3.2.5 Change on Request (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
3.3.5 Help (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:
3.3.6 Error Prevention (All) (Level AAA) Also applies to: Revised Section 508 – Does not apply	Web:	Web:

Revised Section 508 Report

Notes: PEER Physics will be able to populate the tables below following accessibility testing (January 2019).

Chapter 3: Functional Performance Criteria (FPC)

Notes:

Criteria	Conformance Level	Remarks and Explanations
302.1 Without Vision		
302.2 With Limited Vision		
302.3 Without Perception of Color		
302.4 Without Hearing		
302.5 With Limited Hearing		
302.6 Without Speech		
302.7 With Limited Manipulation		
302.8 With Limited Reach and Strength		
302.9 With Limited Language, Cognitive, and Learning Abilities		

Chapter 4: Hardware

Notes:

Criteria	Conformance Level	Remarks and Explanations
402 Closed Functionality	Heading cell – no response required	Heading cell – no response required
402.1 General	Heading cell – no response required	Heading cell – no response required
402.2 Speech-Output Enabled	Heading cell – no response required	Heading cell – no response required
402.2.1 Information Displayed On-Screen		
402.2.2 Transactional Outputs		
402.2.3 Speech Delivery Type and Coordination		
402.2.4 User Control		
402.2.5 Braille Instructions		

Criteria	Conformance Level	Remarks and Explanations
402.3 Volume	Heading cell – no response required	Heading cell – no response required
402.3.1 Private Listening		
402.3.2 Non-private Listening		
402.4 Characters on Display Screens		
402.5 Characters on Variable Message Signs		
403 Biometrics	Heading cell – no response required	Heading cell – no response required
403.1 General		
404 Preservation of Information Provided for Accessibility	Heading cell – no response required	Heading cell – no response required
404.1 General		
405 Privacy	Heading cell – no response required	Heading cell – no response required
405.1 General		
406 Standard Connections	Heading cell – no response required	Heading cell – no response required
406.1 General		
407 Operable Parts	Heading cell – no response required	Heading cell – no response required
407.2 Contrast		
407.3 Input Controls	Heading cell – no response required	Heading cell – no response required
407.3.1 Tactilely Discernible		
407.3.2 Alphabetic Keys		
407.3.3 Numeric Keys		
407.4 Key Repeat		
407.5 Timed Response		
407.6 Operation		
407.7 Tickets, Fare Cards, and Keycards		
407.8 Reach Height and Depth	Heading cell – no response required	Heading cell – no response required
407.8.1 Vertical Reference Plane		
407.8.1.1 Vertical Plane for Side Reach		
407.8.1.2 Vertical Plane for Forward Reach		
407.8.2 Side Reach		
407.8.2.1 Unobstructed Side Reach		
407.8.2.2 Obstructed Side Reach		

Criteria	Conformance Level	Remarks and Explanations
407.8.3 Forward Reach		
407.8.3.1 Unobstructed Forward Reach		
407.8.3.2 Obstructed Forward Reach		
407.8.3.2.1 Operable Part Height for ICT with Obstructed Forward Reach		
407.8.3.2.2 Knee and Toe Space under ICT with Obstructed Forward Reach		
408 Display Screens	Heading cell – no response required	Heading cell – no response required
408.2 Visibility		
408.3 Flashing		
409 Status Indicators	Heading cell – no response required	Heading cell – no response required
409.1 General		
410 Color Coding	Heading cell – no response required	Heading cell – no response required
410.1 General		
411 Audible Signals	Heading cell – no response required	Heading cell – no response required
411.1 General		
412 ICT with Two-Way Voice Communication	Heading cell – no response required	Heading cell – no response required
412.2 Volume Gain	Heading cell – no response required	Heading cell – no response required
412.2.1 Volume Gain for Wireline Telephones		
412.2.2 Volume Gain for Non-Wireline ICT		
412.3 Interference Reduction and Magnetic Coupling	Heading cell – no response required	Heading cell – no response required
412.3.1 Wireless Handsets		
412.3.2 Wireline Handsets		
412.4 Digital Encoding of Speech		
412.5 Real-Time Text Functionality	Reserved for future	Reserved for future
412.6 Caller ID		
412.7 Video Communication		
412.8 Legacy TTY Support	Heading cell – no response required	Heading cell – no response required
412.8.1 TTY Connectability		
412.8.2 Voice and Hearing Carry Over		
412.8.3 Signal Compatibility		
412.8.4 Voice Mail and Other Messaging Systems		

Criteria	Conformance Level	Remarks and Explanations
413 Closed Caption Processing Technologies	Heading cell – no response required	Heading cell – no response required
413.1.1 Decoding and Display of Closed Captions		
413.1.2 Pass-Through of Closed Caption Data		
414 Audio Description Processing Technologies	Heading cell – no response required	Heading cell – no response required
414.1.1 Digital Television Tuners		
414.1.2 Other ICT		
415 User Controls for Captions and Audio Descriptions	Heading cell – no response required	Heading cell – no response required
415.1.1 Caption Controls		
415.1.2 Audio Description Controls		

Chapter 5: Software

Notes:

Criteria	Conformance Level	Remarks and Explanations
501.1 Scope – Incorporation of WCAG 2.0 AA	See WCAG 2.0 section	See information in WCAG section
502 Interoperability with Assistive Technology	Heading cell – no response required	Heading cell – no response required
502.2.1 User Control of Accessibility Features		
502.2.2 No Disruption of Accessibility Features		
502.3 Accessibility Services	Heading cell – no response required	Heading cell – no response required
502.3.1 Object Information		
502.3.2 Modification of Object Information		
502.3.3 Row, Column, and Headers		
502.3.4 Values		
502.3.5 Modification of Values		
502.3.6 Label Relationships		
502.3.7 Hierarchical Relationships		
502.3.8 Text		
502.3.9 Modification of Text		
502.3.10 List of Actions		
502.3.11 Actions on Objects		

Criteria	Conformance Level	Remarks and Explanations
502.3.12 Focus Cursor		
502.3.13 Modification of Focus Cursor		
502.3.14 Event Notification		
502.4 Platform Accessibility Features		
503 Applications	Heading cell – no response required	Heading cell – no response required
503.2 User Preferences		
503.3 Alternative User Interfaces		
503.4 User Controls for Captions and Audio Description	Heading cell – no response required	Heading cell – no response required
503.4.1 Caption Controls		
503.4.2 Audio Description Controls		
504 Authoring Tools	Heading cell – no response required	Heading cell – no response required
504.2 Content Creation or Editing (if not authoring tool, enter "not applicable")	See WCAG 2.0 section	See information in WCAG section
504.2.1 Preservation of Information Provided for Accessibility in Format Conversion		
504.2.2 PDF Export		
504.3 Prompts		
504.4 Templates		

Chapter 6: Support Documentation and Services

Notes:

Criteria	Conformance Level	Remarks and Explanations
601.1 Scope	Heading cell – no response required	Heading cell – no response required
602 Support Documentation	Heading cell – no response required	Heading cell – no response required
602.2 Accessibility and Compatibility Features		
602.3 Electronic Support Documentation	See WCAG 2.0 section	See information in WCAG section
602.4 Alternate Formats for Non-Electronic Support Documentation		
603 Support Services	Heading cell – no response required	Heading cell – no response required
603.2 Information on Accessibility and Compatibility Features		

Criteria	Conformance Level	Remarks and Explanations
603.3 Accommodation of Communication Needs		

Legal Disclaimer (Company)

Include your company legal disclaimer here, if needed

Attachment B
Seattle Public Schools High School Science Adoption Communications Plan
September 2018-April 2019

Date	Message	Audience	Channels	Procedures/Notes
September 7, 2018	Announcement of adoption and requests for applications for committee membership. Web page created to outline process and post meeting notes	Families, community members, staff	Direct emails, homepage post, social media, principals, School Beat newsletter	Website was created and linked to Academics page. Request for committee application and participation, emails will be sent to families and teachers through School Messenger and also to media, requests will be posted on the district newsletter, homepage and social media, and program specialists did community outreach.
September 16, 2018	Announcement of adoption process; request for input and support from administrators and staff; anticipate future communications to families	Families, staff	Principal LLD	Principals were asked to inform their school communities about the adoption and encourage applications for adoption committee membership
September to November, 2018	Needs Assessment survey available	Families, community members, staff	Survey/email/webpage	Committee-designed survey on materials priorities to be linked through emails to families and staff. Surveys translated into top 5 languages.

Date	Message	Audience	Channels	Procedures/Notes
October 2018	Announcement of adoption and requests for applications for committee membership. Web page created to outline process and post meeting notes	School board, staff	Friday memo	Documents posted on an ongoing basis: meeting minutes, survey data, application forms, meeting outcomes, process updates etc.
October 15, 2018	Deadline to apply for Adoption Committee	Families, community members, staff	Direct emails, homepage post, social media, principals, School Beat newsletter	Applications accepted via district website, email, and post
October 2018 and ongoing	Adoption Committee progress	Committee, families, community, staff	Adoption webpage, C&I Policy Committee monthly updates	Documents posted on an ongoing basis: meeting minutes, survey data, adoption candidate information, etc.
October 19, 2018	Adoption Committee requests RFP to selected instructional materials	Vendors	Homepage	List of all instructional materials vendors approved by Purchasing will be listed on the webpage.
October to November, 2018	Adoption Committee meetings, minutes posted to website	Families, community members, staff, school board	Homepage, social media, newsletter, principals, Fri Memo	Adoption Committee meeting to orient to standards and develop and revise instructional materials Review Criteria

Date	Message	Audience	Channels	Procedures/Notes
October to November, 2018	Materials on display in JSCEE library, School Board office, and three selected high schools	Families, community members, staff, school board	Homepage, social media, newsletter, Principals, Friday Memo	When materials are ready, announcement posted to homepage, in newsletter and on social media. Principals provided with an invitation to share with school communities. Feedback forms will be available.
November 13, 2018	Adoption Committee Meeting	Committee, families, community, staff	Adoption webpage	Adoption Committee Meeting: Finalize Selection Criteria
November 14, 2018	Publish Review Criteria Tool	Community members, families, staff	Adoption webpage	Digital version of the Review Criteria Tool posted for public viewing
November 17, 2018	Updates on Adoption Committee meeting outcomes	School board, staff	Friday Memo	Updates on Adoption Committee meeting outcomes
January 2019	Field Test conducted of finalist materials	Families, community members, staff, school board, students	Homepage, social media, newsletter, principals, Fri Memo	Community will be informed of strategy for field test after those details are determined.

Date	Message	Audience	Channels	Procedures/Notes
February 2, 2019	Instructional Materials Open House	Families, community members, staff, school board	Nathan Hale High School	The three program finalists' materials were on display; the Adoption Coordinator, Science Curriculum Specialists, Field Test teachers, and Adoption Committee members were available to interface with the public to guide them through the materials and answer questions
February 9, 2019	Instructional Materials Open House (rescheduled)	Families, community members, staff, school board	Rainier Beach Community Center	This Open House was unfortunately canceled due to adverse weather conditions throughout the Seattle area, and rescheduled for March 2, 2019 at Rainier Beach High School
March 2, 2019	Instructional Materials Open House	Families, community members, staff, school board	Rainier Beach High School	The three program finalists' materials were on display; the Adoption Coordinator, Science Curriculum Specialists, Field Test teachers, and Adoption Committee members were available to interface with the public to guide them through the materials and answer questions

Date	Message	Audience	Channels	Procedures/Notes
March 2019	Panel Discussion with Field Test Teacher Participants	Open to public	Homepage, social media, newsletter	Audiences will be invited to panel discussion
April 2019	Committee has made recommendation	Families, community members, staff, school board	Homepage, press release, social media, newsletter, Principals, Friday Memo	Documents will be provided directly to the school board. An announcement will be posted to the homepage, in the family newsletter and on social media. A press release will be shared

Attachment C
High School Science Adoption Community Engagement

	Internal Engagement (SPS Staff)			External Engagement (Families/Community)		
	Tier 1 Inform	Tier 2 Consult/ Involve	Tier 3 Collab.	Tier 1 Inform	Tier 2 Consult/ Involve	Tier 3 Collab.
Stage 1						
Adoption Committee Application Process			X		X	
SPS Staff and Community/Family Input Survey *(translations of forms available)*		X			X	
Instructional Materials Public Display and Community Input *(translations of forms available)*		X			X	
SPS Staff and Community Information Session Open House		X			X	
Adoption Committee Review/Evaluation of Instructional Materials			X			X
SPS Science Adoption website updates	X			X		
SPS Communication updates (email, SPS website)	X			X		
Field Test						
Field Test Teacher Application Process			X	X		
SPS Science Adoption website updates	X			X		
SPS Communications updates (email, SPS website)	X			X		
Stage 2						
Field Test Teacher Panel Interview			X			
Adoption Committee Review/Evaluation of Instructional Materials Finalists		X			X	
SPS Science Adoption website updates	X			X		
SPS Communication updates (email, SPS website)	X			X		

Attachment D
High School Science Adoption Committee Membership Roster
Staff Membership

Name	Title	School	Years in Education	Professional Experience	Children attending SPS
India Carlson	Teacher (Biology, CTE)	Ballard HS	12		
Kim Dinh	Teacher (Biology)	Chief Sealth HS	9		
Lura Ercolano	Teacher	Middle College			
Daniel Fisher	Teacher (Physics)	Ingraham HS	9		
Jen Fox	Teacher (Biology)	Hamilton MS			
Neil, Rebecca	Teacher (Chemistry)	Chief Sealth HS	6		
Margaret Jones	Teacher (Chemistry)	Garfield HS	11		
Yolanda Jones	Teacher (Chemistry)	Franklin HS	2		
Jackie Wilson	Teacher (Biology)	Roosevelt HS	3		
AJ Katzaroff	Teacher (Biology)	Franklin HS	7	PhD Molecular & Cellular Biology	Gatewood (3rd, 4th)
Greg Kowalke	Teacher (Biology)	Cleveland HS	4	Biological oceanographer	
Laura McGinty	Teacher (Biology)	Ballard HS	5		
Ruth Medsker	Principal	Lincoln HS			
~~Michaela Peterson~~	Teacher (Biology)	The Center School	8		
Tiffany Robinson	Teacher (Biology)	Nathan Hale HS	10		
Emily Wang	Teacher (Instructional Technology)	JSCEE			
Jackie Wilson					
Autumn Tocchi	Teacher (Chemistry)	Rainier Beach HS	2		
Brian Vance	Principal	West Seattle HS			

Staff Membership Demographics
17 total staff members (some chose not to provide this optional information):

- 11 identify as female (64.7%)
- 3 identify as male (17.6%)
- 11 identify as White (64.7%)
- 3 identify as non-White (17.6%)
- 6 represent Title I schools (35.3%)
- 1 represents HCC schools (5.9%)

Attachment D
High School Science Adoption Committee Membership Roster
Community Membership

Name	Professional Affiliations	Children attending SPS
Nina Arens	Development Lead for Education programs at Living Computers Museum + Labs	Roosevelt (9th)
Laura Bailey	NatureBridge; Enhancing Education Through Technology	
Philip Bell	UW School of Education	Nathan Hale (11th)
Judy Bridges	Chemical Engineer; Mechanical Engineer; Electrical Engineer	Washington (6th)
Brian Buchwitz	Senior Lecturer, UW Biology; PhD in Molecular & Cellular Biology	Gatewood (2nd, 3rd)
~~Kristen Dang~~	Computational Biologist in cancer research	John Muir (4th, 4th)
Monica Fujii	Microbiology; MPH in Public Health Genetics	Arbor Heights (2nd)
Fernando Gonzalez	PhD Oceanography; Postdoc in Biophysics	McDonald (2nd)
Christine Helkey	Physician	Center School (10th)
Pam Kraus	PhD in Physics; Educational Consultant	Garfield (12th)
Christopher Lausted	Senior Research Engineer at Institute for Systems Biology	Ballard (10th)
Ryan Miller	UW Tacoma Biology instructor	Graham Hill (1st)
Stephen Montsaroff	Doctorate in Physics; Experience in Education	Garfield (12th), Washington (8th)
Maureen Munn	Retired science educator, UW Dept. of Genome Sciences	
Jessica Thompson	UW School of Education	
~~Olivia Usher~~		John Hay (K)
John Wietfeldt	Retired professional chemist	

Community Membership Demographics
17 total community members (some chose not to provide this optional information):

- 9 identify as female (52.9%)
- 5 identify as male (29.4%)
- 1 identifies as transgender female (5.8%)
- 13 identify as White (76.5%)
- 3 identify as non-White (17.6%)
- 3 represent Title I schools (17.6%)

Attachment D
High School Science Adoption Committee Membership Roster
Student Membership

Name	High School
Nahom Alemayehu	Franklin HS (11th)
Aiden Buchanan	The Center School (10th)
Sofia Nguyen	Franklin HS (11th)

Student Membership Demographics
3 total student members:

- 1 identifies as female (33.3%)
- 2 identify as male (66.6%)
- 0 identify as White (0.0%)
- 3 identify as non-White (100.0%)
- 0 represent Title I schools (0.0%)
- 0 represent HCC schools (0.0%)

Attachment E: SPS Science Instructional Materials Adoption
HS Review Criteria v6.7.11.29.18 ADA-Compliant Version

Vendor: _____

Program Name: _____

CATEGORY 1: STANDARDS ALIGNMENT

WHY: "Educational excellence and equity for every student is Goal One of our district's Strategic Plan. Our academic program is grounded in standards-based curriculum, with strong, targeted instruction delivered by highly-qualified teachers to ensure that every student graduates ready for college, career, and life." – SPS Department of Curriculum, Assessment, and Instruction website

WHAT: "Our mission is to provide all SPS science classrooms with a common NGSS-aligned core scope and sequence that is engaging, authentic, culturally responsive, rigorous, and technology-based to be college and/or career ready. Our goal is that all our students will be scientifically literate. This is accomplished through a collaborative, interactive, rigorous science program responsive to the needs of diverse learners." – SPS Science Department Mission Statement

RUBRIC:
4: Superior Evidence; **3:** Strong Evidence; **2:** Moderate Evidence; **1:** Minimal Evidence; **0:** No Evidence

Category 1 Criterium	Current	Scientifically accurate	Grade-level appropriate	Average Score
1. The instructional materials present the SEPs (Science and Engineering Practices) in a way that is:				
2. The instructional materials present the DCIs (Disciplinary Core Ideas) in a way that is:				
3. The instructional materials present the CCCs (Crosscutting Concepts) in a way that is:				

Category 1 Criterium	Evidence Gathered	Rating
4. The instructional program provides phenomena-based science units.	Evidence:	Rating:
5. The instructional program engages students in the engineering design process by solving engineering problems.	Evidence:	Rating:

Category 1 Criterium	Evidence Gathered	Rating
6. Units are organized in a coherent, sense-making sequence (storyline), anchored by a phenomenon or engineering problem that allows for students to develop and build knowledge to explain the phenomenon or solve the engineering problem.	Evidence:	Rating:
7. Courses are designed around an instructional arc that supports the development of students' conceptual understanding.	Evidence:	Rating:
8. Phenomena and/or engineering problems engage students as directly (first hand) as possible.	Evidence:	Rating:
9. Individual learning activities include Science and Engineering Practices (SEPs) and Disciplinary Core Ideas (DCIs), with Crosscutting Concepts (CCCs) used to unify activities.	Evidence:	Rating:
10. The instructional program provides opportunities for students to collect evidence using all of the following: computer-based simulations, hands-on investigations, field investigations, informational texts, and other media.	Evidence:	Rating:
11. Instructional materials draw upon students' prior knowledge and experiences related to the targeted learning of SEPs, DCIs, and CCCs.	Evidence:	Rating:
12. Instructional materials provide students with opportunities to consider the ethical implications of science where appropriate.	Evidence:	Rating:
13. The instructional program indicates connection(s) to the Common Core State Standards.	Evidence:	Rating:

Category 1 Criterium	Evidence Gathered	Rating
14. The instructional program requires students to use and build their knowledge of Disciplinary Core Ideas as assigned to each course: a. (Circle one) Biology, Chemistry, Physics b. Earth and Space Science (Applies to all content areas reviewed) c. Engineering, Technology, and Application of Science (Applies to all content areas reviewed)	Evidence:	Rating:
14. The instructional program requires students to use, leverage, and build their knowledge of the Science and Engineering Practices: a. SEP 1: Asking Questions (science) and Defining Problems (engineering) b. SEP 2: Developing and Using Models c. SEP 3: Planning and Carrying Out Investigations d. SEP 4: Analyzing and Interpreting Data e. SEP 5: Using Mathematics and Computational Thinking f. SEP 6: Constructing Explanations (science) and Designing Solutions (engineering) g. SEP 7: Engaging in Argument from Evidence h. SEP 8: Obtaining, Evaluating, and Communicating Information	Evidence:	Rating:
15. The instructional program requires students to use and build their knowledge of the Crosscutting Concepts: a. CCC 1: Patterns b. CCC 2: Cause and Effect c. CCC 3: Scale, Proportion, and Quantity d. CCC 4: Systems and System Models e. CCC 5: Energy and Matter f. CCC 6: Structure and Function g. CCC 7: Stability and Change	Evidence:	Rating:

Attachment E: SPS Science Instructional Materials Adoption
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Category 1 Criterium	Evidence Gathered	Rating
Total Score for Category 1:	**Points Possible: 64**	**% Score:**

Comments: **Personal % Score:**

CATEGORY 2: ASSESSMENTS

WHY: "The Board of Directors of Seattle Public Schools … believes that assessments are a critical component of our education system used to inform instruction through identification of student strengths, assessment of learning growth, and diagnosis of barriers, and areas of support." – SPS School Board Policy #2080

WHAT: Includes pre-, formative, summative, self-, and peer-assessment measures that assess three-dimensional learning that provides data used to inform instruction.

RUBRIC:
4: Superior Evidence; **3:** Strong Evidence; **2:** Moderate Evidence; **1:** Minimal Evidence; **0:** No Evidence

Category 2 Criterium	Evidence Gathered	Rating
1. Assessments engage students in at least two of the three dimensions of teaching and learning: The Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs).	Evidence:	Rating:
2. Assessments do not create barriers to student success based on gender identification, cultural status, socioeconomic status, sensitivity, language, learning exceptionality, or the use of adaptive technology.	Evidence:	Rating:
3. Assessments can be modified for language learners and students with learning exceptionalities.	Evidence:	Rating:
4. Assessments are written in a way that makes the assessed standards visible to learners.	Evidence:	Rating:
5. Pre-assessments for each unit are provided to elicit students' prior knowledge and preconceptions.	Evidence:	Rating:
6. 3D assessment tools include multiple measures of student progress within a unit.	Evidence:	Rating:

Category 2 Criterium	Evidence Gathered	Rating
7. Formative assessments are embedded consistently within the unit of instruction to yield frequent information teacher may use in planning and modifying instruction and are designed to elicit understanding to provide evidence of students' progress toward mastering the three-dimensional learning.	Evidence:	Rating:
8. 3D summative assessments, at the end of a chapter or a unit, require students to provide a gapless scientific explanation for the unit phenomenon, supported by evidence.	Evidence:	Rating:
9. 3D summative assessments involve a variety of modalities, including, but not limited to: hands-on or simulation-based performance tasks, open-ended constructed response problems, and scoring of portfolios of student work collected over the course of instruction.	Evidence:	Rating:
10. Tools are provided for scoring assessment items (e.g., sample student responses, rubrics, scoring guidelines) and are connected to standards in student-friendly language.	Evidence:	Rating:
11. Guidance is provided for interpreting the assessments (e.g., determining what high and low scores mean for students) that allow for interpretation of levels of student understanding.	Evidence:	Rating:
12. Instructional materials provide opportunities and guidance for oral and/or written self-assessment allowing students to monitor their own learning.	Evidence:	Rating:
13. Instructional materials include opportunities to use digital tools to assess three-dimensional learning to provide timely feedback to students.		

Category 2 Criterium	Evidence Gathered	Rating
Total Score for Category 2:	**Points Possible: 52**	**% Score:**

Comments: **Personal % Score:**

CATEGORY 3: INCLUSIVE EDUCATIONAL PRACTICES

WHY: "The district shall provide every student with equitable access to a high-quality curriculum, support, facilities, and other educational resources." – SPS School Board Policy #0030

WHAT: Instructional materials support students with learning variabilities, including, but not limited to, standard English learners, English learners, long term English learners, students living in poverty, foster youth, girls and young women, advanced learners, students with disabilities, students experiencing trauma, students below grade level, and students of Native American, Alaskan, Pacific Islander, African American, and Latinx descent.

RUBRIC:
4: Superior Evidence; **3:** Strong Evidence; **2:** Moderate Evidence; **1:** Minimal Evidence; **0:** No Evidence

Category 3 Criterium	Evidence Gathered	Rating
1. Instructional materials leverage students' prior knowledge and experiences by eliciting and revisiting their ideas throughout the unit.	Evidence:	Rating:
2. Instructional materials should build upon student interests and identities and include options for how to connect instruction to students' home, neighborhood, community, and/or culture, with a lens on social justice issues that are pertinent to students' lives (e.g., food deserts).	Evidence:	Rating:
3. Instructional materials are designed to leverage diverse cultural and socioeconomic backgrounds (e.g., phenomenon relates to students from multiple backgrounds) and experiences of students, including honoring the ways they come to know science (e.g., Native American generational storytelling).	Evidence:	Rating:

Category 3 Criterium	Evidence Gathered	Rating
4. Instructional materials provide an intentional balance of a wide variety of activities within a unit (e.g., simulations, hands-on activities, readings, discourse, kinesthetic activities, field investigations, etc.) to support students' sense-making in the construction of explanations of the phenomena.	Evidence:	Rating:
5. Teacher resources provide scaffolds for full participation by students of all capabilities.	Evidence:	Rating:
6. Instructional materials provide appropriate accommodations and modifications to support all students in accessing information in the learning of science and engineering (e.g., reading strategies, accessing complex text, identifying language functions).	Evidence:	Rating:
7. Students have opportunities to express their understanding of phenomena using multiple modalities, including, but not limited to, discussing, writing, gesturing, and drawing.	Evidence:	Rating:
8. Instructional materials are available in multiple languages.	Evidence:	Rating:
9. Instructional materials provide opportunities for students to explore science and engineering career pathways that are connected to their lives through relevance and authenticity.	Evidence:	Rating:
10. Instructional materials integrate technology-based, value-added tools that address issues of equitable access and support the growth of digital literacy skills and engagement for all students.	Evidence:	Rating:

Category 3 Criterium	Evidence Gathered	Rating
11. Instructional materials include a global perspective, referencing work and innovations in the fields of science and technology done by people from different global societies and describing how different global communities experience, and are impacted by, science and engineering.	Evidence:	Rating:
12. Instructional materials involve students in ethical discussions about science innovations that have exploited groups in history, in order to engage in restorative justice and prevent similar situations in the future.	Evidence:	Rating:
13. Instructional materials engage students in ethical discussions related to the science and engineering topic being studied, including humankind's responsibility to the ecosystem, the ethical treatment of human subjects and vertebrate animals in research, and the ethical conduct of research.	Evidence:	Rating:
Total Score for Category 3:	**Points Possible: 52**	**% Score:**

Comments: **Personal % Score:**

CATEGORY 4: EVALUATION OF BIAS CONTENT

WHY: "As schools work to increase success for all students, it is important to recognize the impact of bias in classrooms, instructional materials, and teaching strategies. Evaluating for bias requires us to learn about others and to respect and appreciate the differences and similarities." – WA OSPI Equity & Civil Rights Task Force

WHAT: Criteria adapted from the Washington Models for the Evaluation of Bias Content in Instructional Materials, WA OSPI Equity & Civil Rights Task Force (Appendix A)

RUBRIC:
4: Superior Evidence; **3:** Strong Evidence; **2:** Moderate Evidence; **1:** Minimal Evidence; **0:** No Evidence

Instructions (Criteria 1-5):
The column categories are umbrella terms meant to encompass all examples to consider while reviewing the instructional materials. For categories represented, evaluate the level of evidence for each of the components: A: Gender; B: Sexual Orientation; C: Ethnicity; D: Culture; E: Physical Disability; F: Physical Characteristics; G: Age; H: Family Structure; I: Socioeconomic Status; J: Geographic Setting.

Category 4 Criterium	A	B	C	D	E	F	G	H	I	J	Average
1. Reflect qualities such as collaboration, compassion, intelligence, imagination, and courage.											
2. Represented as central characters in narratives and illustrations.											
3. Shown in active decision-making and leadership roles.											
4. Shown performing similar work in related fields.											
5. Referred to by their names and roles, not their characteristics.											

Category 4 Criterium	Evidence Gathered	Rating
6. Materials include historical and current contributions to science and engineering by members of non-dominant cultures.	Evidence:	Rating:
7. Groups are identified in gender-neutral language (example: 'firefighter' instead of 'fireman').	Evidence:	Rating:

Category 4 Criterium	Evidence Gathered	Rating
8. People of all genders are depicted in non-traditional as well as traditional roles in the family, at work, in leisure activities, and in attitude.	Evidence:	Rating:
9. Persons with disabilities are shown working and playing as equals with those around them.	Evidence:	Rating:
10. Where appropriate, instructional materials acknowledge when the dominant culture took credit for discoveries and work done by non-dominant cultures.	Evidence:	Rating:
Total Score for Category 4:	**Points Possible: 40**	**% Score:**

Comments: **Personal % Score:**

CATEGORY 5: INSTRUCTIONAL PLANNING AND SUPPORT

WHY: "[The District will] align instruction, mentoring, evaluation, and support to ensure each and every educator develops strong foundational teaching skills." – SPS Formula for Success

WHAT: "Educators must possess a repertoire of evidence-based instructional strategies in delivering the curriculum to develop talent, enhance learning, and provide students with the knowledge and skills to become independent, self-aware learners, and to give students the tools to contribute to a multicultural, diverse society. The curriculum, instructional strategies, and materials and resources must engage a variety of learners using culturally responsive practices." – The National Association for Gifted Children website

RUBRIC:
4: Superior Evidence; **3:** Strong Evidence; **2:** Moderate Evidence; **1:** Minimal Evidence; **0:** No Evidence

Category 5 Criterium	Evidence Gathered	Rating
1. Teacher support materials provide coherent learning progressions within and between units.	Evidence:	Rating:
2. The instructional program includes features that help teachers understand how the Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs) work together to support students' sense making.	Evidence:	Rating:
3. Instructional materials document how each unit aligns to English/Language Arts and Math Common Core State Standards.	Evidence:	Rating:
4. Instructional materials contain teacher guidance on how learning activities relate to the unit storyline and relevant phenomenon, including when in the unit to have students revise their thinking.	Evidence:	Rating:
5. The instructional program provides guidance to teachers on how to engage students in a variety of discourse strategies to support their three-dimensional learning.	Evidence:	Rating:

Category 5 Criterium	Evidence Gathered	Rating
6. Teachers are provided with a wide variety of engaging, student-centered learning activities that help students make sense of phenomena or in designing solutions to related problems.	Evidence:	Rating:
7. The instructional program contains teacher guidance, with annotations and suggestions, for how to successfully implement their units and daily lesson plans, including common issues that arise and how to respond to them.	Evidence:	Rating:
8. Instructional materials contain explanations of the instructional approaches of the program and identification of the research supporting the approach.	Evidence:	Rating:
9. Instructional materials include research on the effectiveness of the program.	Evidence:	Rating:
10. Teacher support materials provide background knowledge related to the scientific content and engineering design process in each lesson.	Evidence:	Rating:
11. Where applicable, teacher background knowledge materials include a global and local perspective.	Evidence:	Rating:
12. Teacher support materials identify common student preconceptions and suggestions for how to provide feedback and engage students in meaning-making that addresses these preconceptions.	Evidence:	Rating:
13. Teacher support materials ensure three-dimensional learning by identifying: opportunities for checking for understanding, when to revisit students' initial ideas, and methods of responsive instruction.	Evidence:	Rating:

Category 5 Criterium	Evidence Gathered	Rating
14. Teacher support materials provide regular updates to content, phenomena, assessments, and pedagogy.	Evidence:	Rating:
15. Instructional materials include a comprehensive list of consumable and non-consumable supplies needed, as well as a detailed list of preparation tasks, for each lesson.	Evidence:	Rating:
16. Instructional materials embed clear science safety guidelines for teachers and students across all lessons that are consistent with science safety rules and regulations, when appropriate, lab safety sheets are provided, and digital safety concerns and guidelines are addressed.	Evidence:	Rating:
17. Instructional materials designated for each course are appropriate for one semester, and teacher support materials contain suggested pacing for the semester.	Evidence:	Rating:
18. Instructional materials contain strategies for informing students, parents, and caregivers about the science program that are culturally respectful.	Evidence:	Rating:
19. Technology Criteria: a. Instructional materials encourage the meaningful use of digital technologies and tools (such as video clips, sensors, and computer simulations) to investigate and document phenomena that cannot be directly experienced in the classroom, as well as tools used to record, display, and analyze data.	Evidence:	Rating:
b. Instructional materials provide strategies for effective implementation and management of instructional technology tools.	Evidence:	Rating:

Category 5 Criterium	**Evidence Gathered**	**Rating**
c. Instructional materials include or reference digital technology that provides opportunities for teachers and students to collaborate with each other (e.g., websites, discussion groups, webinars, simulations, data visualization software, cloud-based collaborative tools, etc.).	Evidence:	Rating:
Electronic learning resources support instruction by: d. indicating which lessons require technology. e. having a well-designed user interface. f. providing technical support. g. including suggestions for appropriate use. h. including back up plans that do not require technology.	Evidence:	Rating:
Total Score for Category 5:	**Points Possible: 76**	**% Score:**

Comments: **Personal % Score:**

Attachment E: SPS Science Instructional Materials Adoption
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Category	% Score	X 100 =	Points	X	Weighting	=	Score
Category 1: Standards Alignment		**X 100 =**		**X**	**0.24**	**=**	
Category 2: Assessments		**X 100 =**		**X**	**0.20**	**=**	
Category 3: Inclusive Educational Practices		**X 100 =**		**X**	**0.17**	**=**	
Category 4: Evaluation of Bias Content		**X 100 =**		**X**	**0.16**	**=**	
Category 5: Instructional Planning and Support		**X 100 =**		**X**	**0.23**	**=**	

Program Total:
(attach any additional notes)

Comments:

Attachment F
High School Science Adoption Committee
Process, Protocol, and Results of Instructional Materials Review

In keeping with School Board Policy 2015, Selection and Adoption of Instructional Materials, and the commitment to provide all Seattle Public School students and teachers with the best possible high school science instructional materials and narrow the opportunity gap for historically underserved students, the School Board instructed the science content area of Curriculum, Assessment, and Instruction to launch a high school science instructional materials adoption in September 2018. The adoption process was carried out over a 9-month period and proceeded according to guidelines outlined in School Board Policy 2015. The process occurred in three phases: Stage 1, Field Test, and Stage 2 (see Attachment F).

In October of 2018, a high school Science Adoption Committee, comprised of teachers, school leaders, parents, professionals in STEM fields, and other community members, was selected through an application process to ensure a committee that represented the diversity of stakeholders in the District, including geography, race, ethnicity, gender, and age (see Attachment D).

Review Criteria Tool

The K-8 Adoption Committee members identified five categories and 74 specific criteria for evaluation of program candidates, based on the needs, priorities, data, and research that emerged from the following sources:

- 2013 Washington State Science Learning Standards (adopted from the 2013 Next Generation Science Standards)
- Preliminary Family/Community and Teacher/Staff Needs Assessment and input survey, which identified priorities around science materials, instruction, and learning in the District
- A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (National Research Council [NRC] of the National Academy of Sciences)
- The Educators Evaluating the Quality of Instructional Products Rubric (EQuIP) for Science
- Primary Evaluation of Essential Criteria (PEEC) for NGSS Instructional Materials Design
- California's Science Instructional Materials Rubric
- Anti-Bias Criteria Screen Tool outlined in Board Policy 2015
- Washington OSPI Equity & Civil Rights Task Force's Models for the Evaluation of Bias Content in Instructional Materials tool
- SPS Formula for Success

The first draft of the tool was created on May 4, 2018. A second version of tool was created after receiving initial K-8 Committee input on June 9, 2018 and June 13, 2018. A third version of the

tool was created by a subcommittee on June 26, 2018, continuing modifications suggested by the K-8 Committee as well as utilizing components of a draft version of a new, comprehensive rubric created by the nonprofit edReports.org. A fourth and final version resulted from a final review by the K-8 Adoption Committee in September of 2018. The categories were weighted, and a final draft of the Science Instructional Materials Review Criteria (see Attachment E) was presented to the SPS Instructional Materials Committee (IMC) for feedback and the final draft approved for use as the committee's evaluation tool of candidate programs.

The High School Adoption Committee used the K-8 version of the Review Criteria as the basis of their work to develop their own set of criteria. Revision work began at the Committee's meeting on October 27, 2018 and continued until the meeting on November 30, 2018.

The weighted review criteria categories included:

- Category 1: Standards Alignment (24%)
- Category 2: Assessments (20%)
- Category 3: Inclusive Educational Practices (17%)
- Category 4: Evaluation of Bias Content (16%)
- Category 5: Instructional Planning and Support (23%)

Stage 1: RFI

In October of 2018, vendors responded to the District's initial RFI, which targeted the following courses: BIO A, BIO B, CHEM A, CHEM B, PHYS A, and PHYS B. The following vendors sent formal responses:

Company	**Program**	**Course(s)**
Accelerate Learning, Inc.	STEMScopes	All courses
Bedford, Freeman & Worth (BFW)	Living By Chemistry	CHEM A / B
Michigan State University	Carbon TIME	BIO A
Discovery Education, Inc.	Discovery Science	All courses
Houghton Mifflin Harcourt (HMH)	HMH Science Dimensions	All courses
McGraw-Hill Education	Inspire Science	All courses
PASCO Scientific	Essential Physics Essential Chemistry	PHYS A, B CHEM A, B
Pearson Education, Inc.	Miller and Levine Biology Pearson Chemistry	BIO A, B CHEM A, B
University of Colorado Boulder	Physics through Evidence: Empowerment through Reasoning (PEER)	PHYS A, B

Two programs developed by District science teachers, in collaboration with university partners, were also presented to the Committee: one for BIO B and one for CHEM A.

Stage 1 Review Protocol

In December of 2018, the Committee worked collaboratively in small review teams to evaluate the program candidates, using the Science Instructional Materials Review Criteria. The Committee was split into 3- to 4-person teams, with three teams created for each of the three content areas: Biology, Chemistry, and Physics. These nine teams were also balanced between staff and community members. Each team reviewed a randomly-assigned program within their content area, using the Review Criteria Tool to record their scoring and supporting evidence. As teams completed their reviews, the data was digitally collected and collated for the record. The results of each review were kept confidential, so that subsequent reviews would not be influenced by the work of previous teams.

When evaluating a program, review teams assigned each criteria a quantitative score between 0 and 4, using the scoring rubric established by the Committee, and included annotations based on evidence collected directly from their review of the materials. The score was calculated for each category and weighted based on the above percentages. A total score was then calculated by the review team for that vendor program.

Due to the breadth and depth of the criteria contained within the five categories within the Review Criteria, a protocol was proposed in which a vendor program could be eliminated from consideration if two separate review teams, independent from each other and without knowledge of each other's work, reached consensus that the candidate program did not meet the minimum alignment to science standards or anti-bias content and should not be eligible for consideration. If this condition was met, the program would be eliminated from the candidate pool. The committee voted unanimously to approve this protocol as an amendment to the Review Criteria scoring protocol. After each candidate vendor program was reviewed by two independent review teams, the total scores for each vendor program were averaged and ranked (see Attachment F).

Stage 1: RFP Step 1

In December of 2018, vendors responded to Step 1 of the District's RFP process. All vendors still in consideration responded, however, Discovery Education and BFW were removed from consideration by Purchasing due to their failure to comply with the requirements of the RFP process. The Committee was informed of this development.

At the end of the first round of review, the following programs were eliminated from consideration based on the "two strikes" protocol:

Biology:

Company	**Program**	**Review Score (%)**
McGraw-Hill Education	Inspire Science	**21.6**

Chemistry:

Company	**Program**	**Review Score (%)**
Houghton Mifflin Harcourt (HMH)	HMH Science Dimensions	**27.3**
PASCO Scientific	Essential Chemistry	**11.8**
Pearson Education, Inc.	Pearson Chemistry	**7.2**

Physics:

Company	Program	Review Score (%)
Houghton Mifflin Harcourt (HMH)	HMH Science Dimensions	**17.3**
McGraw-Hill Education	Inspire Science	**27.7**
PASCO Scientific	Essential Physics	**5.2**

At the final stage of Round 1, the Committee met to review the materials still in consideration one final time, and to determine which programs to elevate to Round 2 and the Field Test component of the process. The Committee unanimously voted to elevate the following programs:

Company	Program	Course	Review Score (%)
Michigan State University	Carbon TIME	BIO A	**56.8**
SPS Teacher-Developed	BIO B Curriculum	BIO B	**52.1**
University of Colorado Boulder	PEER	PHYS A / B	**42.7**

The Committee voted to elevate the following programs for Chemistry, based on the voting below:

Company	Program	Course	Review Score (%)	Votes
SPS Teacher-Developed	CHEM A Curriculum	CHEM A	**35.1**	**11 yes, 1 no**
Accelerate Learning, Inc.	STEMScopes	CHEM A / B	**37.4**	**7 yes, 5 no**

The McGraw Hill program received a vote of 3 yes and 8 no, with 1 abstaining, and was therefore not elevated to the Field Test.

Stage 2: RFP Step 2 and Field Test

The finalist vendors were contacted by the District and asked to respond to RFP Step 2.

All SPS high school science teachers were invited to apply to participate in the High School Science Adoption field test pending principal approval and demonstration of understanding of the 2013 Washington State Science Learning Standards. 21 teachers and their students, representing a diversity of years in the profession, science background, gender, and ethnicity, were selected by the Adoption Coordinator to teach the field test unit in their classrooms. The field test classrooms included over 1000 students from 12 SPS middle and high school buildings located in multiple regions of the district, and represented Seattle Public Schools' diverse racial, ethnic, and socioeconomic groups and student populations, including English Language Learners, Special Education, HCC, and general education (see Attachment H).

The 21 field test teachers were instructed to implement and instruct a pre-selected unit from one of the three candidate programs. Units were selected along a common content area and set of Disciplinary Core Ideas (DCIs) to allow for a common frame of reference for evaluation. The units selected are detailed below:

Program	**Grade**	**Unit**	**# of Classrooms**
Carbon TIME	BIO A	Human Energy Systems	5
Teacher-Developed BIO B	BIO B	Development	3
Teacher-Developed CHEM A	CHEM A	Atomic Structure	4
PEER	PHYS A	Magnetism	4
PEER	PHYS B	Energy	3
STEMScopes	CHEM A	Atomic Structure	4
STEMScopes	CHEM B	Periodic Trends	3

Field test teachers received a full day of training from the vendor including follow-up time to plan and calendar their unit with their field test colleagues.

Field test teachers were given the following guidelines and expectations for field test participation in order to ensure the validity of the field test and provide multiple data collection opportunities (see Attachment I) about each candidate program:

- Implement the unit with as much fidelity as possible
- Submit feedback via digital survey platform on a weekly basis about the effectiveness of learning activities, standards alignment, and student engagement.
- Work with the Adoption Coordinator and Science Curriculum Specialists to schedule a lesson observation and participate in a post-observation interview
- Select a small student focus group to be interviewed about their experience with the field test unit
- Have all students participating in the field test complete an end-of-unit student survey around the following attributes:
    - Engagement in standards-aligned science practices

    - Using instructional materials that are organized around a conceptual storyline and anchored by a puzzling science phenomena problem to solve
    - Sharing science ideas through student discourse
    - Relevance in science learning
    - Equity, Identity, and Disposition
- Administer and score the provided pre-unit and post-unit assessments and record student scores to quantify student growth
- Participate in a panel interview session with the Adoption Committee

The following schools were involved in the Field Test:

School	**Field Test(s)**
Ballard High School	PHYS A, PHYS B
The Center School	BIO A, BIO B, PHYS B
Chief Sealth International High School	CHEM A, PHYS A, PHYS B
Cleveland High School	CHEM A
Franklin High School	BIO A, BIO B, CHEM A, CHEM B, PHYS A
Garfield High School	BIO A
Hamilton International Middle School	BIO A (HCC), CHEM A (HCC)
Jane Addams Middle School	PHYS A (HCC)
Nathan Hale High School	CHEM A
Rainier Beach High School	CHEM A, CHEM B
Robert Eagle Staff Middle School	CHEM A (HCC)
Roosevelt High School	BIO B

Stage 2: Committee Final Recommendations

During the course of final review and analysis of all data collected for each candidate program, Adoption Committee members completed a survey in which they provided input about how each category of data collected during Stage 1 and the Field Test Stage of the adoption process should be weighted (see Attachment J), for each separate course. When the Committee member input was averaged, the weights were assigned to each data set as follows:

Course	**Review Criteria**	**Field Test Data**	**Public Input**
BIO A	34.0%	55.9%	10.1%
BIO B	33.6%	63.9%	2.5%
CHEM A	33.4%	52.5%	14.1%
CHEM B	33.6%	60.0%	6.4%
PHYS A and B	38.2%	56.6%	5.2%

On March 13 and 16, 2019, the Adoption Committee participated in panel interview sessions with the field test teachers of each candidate program. Each field test reported to the Committee about their experience implementing the candidate program they field tested and their perception of their students' experience, and to provide input and feedback about the instructional materials in that program. In the panel interview, field test teachers were asked a set of 23 questions aligned with Science Instructional Materials Review Criteria categories and criteria by the Adoption Coordinator. Adoption Committee members were allowed to ask follow-up questions of the field test panels. Committee members were instructed to record notes during the panel interview for each candidate program as a source of evidence about the outcomes of the field test stage of the adoption.

Following each teacher panel, the Adoption Committee worked in small teams to review additional data sources generated from the Field Test stage for evidence of alignment with the Science Instructional Materials Review Criteria, including post-observation teacher interviews, student focus group interviews, end-of-unit student attribute surveys, and student growth data as measured by pre and post-unit assessments. Committee members worked in review teams to collectively synthesize and review all of the data then assign each program a Field Test score between 0 and 4 in each of the five categories in the Science Instructional Materials Review Criteria (see Attachment E). The score for each category was weighted then tallied and reported as a consensus score.

Committee members then reviewed input from the public. Members of school communities and the public were invited to review instructional materials from each vendor program under consideration for adoption and to provide input about these materials. The input forms were collected through the SPS Science Adoption website, at one of the five instructional materials public display site across the district, and at two open house information sessions. Of the Community Input Forms submitted, 1 was completed for PEER (PHYS A), 2 for Carbon TIME (BIO A), and 1 for Teacher-Developed CHEM A. Although the amount of data generated for each vendor program was very small, review teams analyzed the input forms for each finalist vendor program and assigned a Public Input score between 0 and 4 in each of the five categories in the Science Instructional Materials Review Criteria (see Attachment E) based on the comments. The score for each category was weighted then tallied and reported as a consensus score.

Each committee review team calculated their weighted consensus scores for the Review Criteria scores from Stage 1, the Field Test data, and the Public Input data including annotated evidence collected from the data to support their scores. Each review team reported their scores and supporting evidence as to the other committee review teams. The committee identified patterns and trends across all review team reports and each review team tallied their three final scores to report a total score for each candidate finalist program. The Adoption Committee then proceeded to the decision-making phase. Adoption Committee members agreed to an anonymous vote to either identify a single finalist for recommendation for adoption to the school board for each of the courses or to recommend no Adoption.

Based on the synthesis and summary of all data reviewed by the committee and the final scores reported, PEER was recommended for Adoption for PHYS A and PHYS B; Carbon TIME was recommended for Adoption for BIO A; Teacher-Developed curriculum was recommended for Adoption for BIO B; and Teacher-Developed curriculum was recommended for Adoption for CHEM A. The Committee did not recommend Adoption of a curriculum for CHEM B at this

time. The Committee also moved to recommend that the Board provide funding to support teacher collaboration through professional development in support of continuing work on the Teacher-Developed curriculum for both CHEM A and CHEM B.

Attachment G 1:
Community Input Form Summary Report

CARBON TIME (BIO A)

Community members were invited to complete a yes/no survey, containing some of the major criteria within each of the five categories of the Review Criteria. Comments are included below each response.
Percentages are calculated only when there are one or fewer blanks for a category and do not include the blank in the calculation.

Vendor:	**Carbon TIME (BIO A)**			
	Yes	**No**	**Blank**	**%**
1: Standards Alignment (8 criteria)	6	1	1	**85.7%**
2: Assessments (6 criteria)	5	0	1	**100%**
3: Inclusive Educational Practices (6 criteria)	2	0	4	**-**
4: Evaluation of Bias Content (7 criteria)	0	0	7	**-**
5: Instructional Planning & Support (10 criteria)	6	0	4	**-**
How well do you feel this program meets the high expectations we have set to provide all our students with an equitable, authentic science experience?				Well
What did we not ask that you feel is important in the decision-making process?				N/A

Vendor:	**Carbon TIME (BIO A)**			
	Yes	**No**	**Blank**	**%**
1: Standards Alignment (8 criteria)	7	1	0	**87.5%**
2: Assessments (6 criteria)	6	0	0	**100.0%**
3: Inclusive Educational Practices (6 criteria)	3	1	2	**-**
4: Evaluation of Bias Content (7 criteria)	2	0	5	**-**
5: Instructional Planning & Support (10 criteria)	6	0	4	**-**
How well do you feel this program meets the high expectations we have set to provide all our students with an equitable, authentic science experience?				Well
What did we not ask that you feel is important in the decision-making process?				N/A

Vendor:	**CHEM A Teacher-Developed** *(comments included Carbon TIME reference)*
What did we not ask that you feel is important in the decision-making process?	
Chemistry can get really boring, reading textbooks then answering questions. The teacher-developed curriculum is much more engaging and exciting, the chemistry can be applied to real life, connecting science to real world things. As a student, it makes all the concepts all the more interesting. I really liked the story and connections to real life in Biology with Carbon TIME. That was the first time that I was <u>really</u> excited about science in school. The teacher-developed curriculum seems way more interesting and similar to Biology. It would be great if the excitement and interest could continue into Chemistry.	

Attachment G3:
Community Input Form Summary Report

TEACHER DEVELOPED (CHEM A)

Community members were invited to complete a yes/no survey, containing some of the major criteria within each of the five categories of the Review Criteria. Comments are included below each response.
Percentages are calculated only when there are one or fewer blanks for a category and do not include the blank in the calculation.

Vendor:	**CHEM A Teacher-Developed**			
	Yes	**No**	**Blank**	**%**
1: Standards Alignment (8 criteria)	0	0	8	-
2: Assessments (6 criteria)	0	0	6	-
3: Inclusive Educational Practices (6 criteria)	0	0	6	-
4: Evaluation of Bias Content (7 criteria)	0	0	7	-
5: Instructional Planning & Support (10 criteria)	0	0	10	-
How well do you feel this program meets the high expectations we have set to provide all our students with an equitable, authentic science experience?				N/A
What did we not ask that you feel is important in the decision-making process?				
Chemistry can get really boring, reading textbooks then answering questions. The teacher-developed curriculum is much more engaging and exciting, the chemistry can be applied to real life, connecting science to real world things. As a student, it makes all the concepts all the more interesting. I really liked the story and connections to real life in Biology with Carbon TIME. That was the first time that I was <u>really</u> excited about science in school. The teacher-developed curriculum seems way more interesting and similar to Biology. It would be great if the excitement and interest could continue into Chemistry.				

Attachment G4:
Community Input Form Summary Report

PEER (PHYS A and PHYS B)

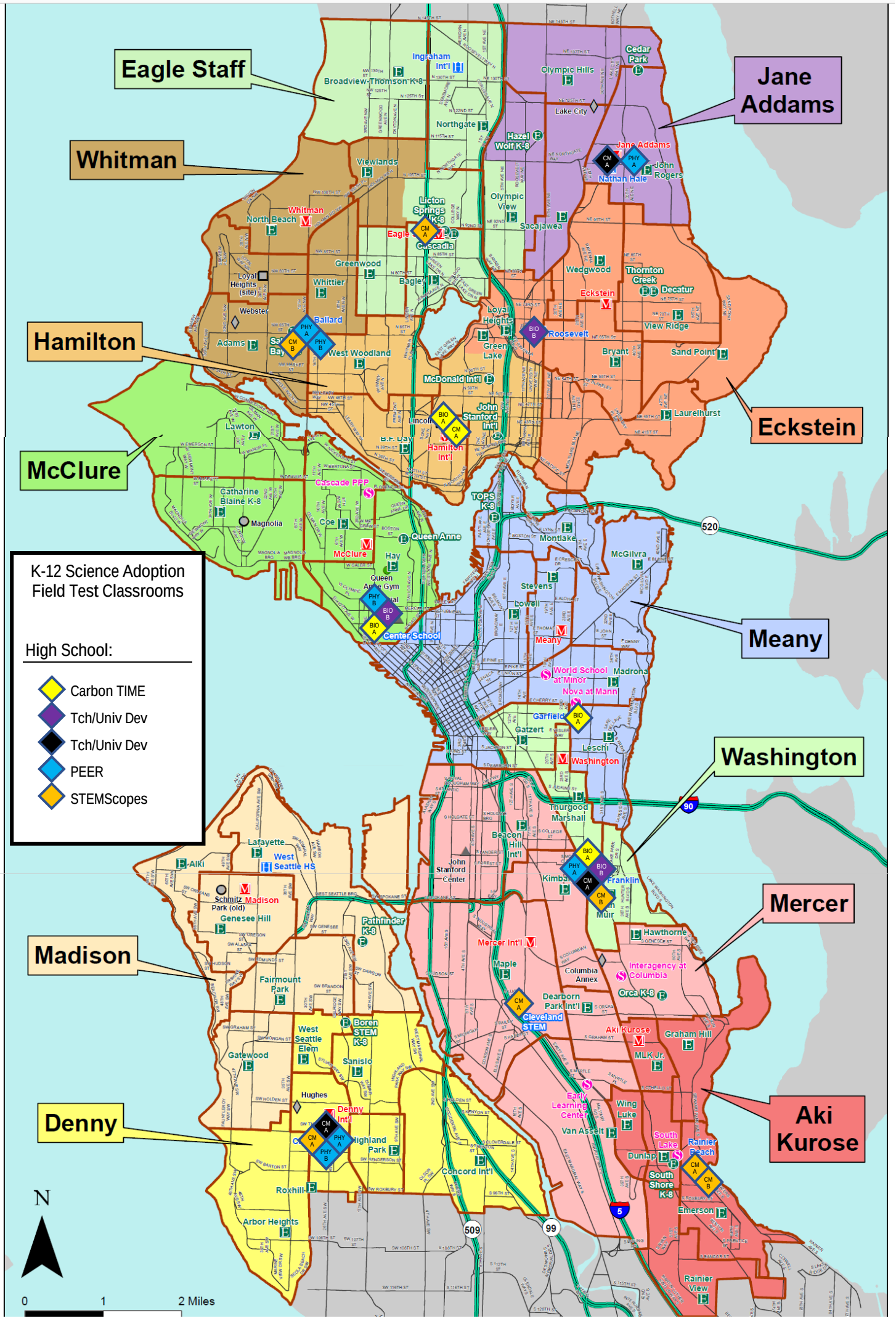
Community members were invited to complete a yes/no survey, containing some of the major criteria within each of the five categories of the Review Criteria. Comments are included below each response.

Vendor:	**PEER**		
[Not scored]	**Yes**	**No**	**Blank**
1: Standards Alignment (8 criteria)	0	0	8
2: Assessments (6 criteria)	0	0	6
3: Inclusive Educational Practices (6 criteria)	0	0	6
4: Evaluation of Bias Content (7 criteria)	0	0	7
5: Instructional Planning & Support (10 criteria)	0	0	10
How well do you feel this program meets the high expectations we have set to provide all our students with an equitable, authentic science experience?			Well
What did we not ask that you feel is important in the decision-making process?			
I only know about PHYS A, but it seems great. I am worried about the math in PHYS B. You do need to see the intersection. But PHYS A has been great for my mathy 7th grade HCC student.			

Attachment H: Field Test Schools and Teachers

Vendor	School	Demographics	Teacher	Grade / Course
Carbon TIME	Garfield HS	42.9% White 27.7% Low-income 4.8% EL	Stever	BIO A
Carbon TIME	Center School	72.3% White 10.0% Low-income 0.4% EL	Peterson	BIO A
Carbon TIME	Hamilton Intl MS	70.0% White 9.0% Low-income 1.4% EL	Peterson	BIO A
Carbon TIME	Franklin HS	8.1% White 63.3% Low-income 18.8% EL	Katzaroff	BIO A
Carbon TIME	Franklin HS	8.1% White 63.3% Low-income 18.8% EL	Craig	BIO A
Chemistry A TD	Nathan Hale HS	52.2% White 30.9% Low-income 8.7% EL	Robinson	CHEM A
Chemistry A TD	Hamilton/Lincoln	70.0% White 9.0% Low-income 1.4% EL	Vermaak	CHEM A
Chemistry A TD	Chief Sealth HS	23.8% White 60.8% Low-income 14.6% EL	Field	CHEM A
Chemistry A TD	Franklin HS	8.1% White 63.3% Low-income 18.8% EL	Tashima-Boyd	CHEM A
Genetics TD	Center School	72.3% White 10.0% Low-income 0.4% EL	Peterson	BIO B
Genetics TD	Roosevelt HS	68.7% White 9.2% Low-income 2.6% EL	Coulthard	BIO B
Genetics TD	Franklin HS	8.1% White 63.3% Low-income 18.8% EL	Craig	BIO B
PEER	Ballard HS	74.7% White 9.2% Low-income 2.2% EL	Lozen	PHYS A

Vendor	School	Demographics	Teacher	Grade / Course
PEER	Jane Addams MS	56.5% White 23.7% Low-income 7.3% EL	Grevstad	PHYS A
PEER	Chief Sealth HS	23.8% White 60.8% Low-income 14.6% EL	Field	PHYS A
PEER	Franklin HS	8.1% White 63.3% Low-income 18.8% EL	Tashima-Boyd	PHYS A
PEER	Center School	72.3% White 10.0% Low-income 0.4% EL	Scilletta	PHYS B
PEER	Ballard HS	74.7% White 9.2% Low-income 2.2% EL	Lozen	PHYS B
PEER	Chief Sealth HS	23.8% White 60.8% Low-income 14.6% EL	Jacobs	PHYS B
STEMScopes	Robert Eagle Staff MS	59.3% White 24.2% Low-income 5.9% EL	Conley	CHEM A
STEMScopes	Chief Sealth HS	23.8% White 60.8% Low-income 14.6% EL	Niel	CHEM A
STEMScopes	Rainier Beach HS	3.2% White 72.2% Low-income 25.2% EL	Goldman	CHEM A
STEMScopes	Cleveland HS	7.8% White 54.5% Low-income 9.5% EL	Kastl	CHEM A
STEMScopes	Ballard HS	74.7% White 9.2% Low-income 2.2% EL	Povey	CHEM B
STEMScopes	Rainier Beach HS	3.2% White 72.2% Low-income 25.2% EL	Tocchi	CHEM B
STEMScopes	Franklin HS	8.1% White 63.3% Low-income 18.8% EL	Larson	CHEM B


Eagle Staff
Whitman
Hamilton
McClure
Jane Addams
Eckstein
Meany
Washington
Mercer
Aki Kurose
Denny
Madison
K-12 Science Adoption Field Test Classrooms
High School:
Carbon TIME
Tch/Univ Dev
Tch/Univ Dev
PEER
STEMScopes
Ingraham Int'l
Broadview-Thomson K-8
Olympic Hills
Cedar Park
Lake City
Northgate
Hazel Wolf K-8
Jane Addams
Nathan Hale
John Rogers
Viewlands
Olympic View
Sacajawea
Licton Springs K-8
Cascadia
Eagle
Whitman
North Beach
Greenwood
Whittier
Bagley
Loyal Heights (site)
Webster
Ballard
Adams
Salmon Bay
West Woodland
Wedgwood
Thornton Creek
Decatur
Eckstein
View Ridge
Loyal Heights
Roosevelt
Green Lake
Bryant
Sand Point
Laurelhurst
McDonald Int'l
John Stanford Int'l
Lincoln
Hamilton Int'l
Lawton
B.F. Day
Catharine Blaine K-8
Cascade PPP
Magnolia
Coe
Queen Anne
McClure
Hay
Queen Anne Gym
Center School
TOPS K-8
Montlake
McGilvra
Stevens
Lowell
Meany
World School at Minor
Madrona
Nova at Mann
Garfield
Gatzert
Leschi
Washington
520
90
Thurgood Marshall
Beacon Hill Int'l
John Stanford Center
Kimball
Franklin
Muir
Lafayette
West Seattle HS
Alki
Schmitz Park (old)
Madison
Genesee Hill
Pathfinder K-9
Mercer Int'l
Hawthorne
Maple
Columbia Annex
Interagency at Columbia
Orca K-8
Dearborn Park Int'l
Cleveland STEM
Aki Kurose
Graham Hill
MLK Jr.
Fairmount Park
Boren STEM K-9
West Seattle Elem
Sanislo
Gatewood
Early Learning Center
Wing Luke
Van Asselt
South Lake
Rainier Beach
Dunlap
South Shore K-8
Emerson
Rainier View
Hughes
Denny Int'l
Highland Park
Concord Int'l
Roxhill
Arbor Heights
509
99
5
N
0
1
2 Miles

ATTACHMENT I: TABLE OF CONTENTS

Attachment I.1: Field Test Summary Scores for BIO A

On March 16, 2019, the Adoption Committee worked in small teams to review additional data sources generated from the Field Test stage for evidence of alignment with the Science Instructional Materials Review Criteria, including post-observation teacher interviews, student focus group interviews, end-of-unit student attribute surveys, and student growth data as measured by pre- and post-unit assessments. Combining this new data with their notes from the Field Test teacher panels, the Committee members collaborated in their teams to collectively synthesize and review all the data for each program to reach consensus on a Field Test score between 0 and 4 in each of the five categories detailed in the Science Instructional Materials Review Criteria (see Attachment E). The score for each category was weighted as previously determined on the Review Criteria, then tallied and reported as a consensus score. These scores are provided below.

Results: Carbon TIME Field Test

Team	**Consensus Score**
Team A	72.5
Team B	72.0
Team C	69.9
Team D	79.0
Team E	58.3
Team F	79.8
Team G	81.0
Team H	80.8
Average	**74.2**

Attachment I.1: Field Test Summary Scores for BIO B

On March 16, 2019, the Adoption Committee worked in small teams to review additional data sources generated from the Field Test stage for evidence of alignment with the Science Instructional Materials Review Criteria, including post-observation teacher interviews, student focus group interviews, end-of-unit student attribute surveys, and student growth data as measured by pre- and post-unit assessments. Combining this new data with their notes from the Field Test teacher panels, the Committee members collaborated in their teams to collectively synthesize and review all the data for each program to reach consensus on a Field Test score between 0 and 4 in each of the five categories detailed in the Science Instructional Materials Review Criteria (see Attachment E). The score for each category was weighted as previously determined on the Review Criteria, then tallied and reported as a consensus score. These scores are provided below.

Results: Teacher-Developed Curriculum Field Test

Team	**Consensus Score**
Team A	74.0
Team B	71.0
Team C	76.8
Team D	88.0
Team E	84.8
Team F	74.6
Team G	82.8
Team H	86.5
Average	**79.8**

Attachment I.1: Field Test Summary Scores for CHEM A

On March 16, 2019, the Adoption Committee worked in small teams to review additional data sources generated from the Field Test stage for evidence of alignment with the Science Instructional Materials Review Criteria, including post-observation teacher interviews, student focus group interviews, end-of-unit student attribute surveys, and student growth data as measured by pre- and post-unit assessments. Combining this new data with their notes from the Field Test teacher panels, the Committee members collaborated in their teams to collectively synthesize and review all the data for each program to reach consensus on a Field Test score between 0 and 4 in each of the five categories detailed in the Science Instructional Materials Review Criteria (see Attachment E). The score for each category was weighted as previously determined on the Review Criteria, then tallied and reported as a consensus score. These scores are provided below.

Results: STEMScopes Field Test

Team	**Consensus Score**
Team A	29.5
Team B	31.5
Team C	18.1
Team D	21.7
Team E	18.9
Team F	21.0
Team G	21.0
Team H	21.0
Average	**22.8**

Results: Teacher-Developed Curriculum Field Test

Team	**Consensus Score**
Team A	71.0
Team B	69.4
Team C	86.0
Team D	79.9
Team E	78.3
Team F	85.6
Team G	71.0
Team H	78.5
Average	**77.5**

Attachment I.1: Field Test Summary Scores for PHYS A and B

On March 13, 2019, the Adoption Committee worked in small teams to review additional data sources generated from the Field Test stage for evidence of alignment with the Science Instructional Materials Review Criteria, including post-observation teacher interviews, student focus group interviews, end-of-unit student attribute surveys, and student growth data as measured by pre- and post-unit assessments. Combining this new data with their notes from the Field Test teacher panels, the Committee members collaborated in their teams to collectively synthesize and review all the data for each program to reach consensus on a Field Test score between 0 and 4 in each of the five categories detailed in the Science Instructional Materials Review Criteria (see Attachment E). The score for each category was weighted as previously determined on the Review Criteria, then tallied and reported as a consensus score. These scores are provided below.

Results: PEER Field Test for both PHYS A and B

Team	**Consensus Score**
Team A	90.0
Team B	76.0
Team C	73.8
Team D	68.8
Team E	66.8
Team F	85.0
Team G	72.5
Average	**76.1**

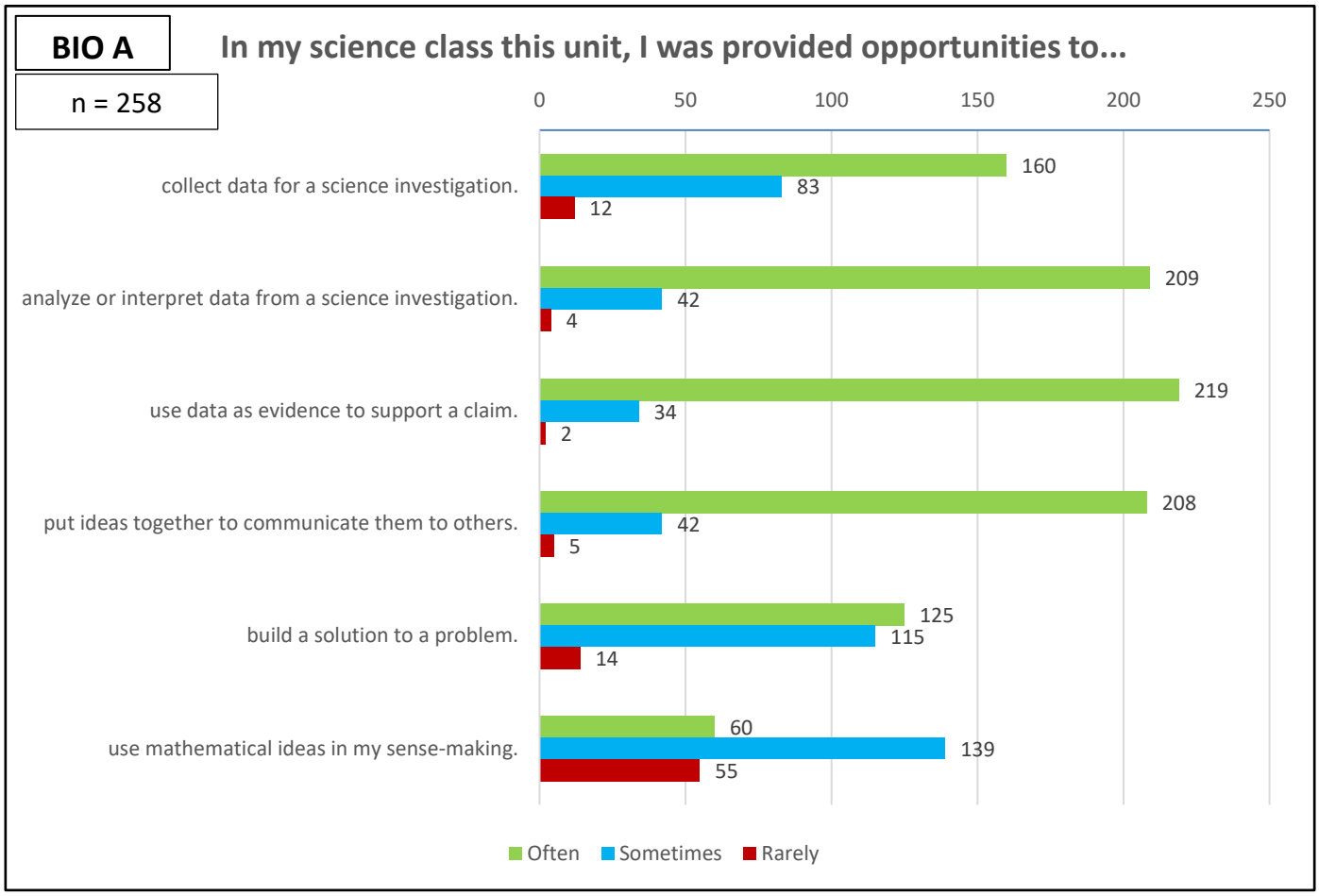
Attachment I.1: Field Test Summary Scores for CHEM B

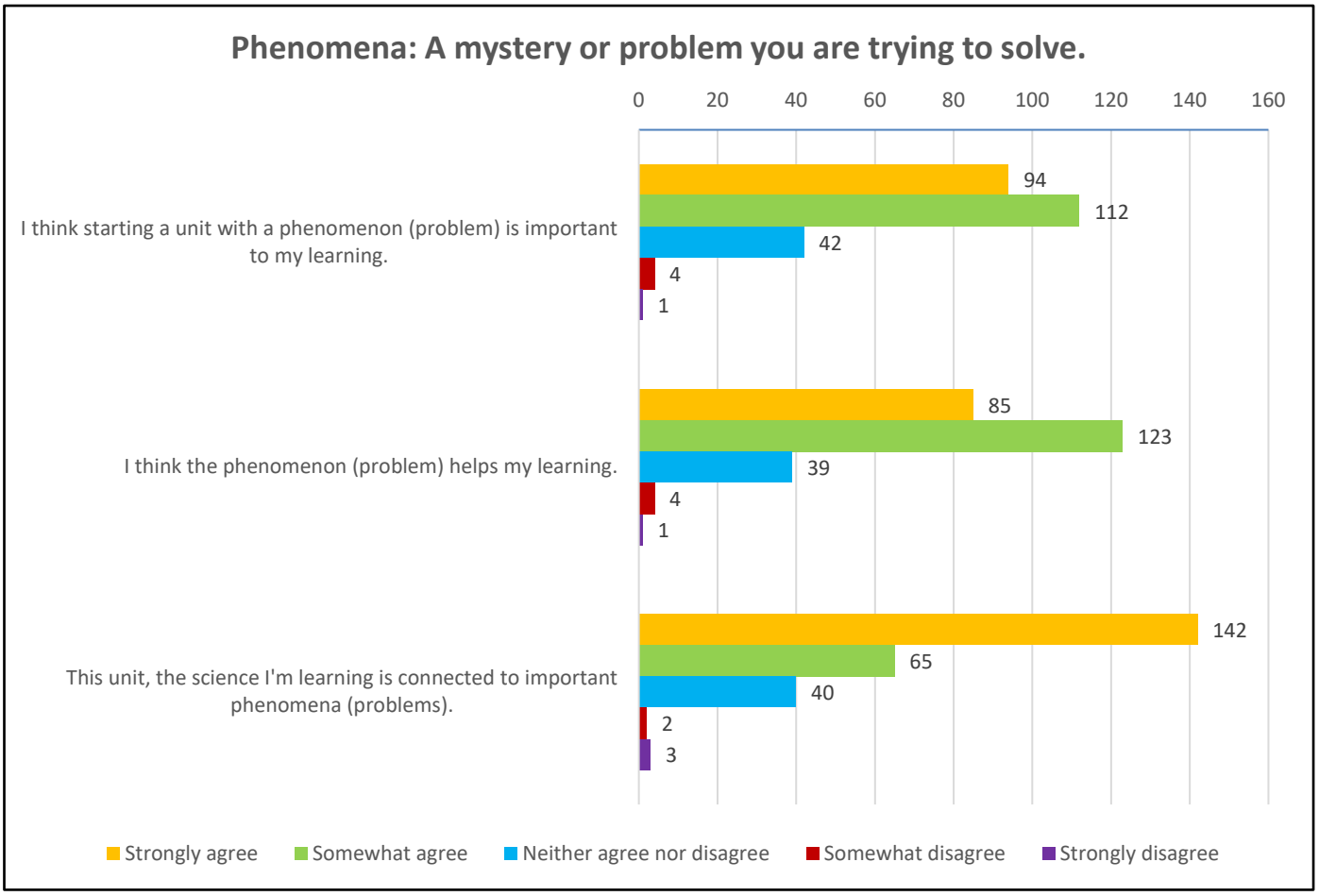
On March 16, 2019, the Adoption Committee worked in small teams to review additional data sources generated from the Field Test stage for evidence of alignment with the Science Instructional Materials Review Criteria, including post-observation teacher interviews, student focus group interviews, end-of-unit student attribute surveys, and student growth data as measured by pre- and post-unit assessments. Combining this new data with their notes from the Field Test teacher panels, the Committee members collaborated in their teams to collectively synthesize and review all the data for each program to reach consensus on a Field Test score between 0 and 4 in each of the five categories detailed in the Science Instructional Materials Review Criteria (see Attachment E). The score for each category was weighted as previously determined on the Review Criteria, then tallied and reported as a consensus score. These scores are provided below.

Results: STEMScopes Field Test

Team	**Consensus Score**
Team A	27.0
Team B	31.5
Team C	18.1
Team D	15.1
Team E	25.5
Team F	21.0
Team G	20.5
Team H	21.0
Average	**22.5**

Attachment I.2

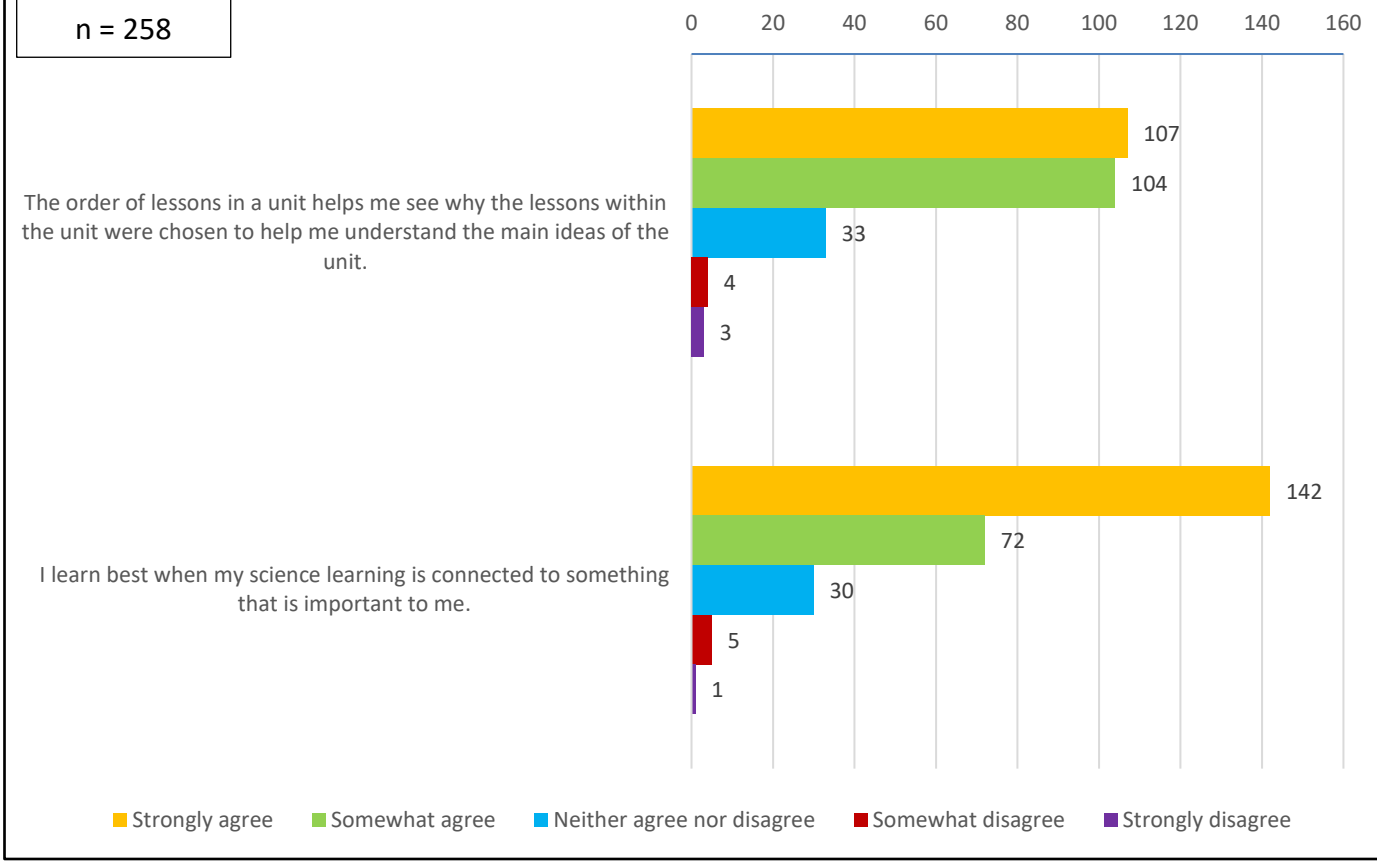




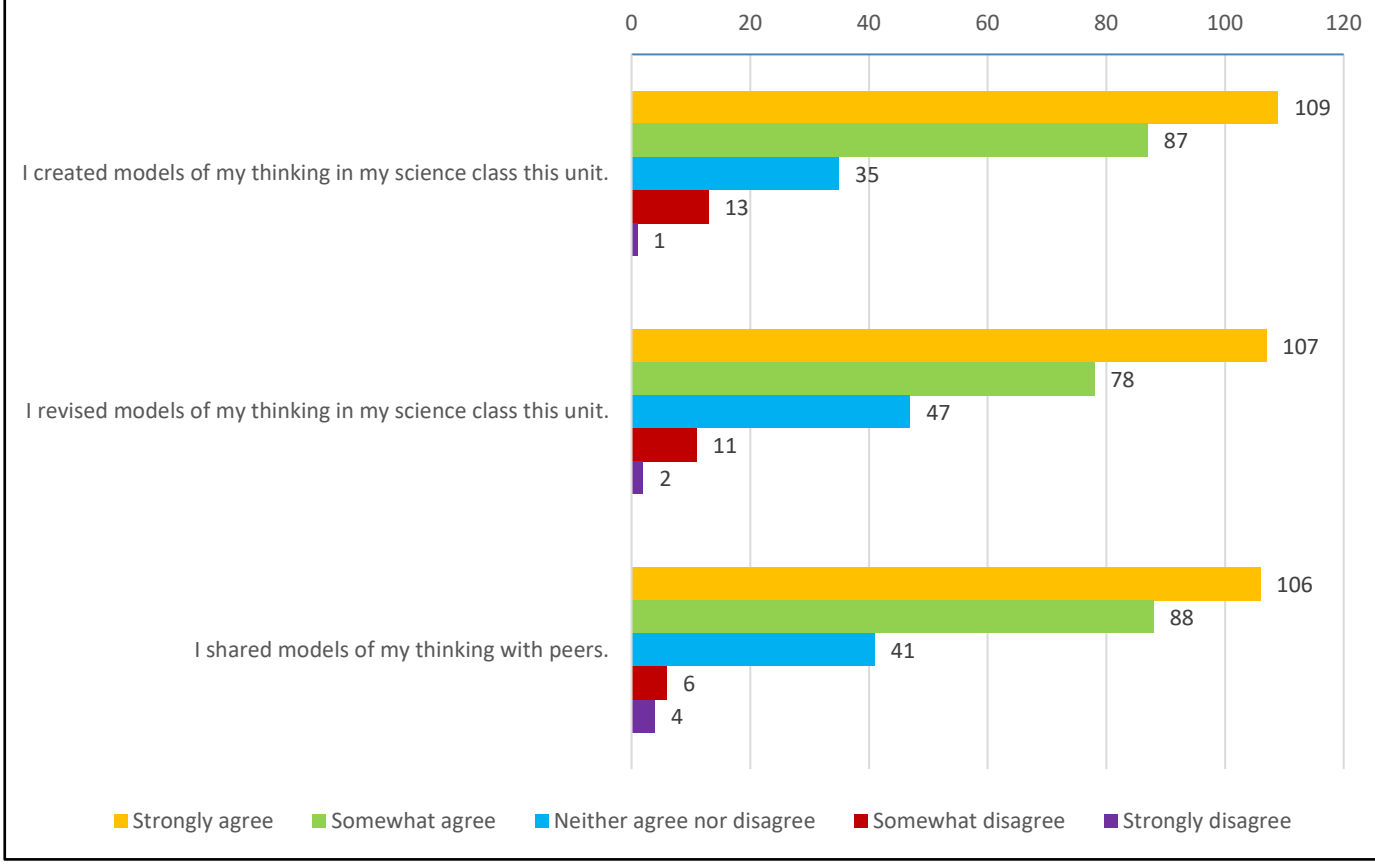
BIO A

n = 258

Storylining



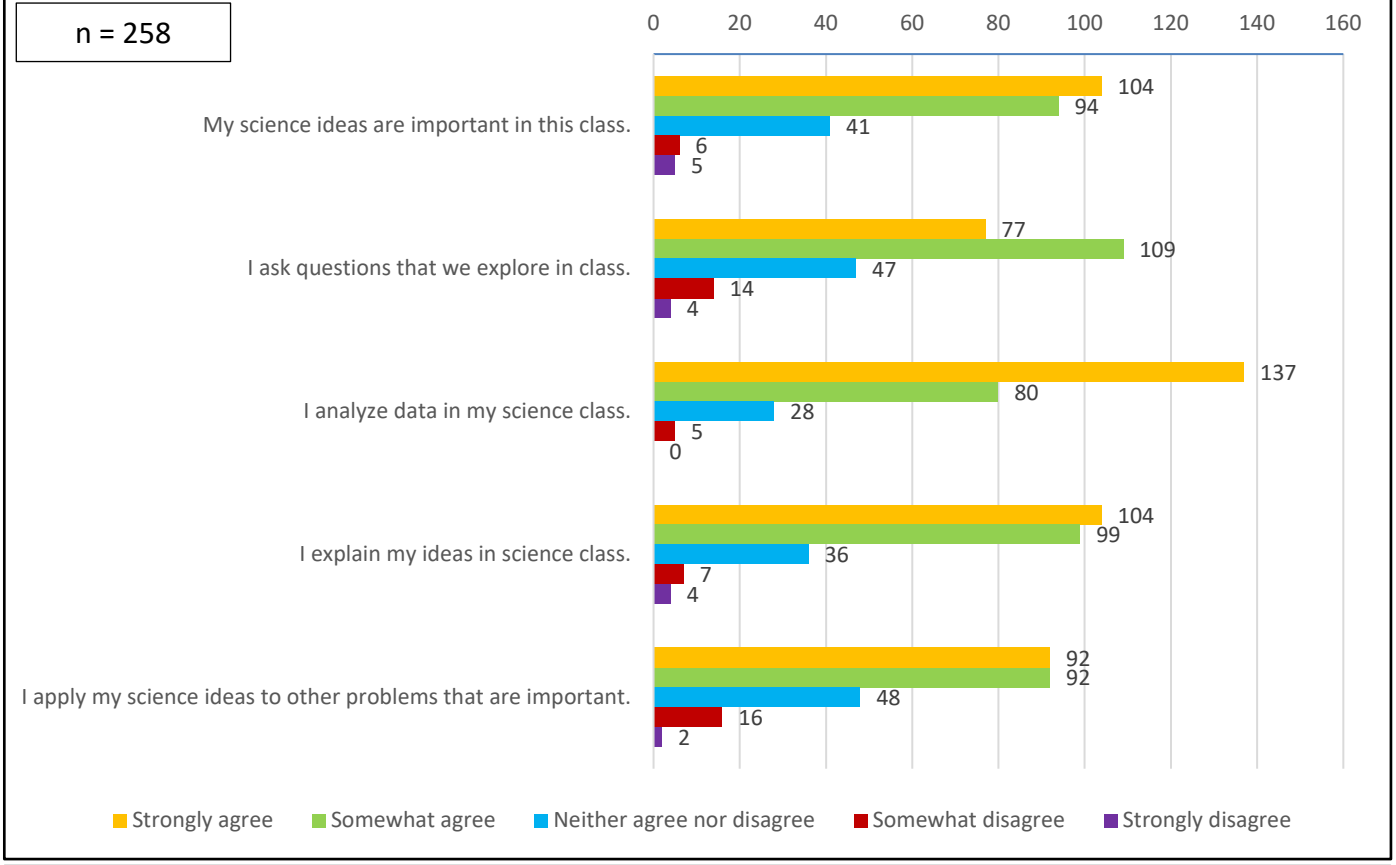
Modeling



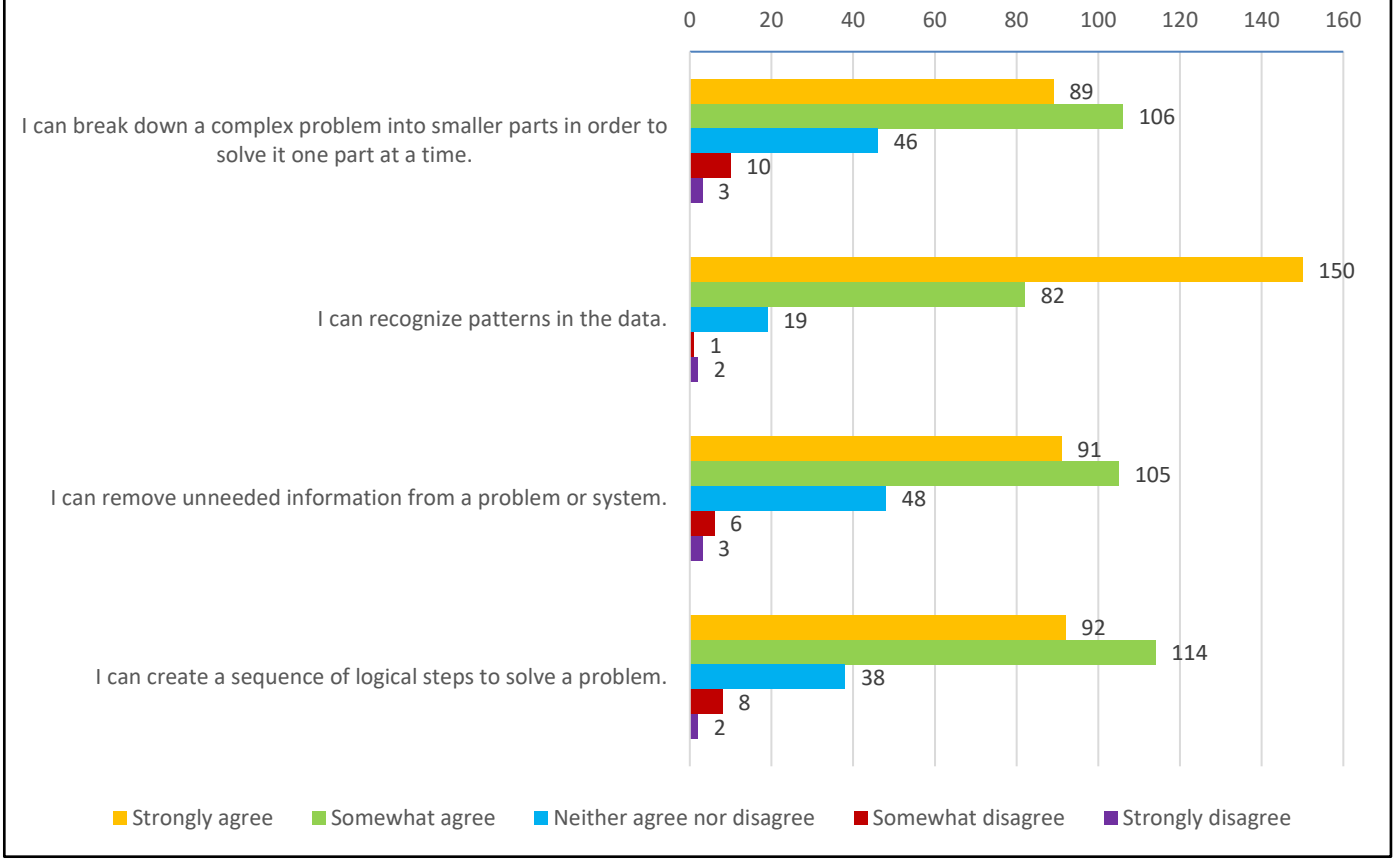
BIO A

n = 258

Science Ideas & Doing Science



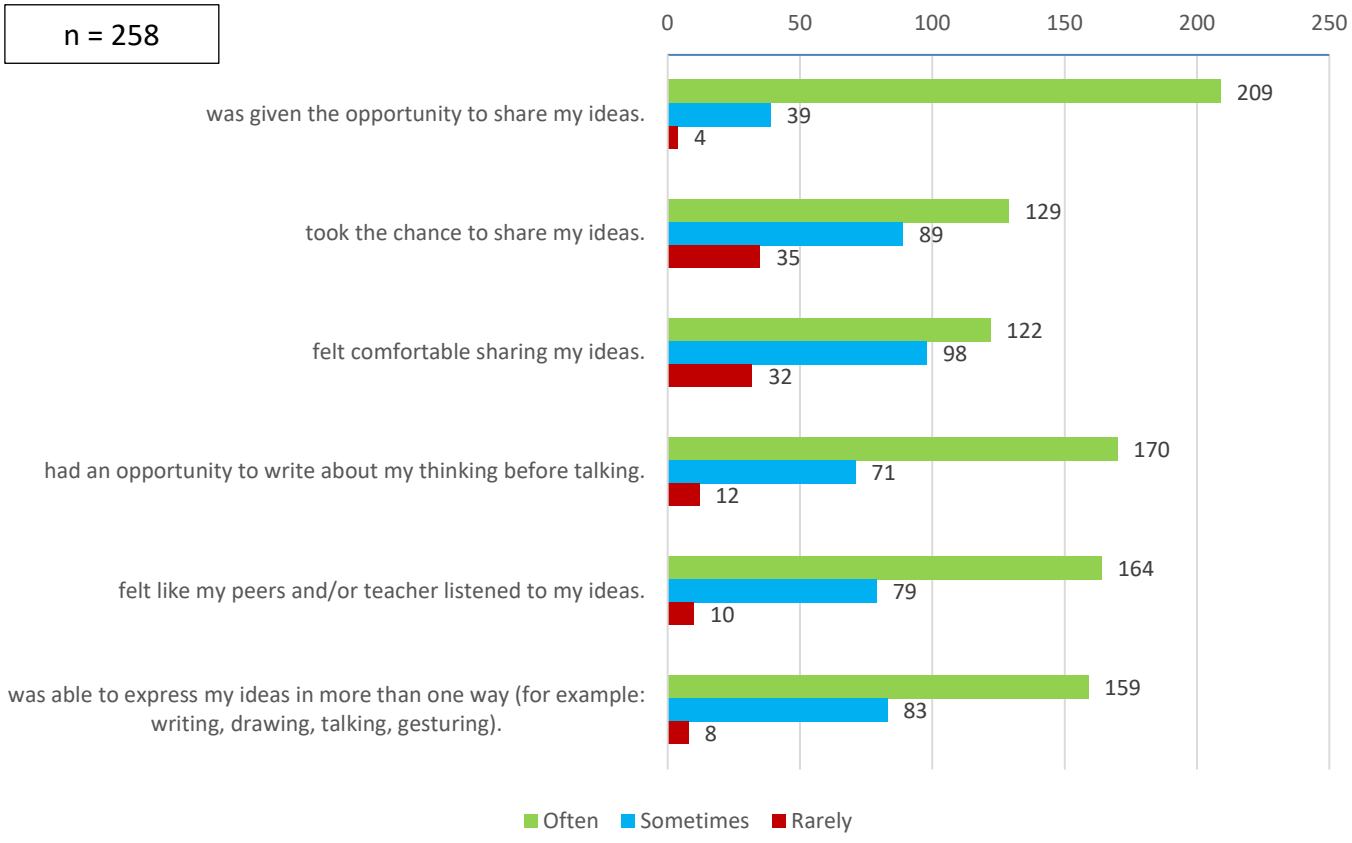
Computational Thinking



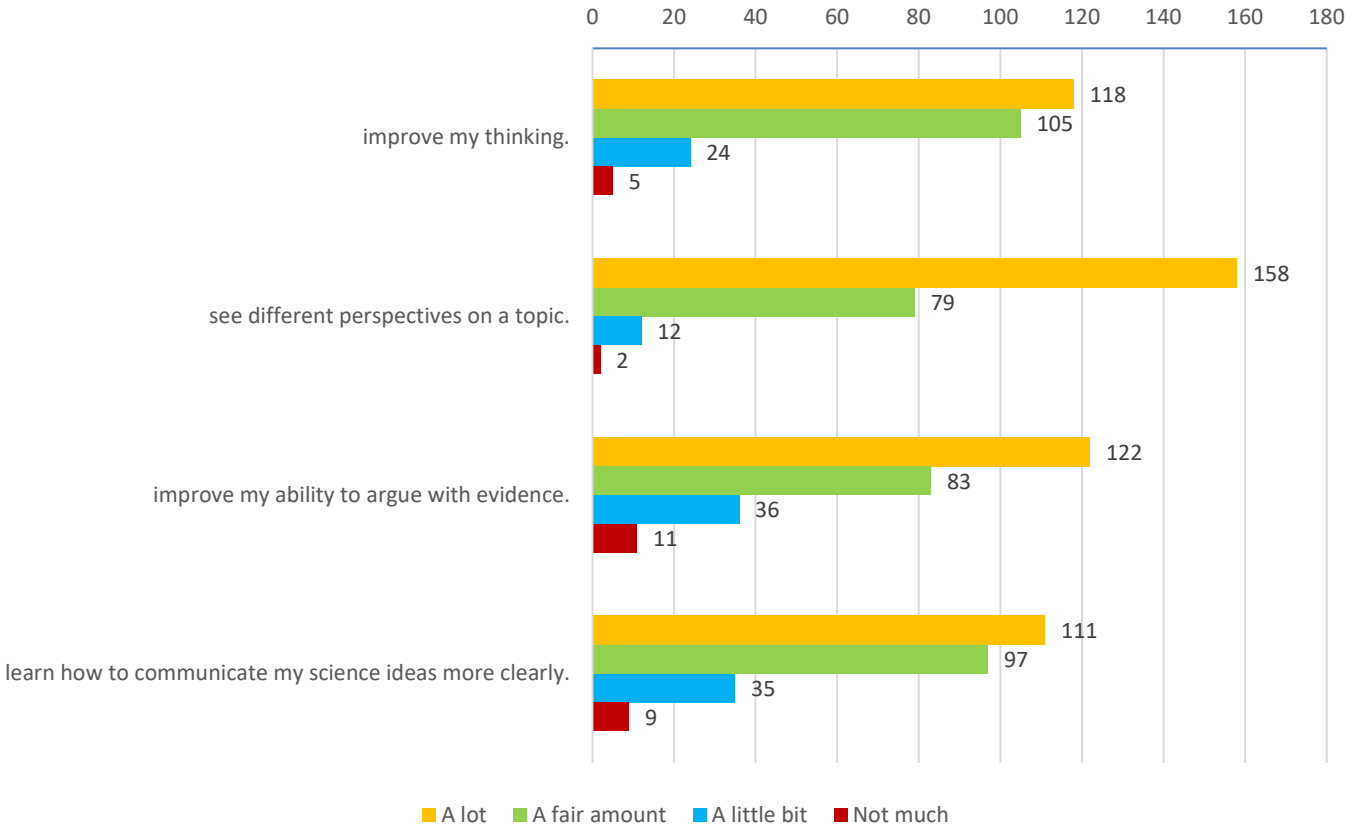
BIO A

n = 258

In science class this unit, I...

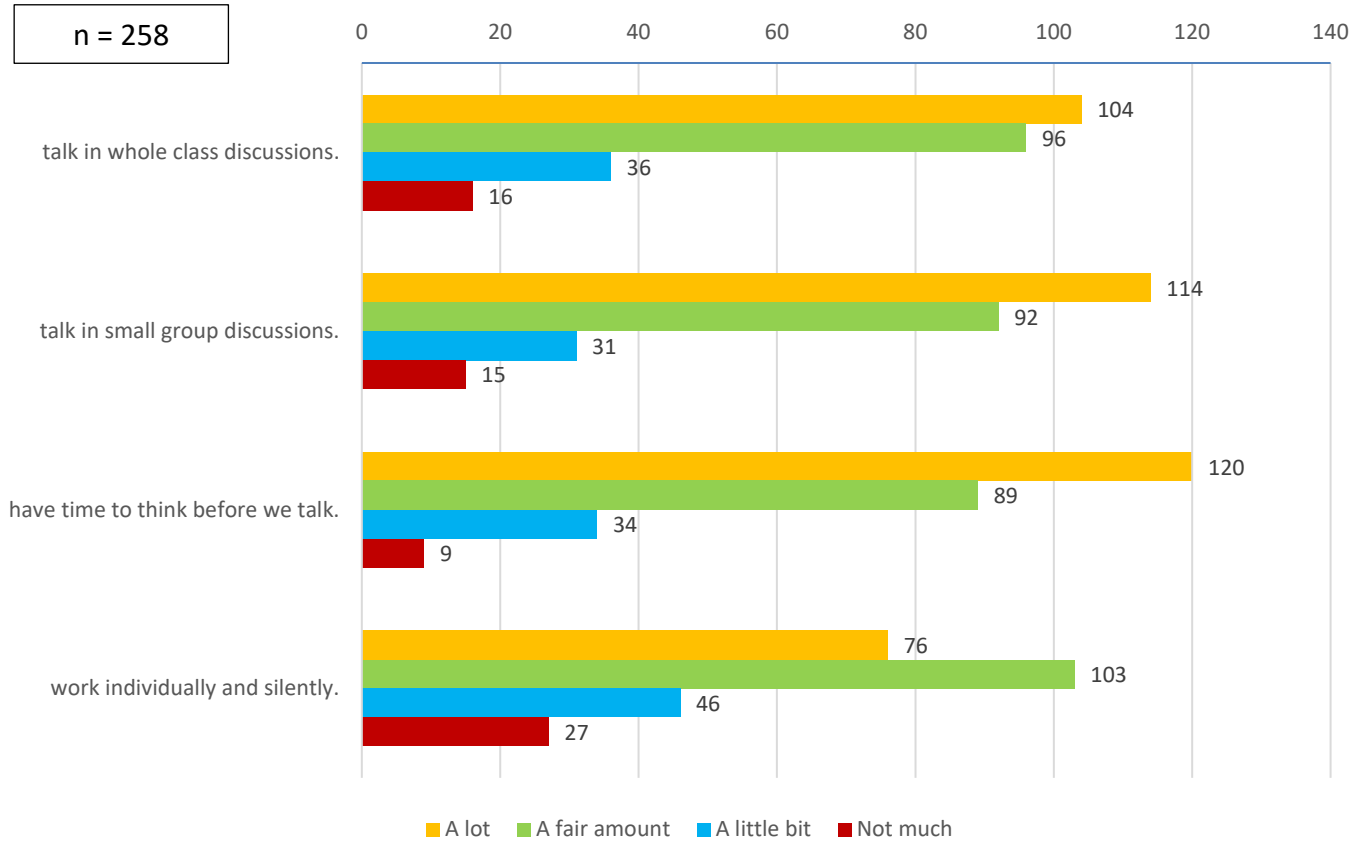


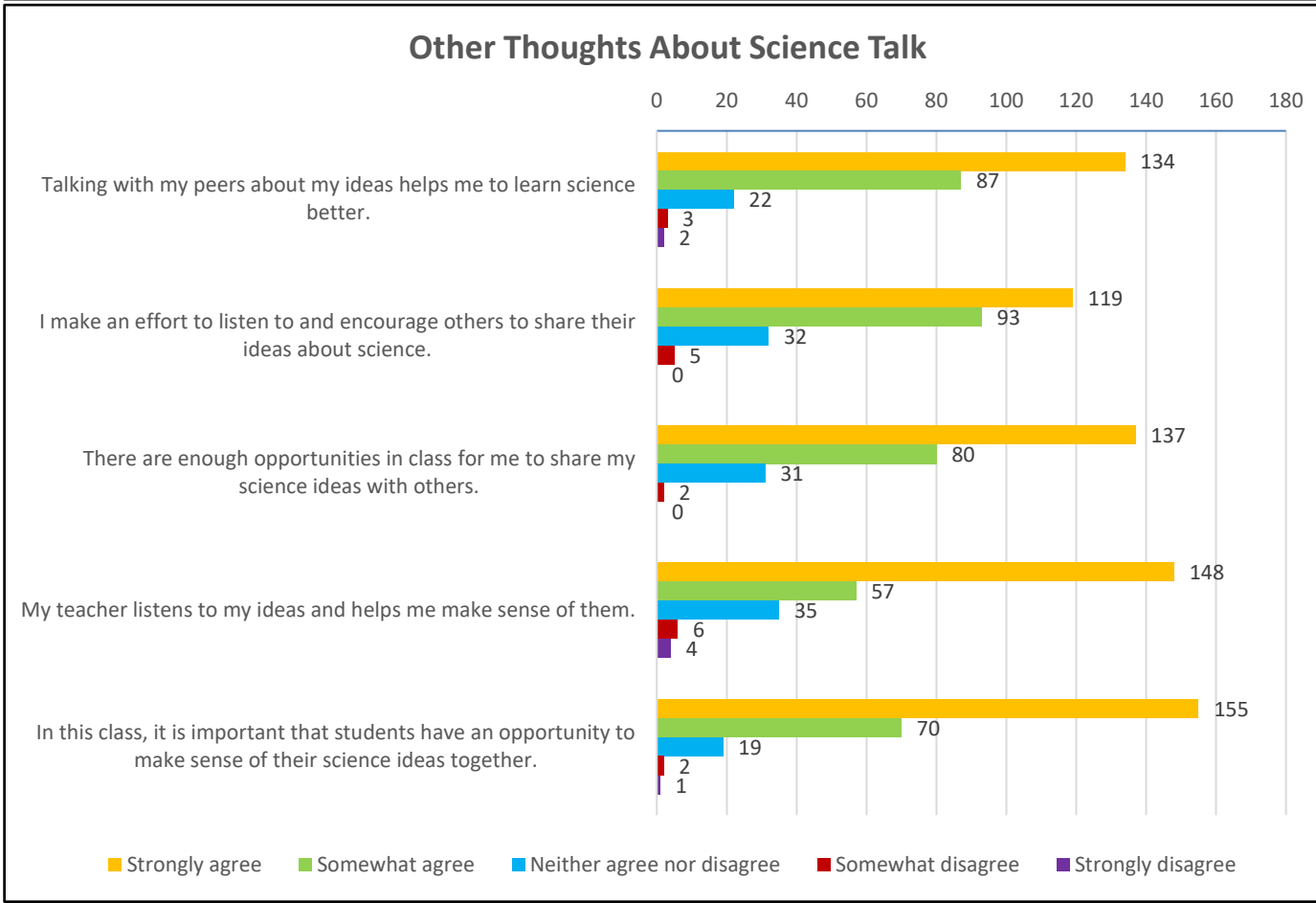
Listening to other students helps me...



BIO A

n = 258

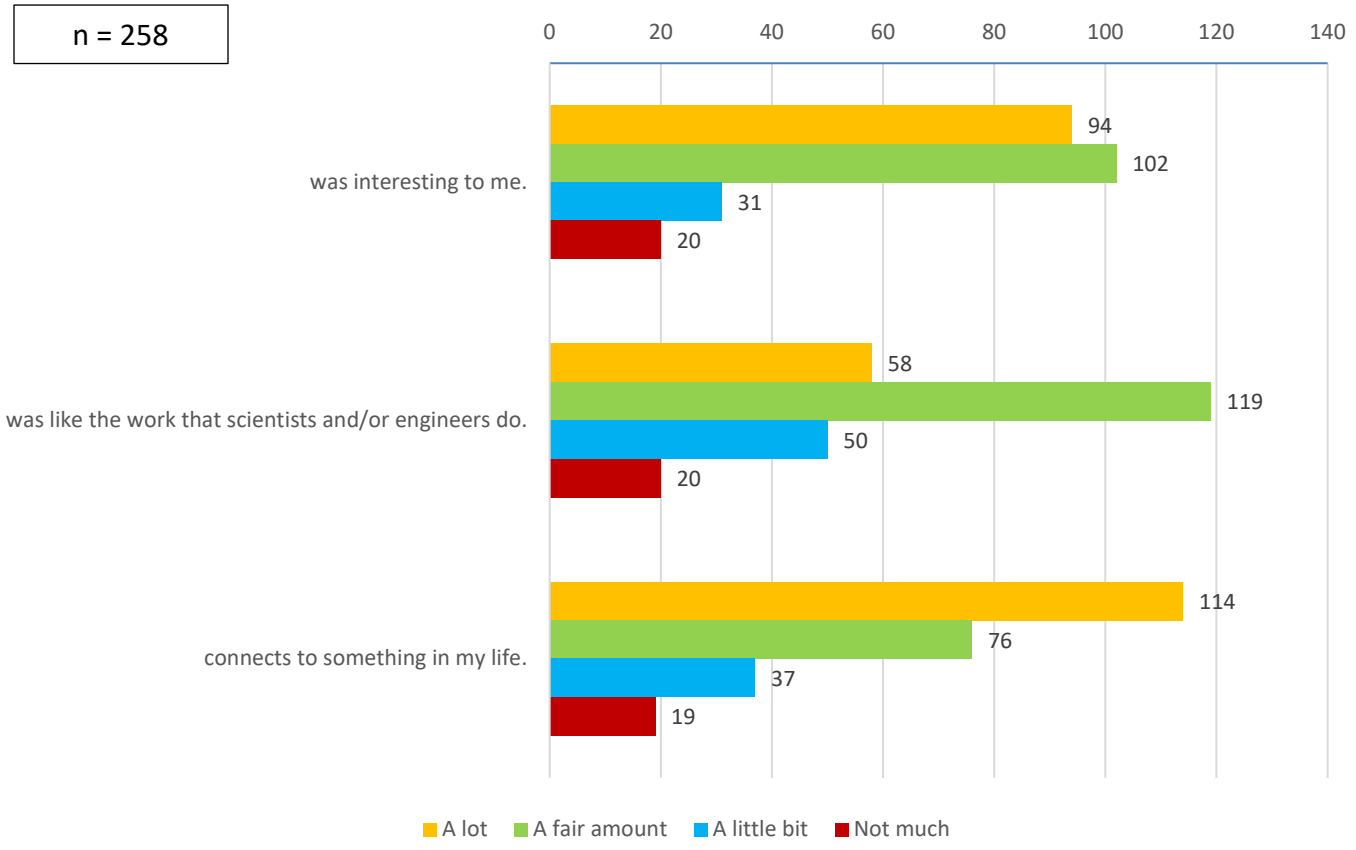

I learn a lot better when we...
0
20
40
60
80
100
120
140
talk in whole class discussions.
104
96
36
16
talk in small group discussions.
114
92
31
15
have time to think before we talk.
120
89
34
9
work individually and silently.
76
103
46
27
A lot
A fair amount
A little bit
Not much


Other Thoughts About Science Talk
0
20
40
60
80
100
120
140
160
180
Talking with my peers about my ideas helps me to learn science better.
134
87
22
3
2
I make an effort to listen to and encourage others to share their ideas about science.
119
93
32
5
0
There are enough opportunities in class for me to share my science ideas with others.
137
80
31
2
0
My teacher listens to my ideas and helps me make sense of them.
148
57
35
6
4
In this class, it is important that students have an opportunity to make sense of their science ideas together.
155
70
19
2
1
Strongly agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Strongly disagree

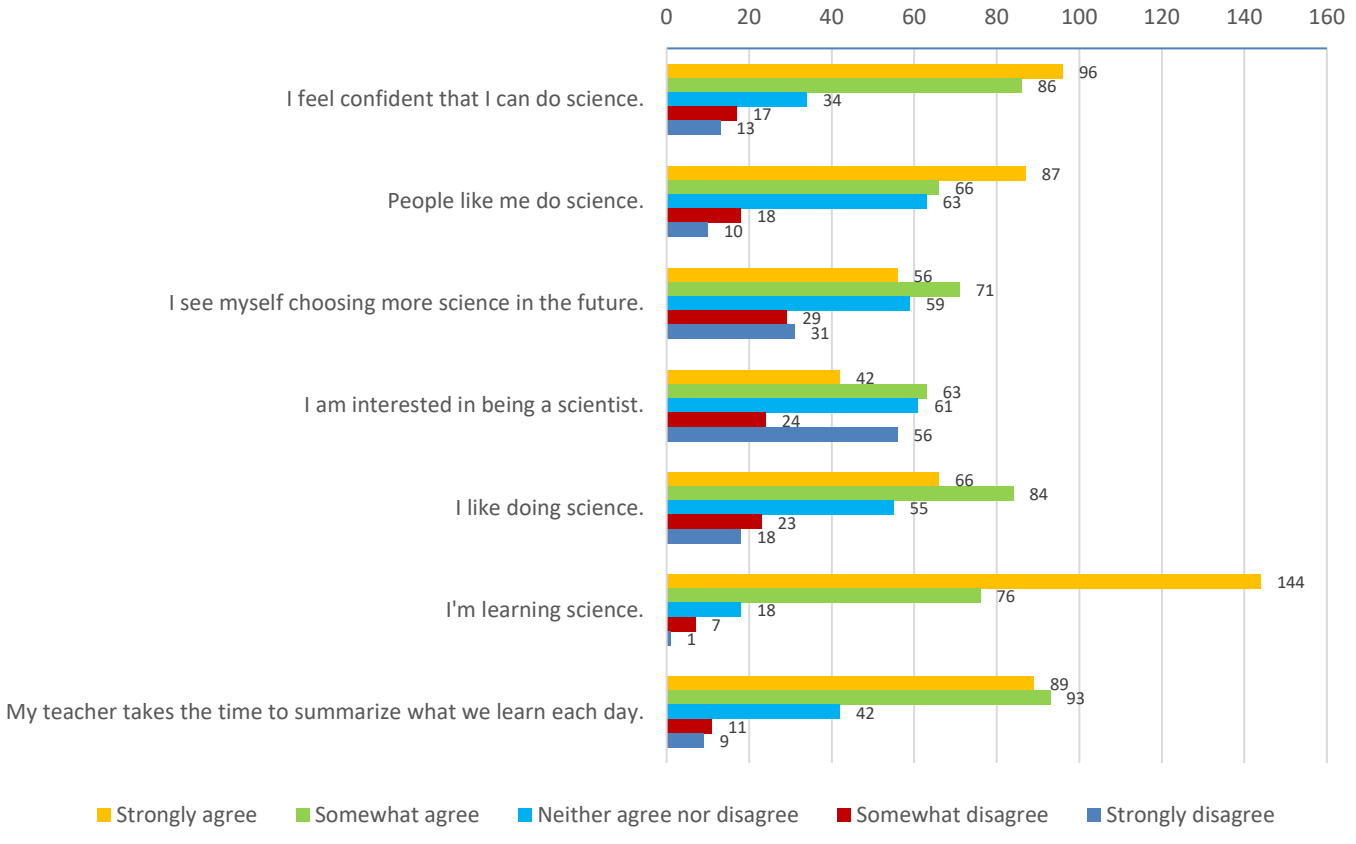
BIO A

n = 258

The work we did in science class this unit...

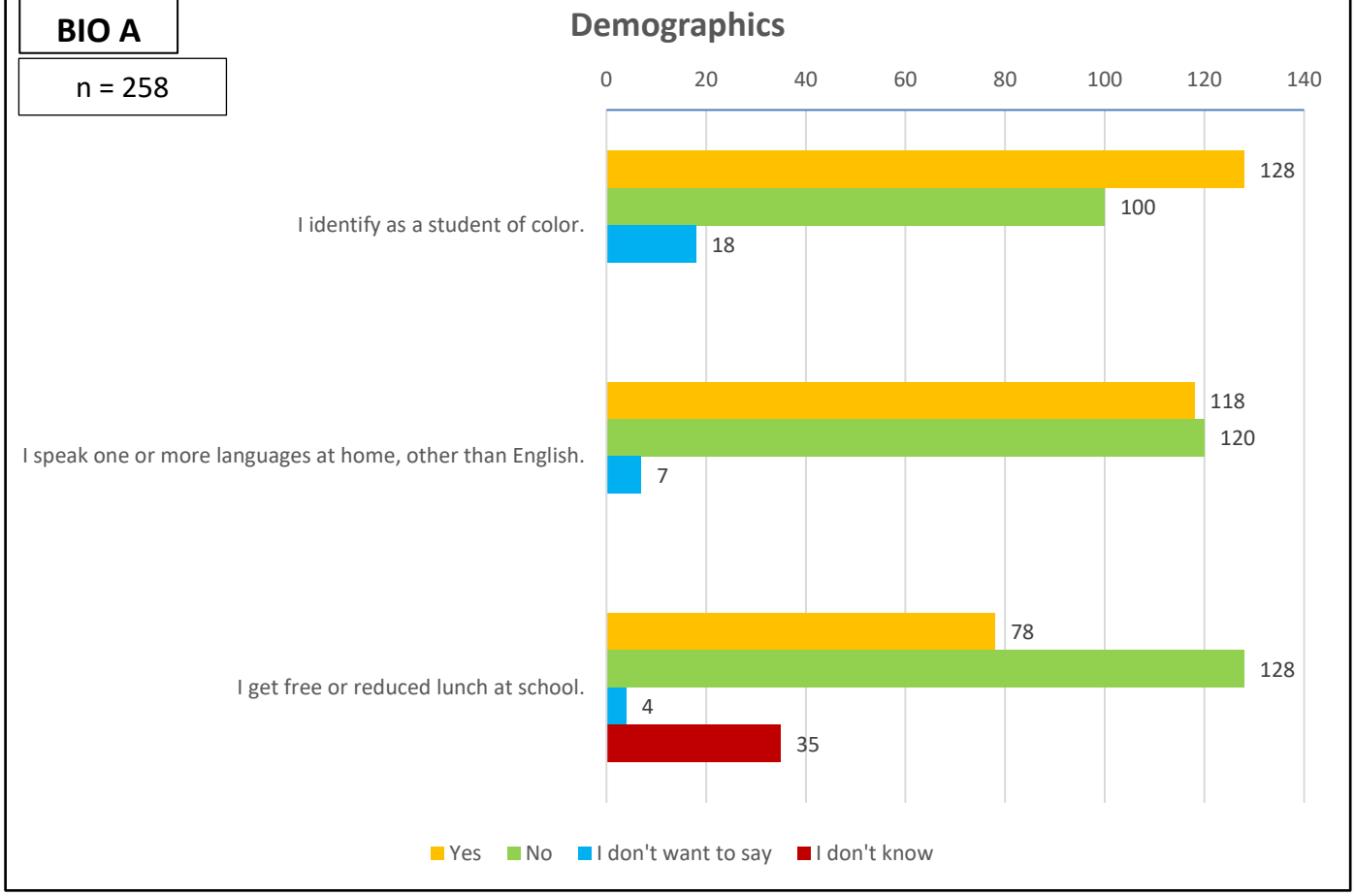


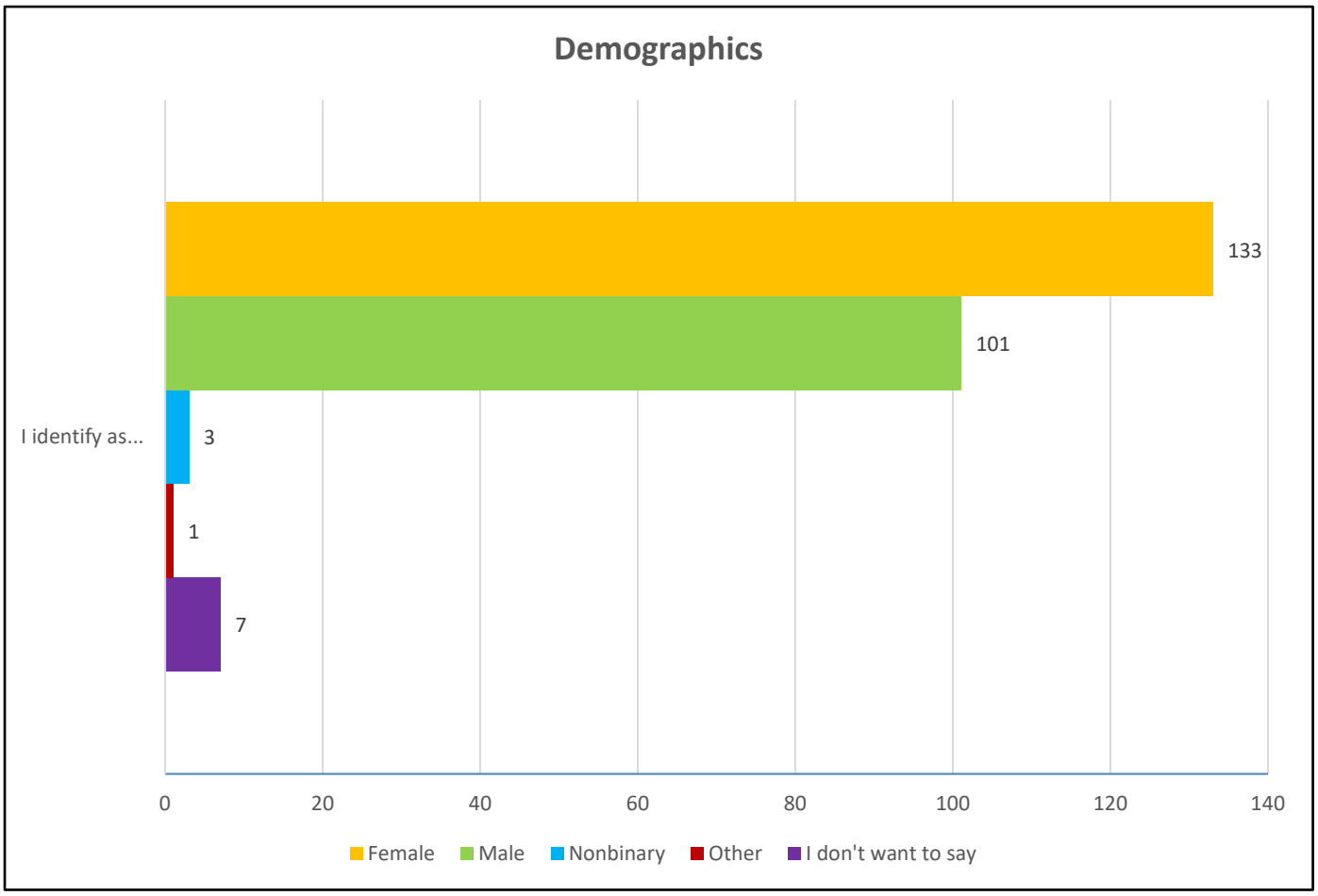
Identity, Disposition, and Learning



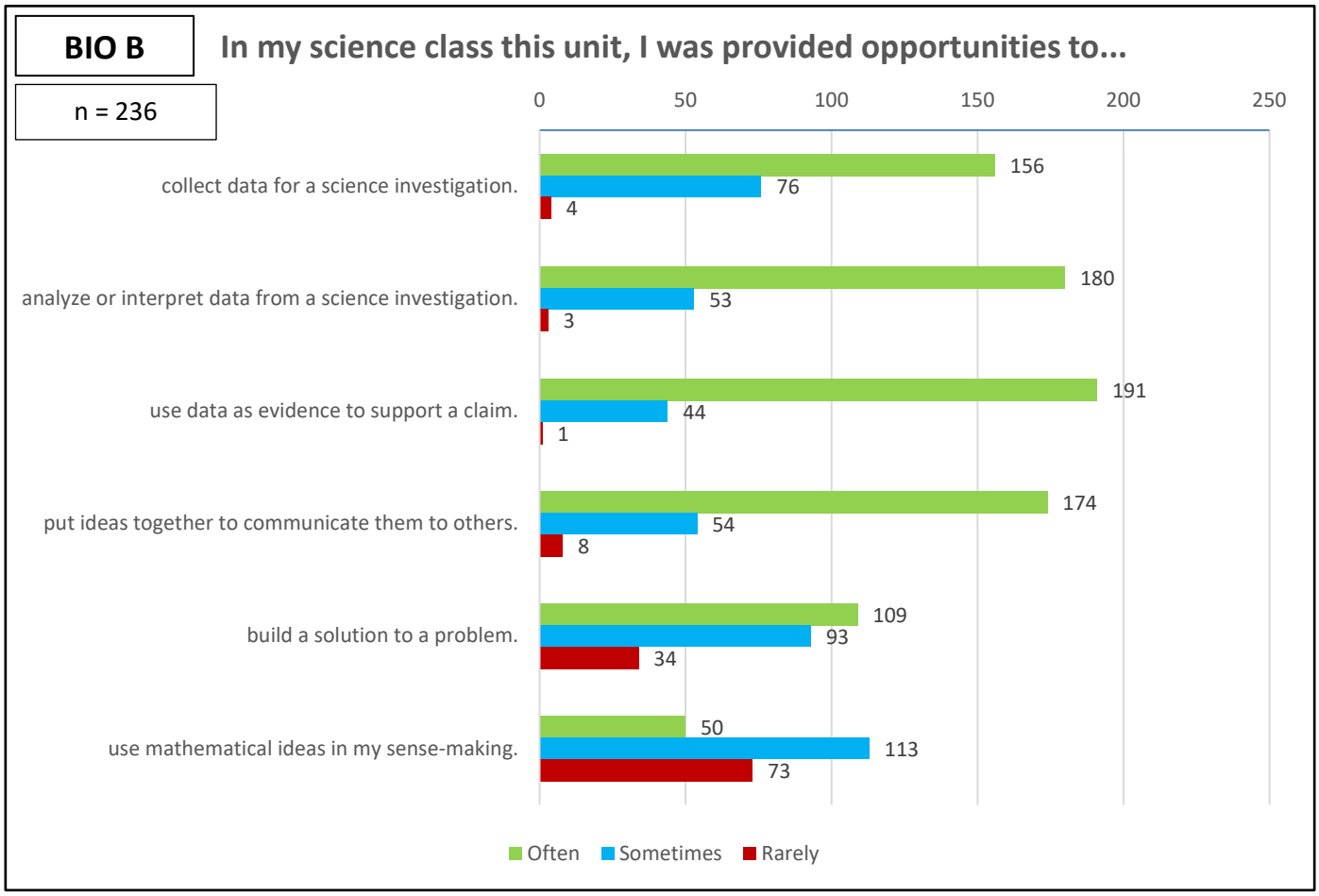
BIO A

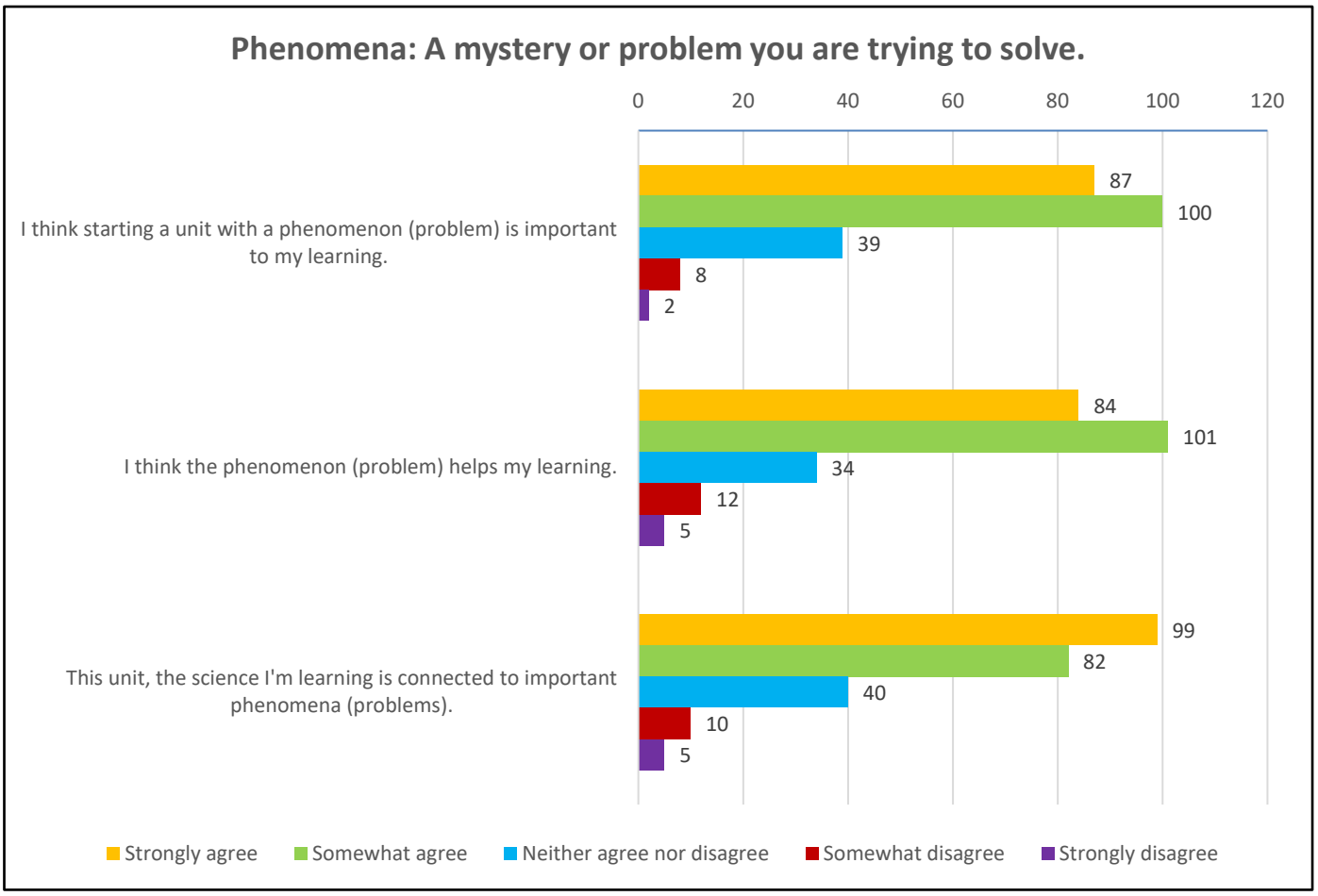
n = 258


Demographics
0
20
40
60
80
100
120
140
I identify as a student of color.
128
100
18
I speak one or more languages at home, other than English.
118
120
7
I get free or reduced lunch at school.
78
128
4
35
Yes
No
I don't want to say
I don't know


Demographics
I identify as...
133
101
3
1
7
0
20
40
60
80
100
120
140
Female
Male
Nonbinary
Other
I don't want to say

Attachment I.2

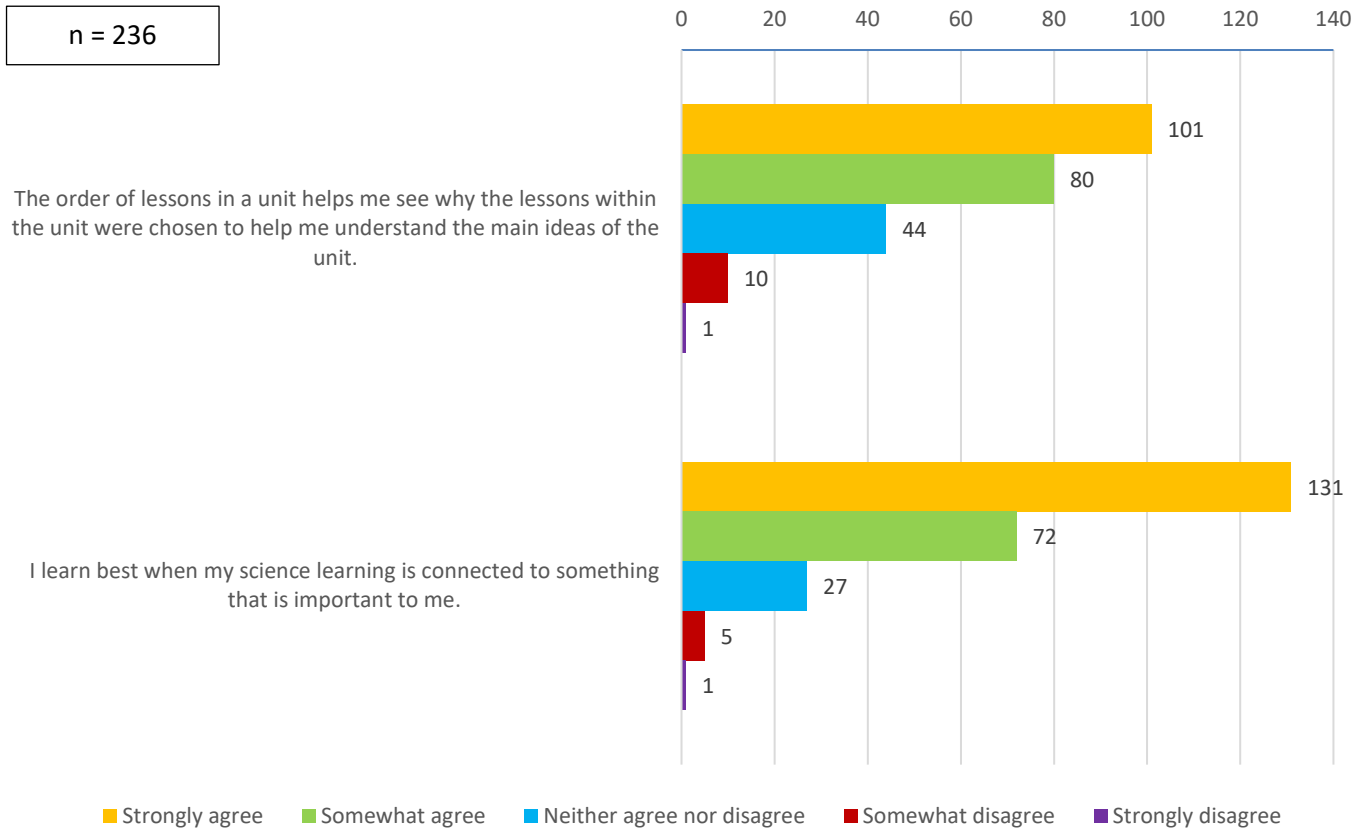




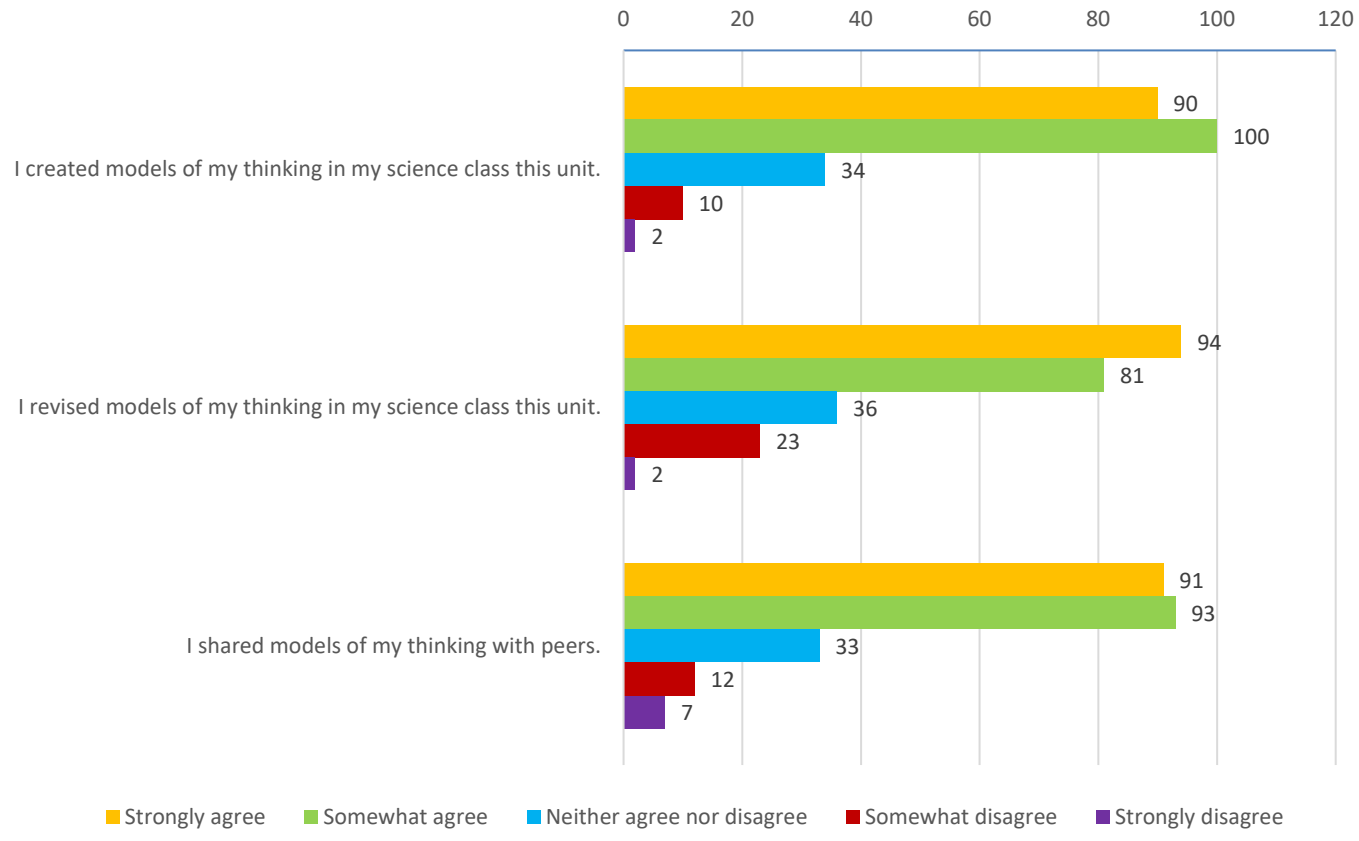
BIO B

n = 236

Storylining



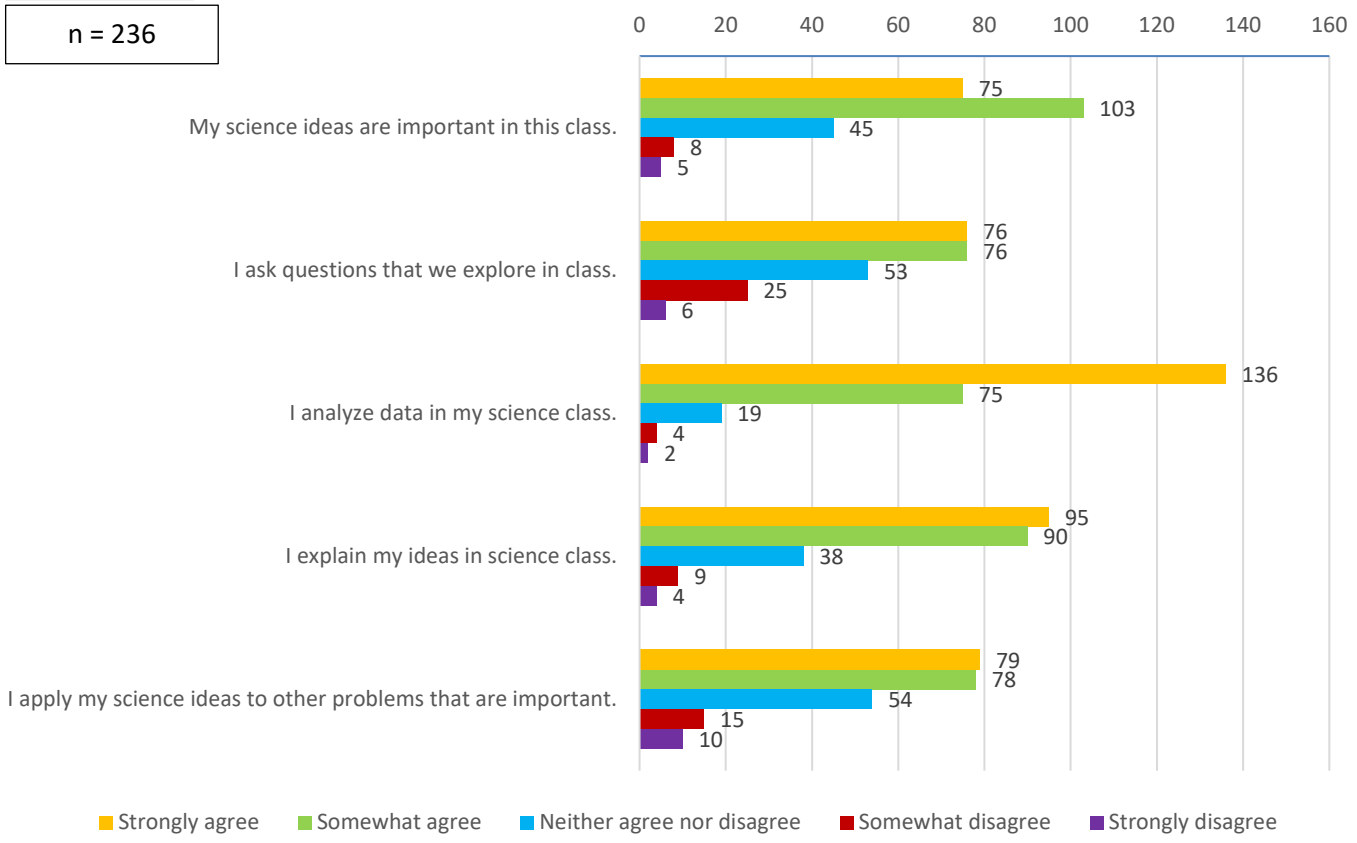
Modeling



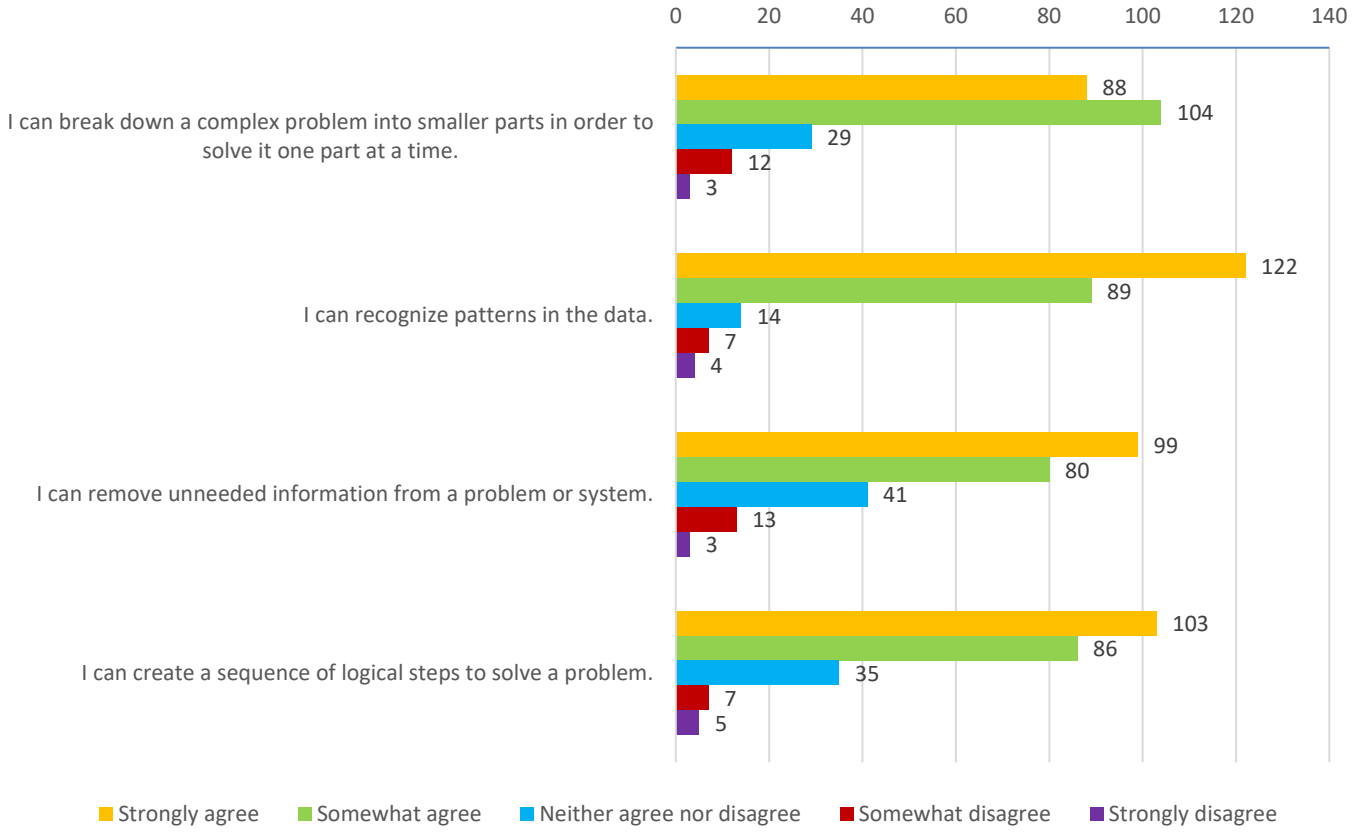
BIO B

n = 236

Science Ideas & Doing Science



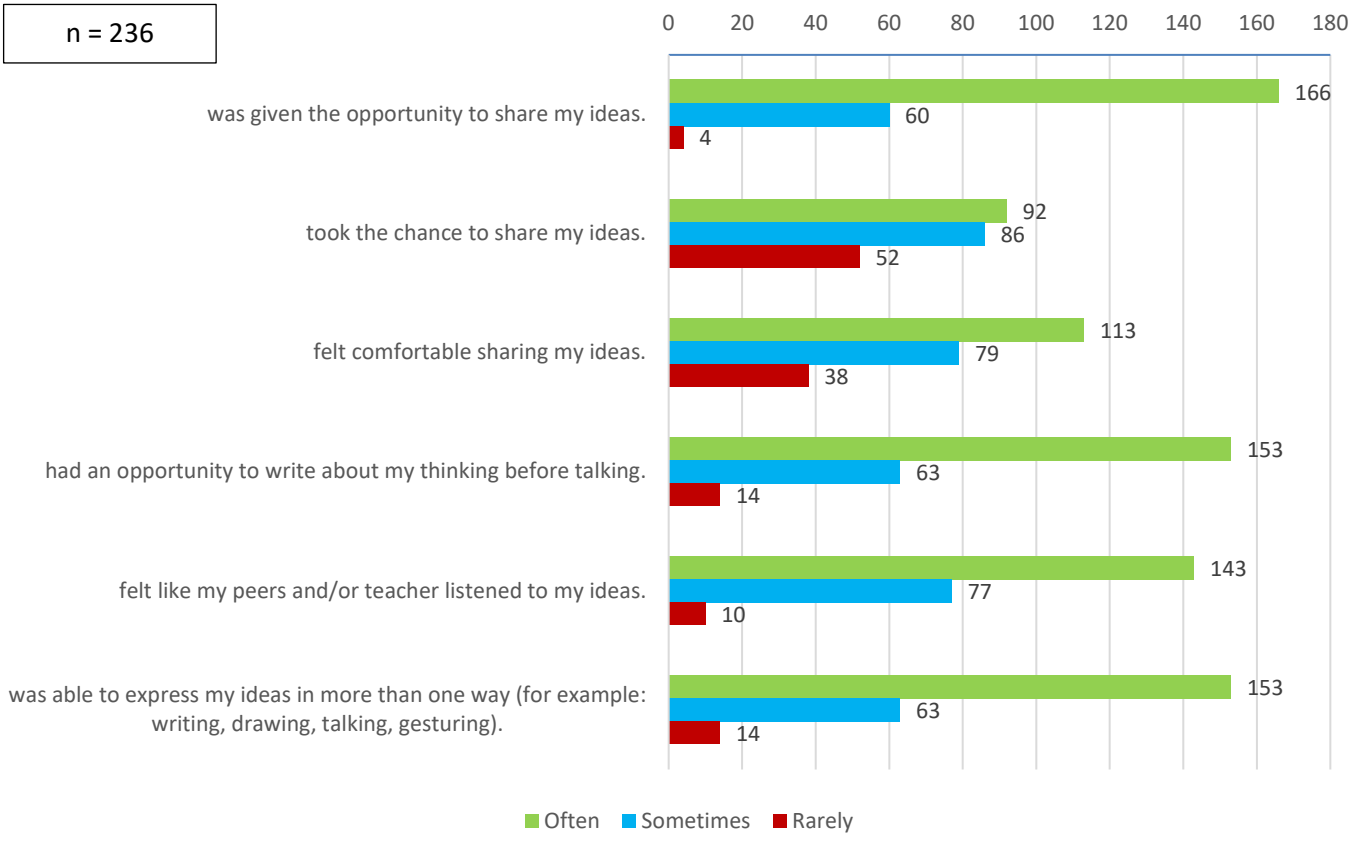
Computational Thinking



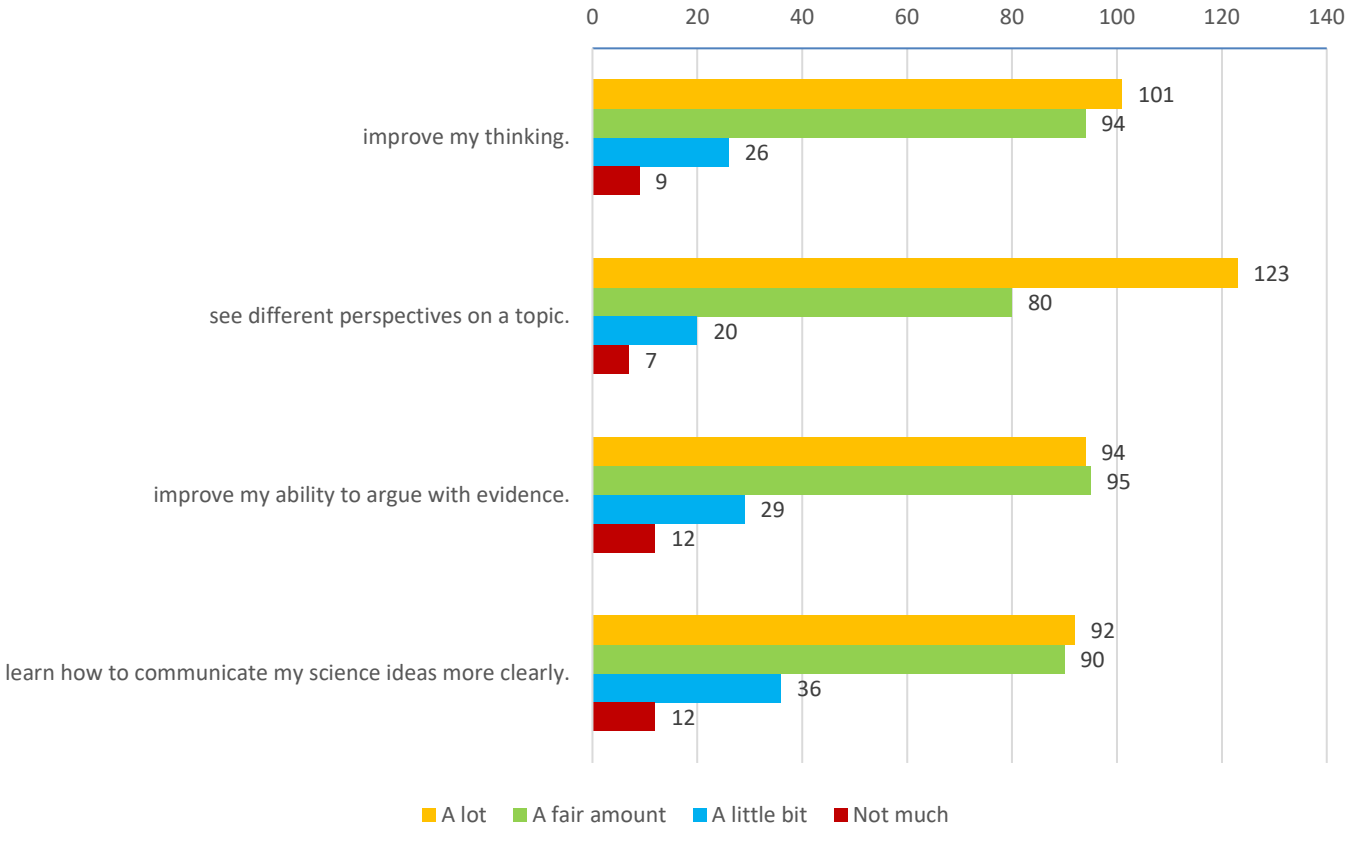
BIO B

n = 236

In science class this unit, I...

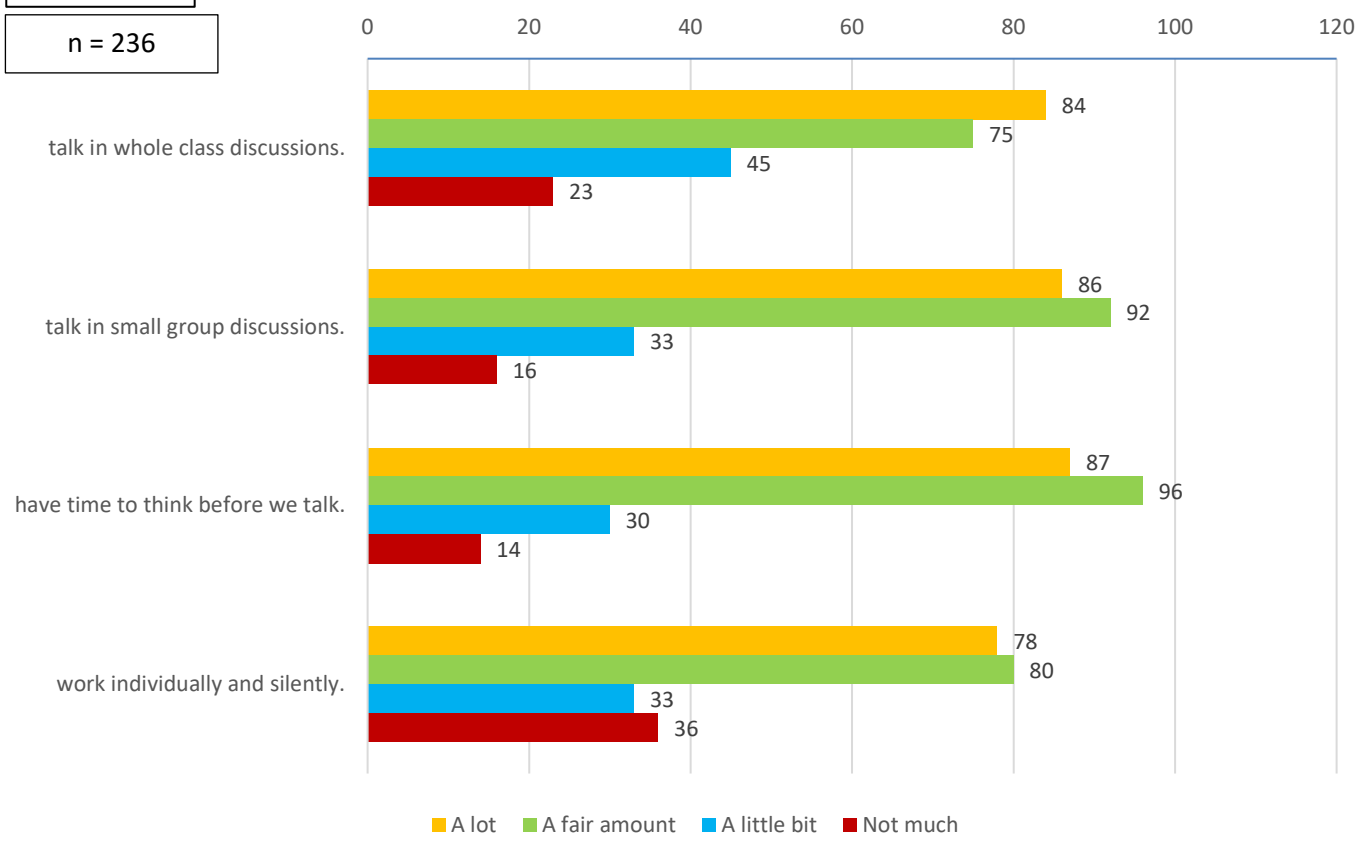


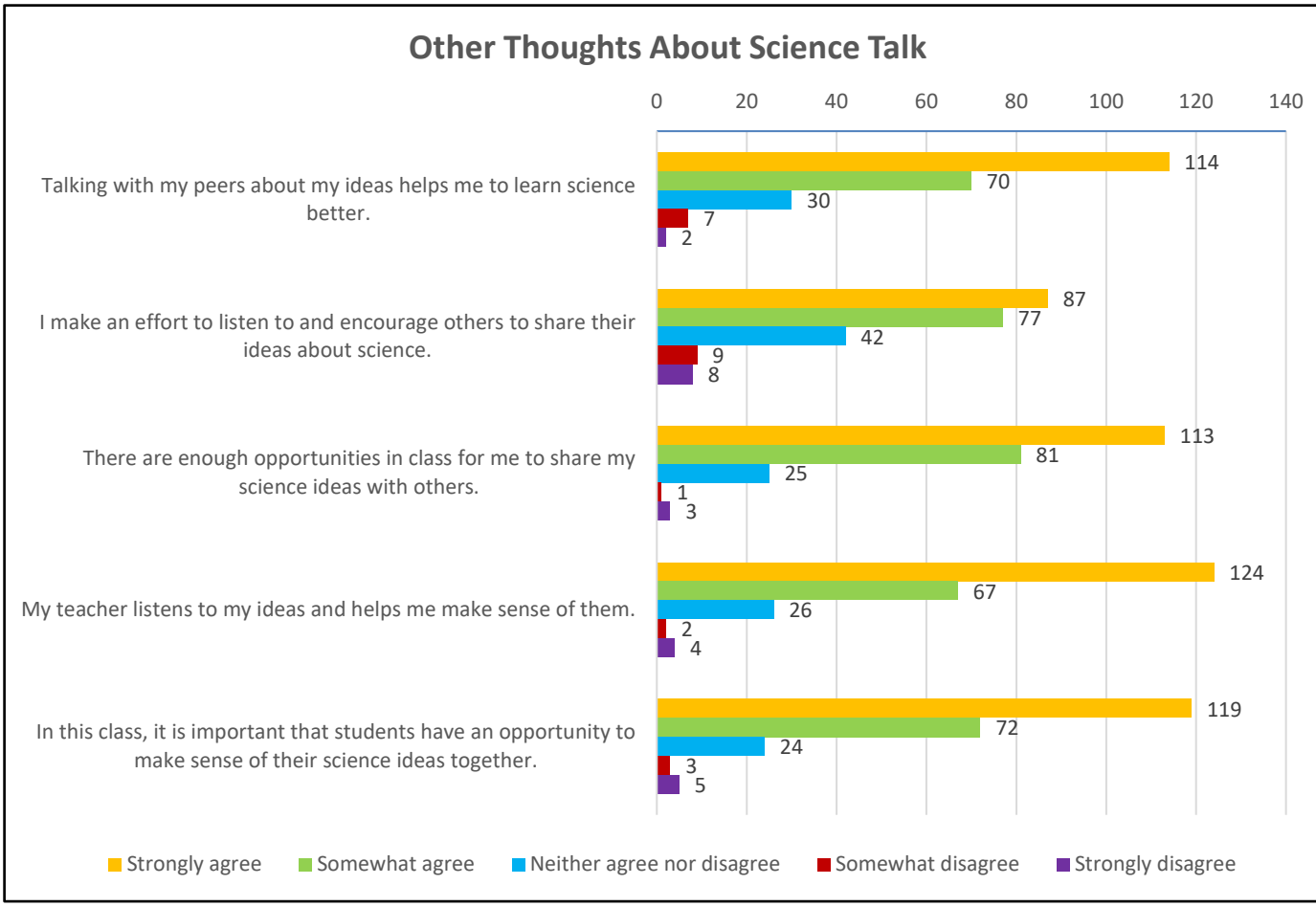
Listening to other students helps me...



BIO B

n = 236

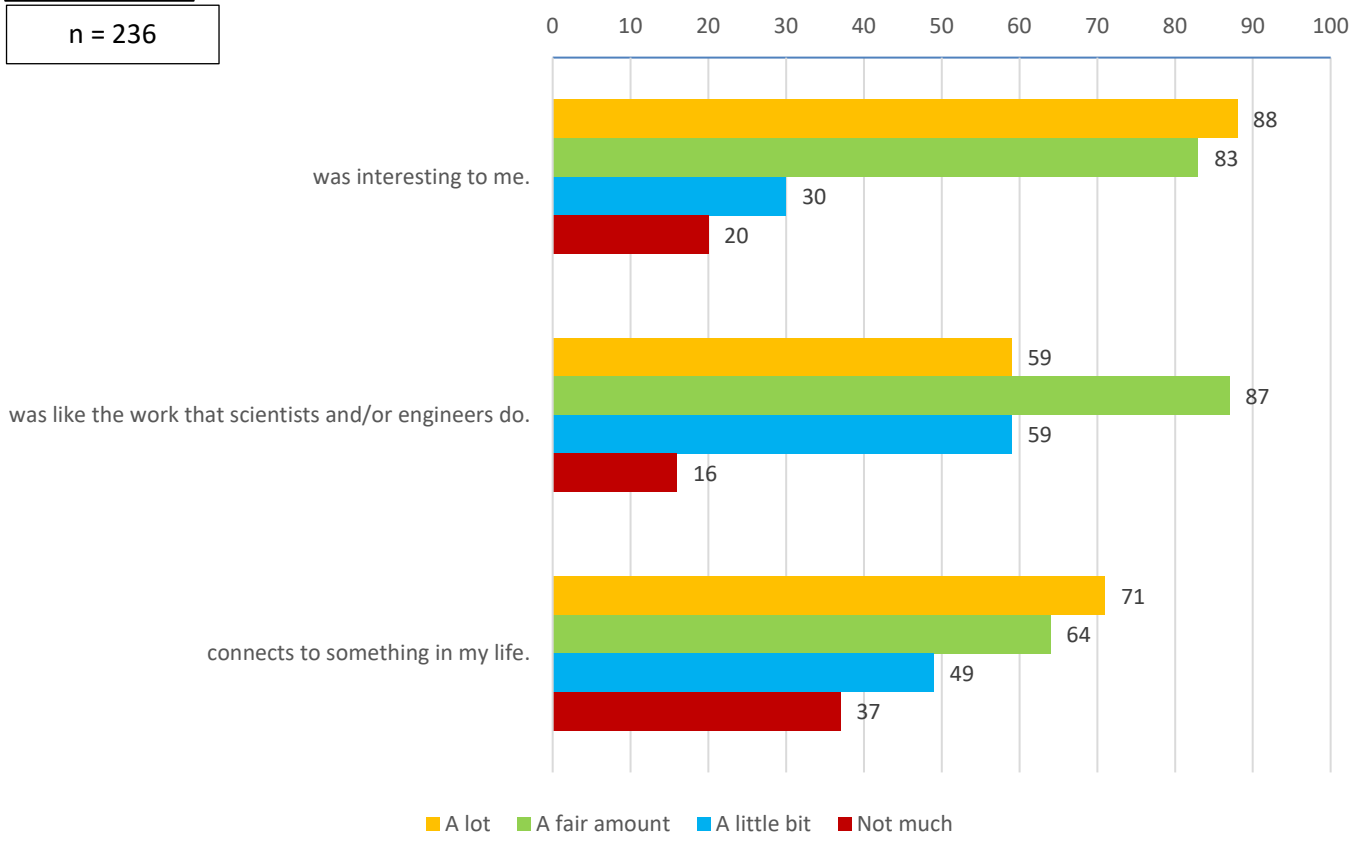

I learn a lot better when we...
0
20
40
60
80
100
120
talk in whole class discussions.
84
75
45
23
talk in small group discussions.
86
92
33
16
have time to think before we talk.
87
96
30
14
work individually and silently.
78
80
33
36
A lot
A fair amount
A little bit
Not much


Other Thoughts About Science Talk
0
20
40
60
80
100
120
140
Talking with my peers about my ideas helps me to learn science better.
114
70
30
7
2
I make an effort to listen to and encourage others to share their ideas about science.
87
77
42
9
8
There are enough opportunities in class for me to share my science ideas with others.
113
81
25
1
3
My teacher listens to my ideas and helps me make sense of them.
124
67
26
2
4
In this class, it is important that students have an opportunity to make sense of their science ideas together.
119
72
24
3
5
Strongly agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Strongly disagree

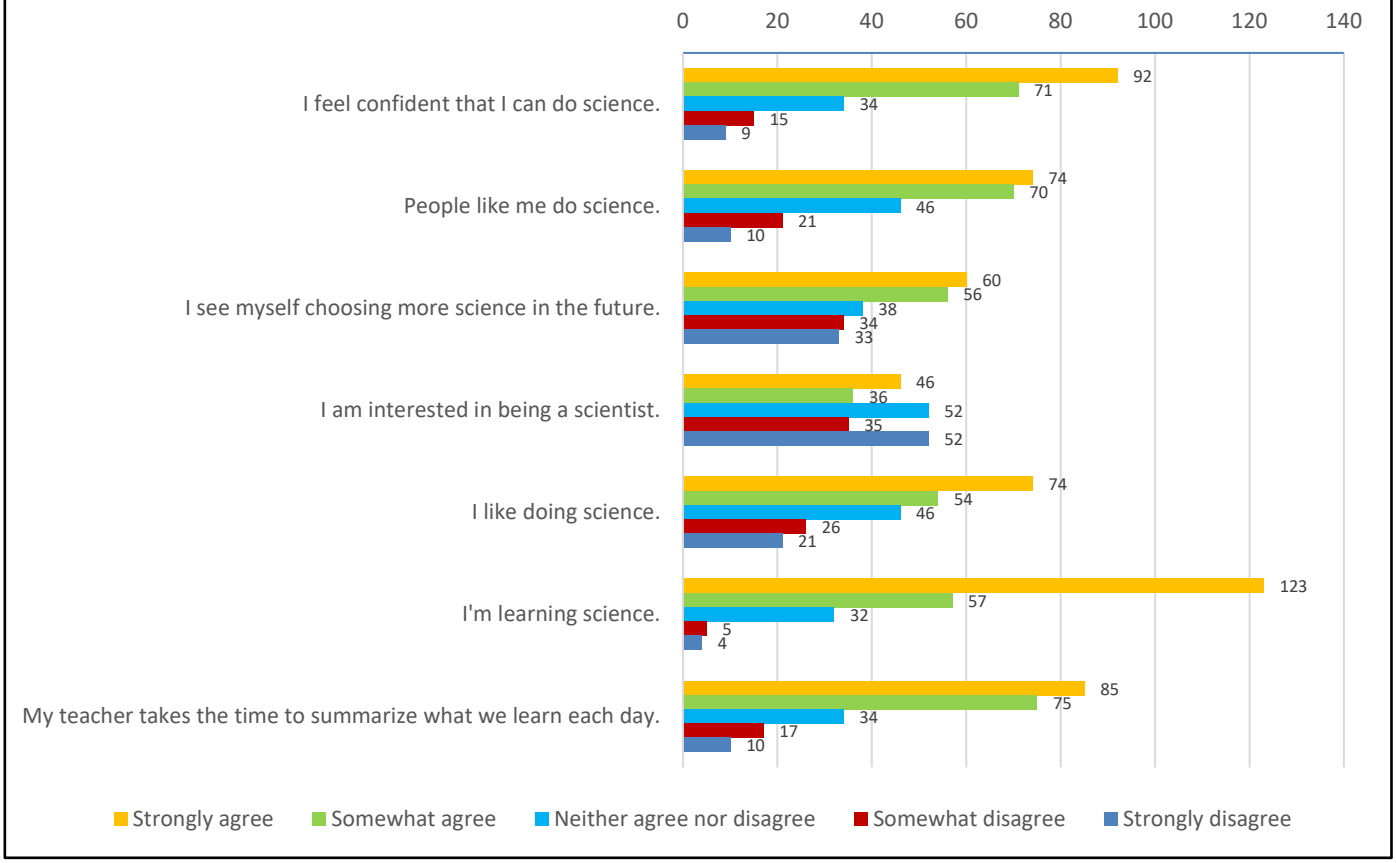
BIO B

n = 236

The work we did in science class this unit...

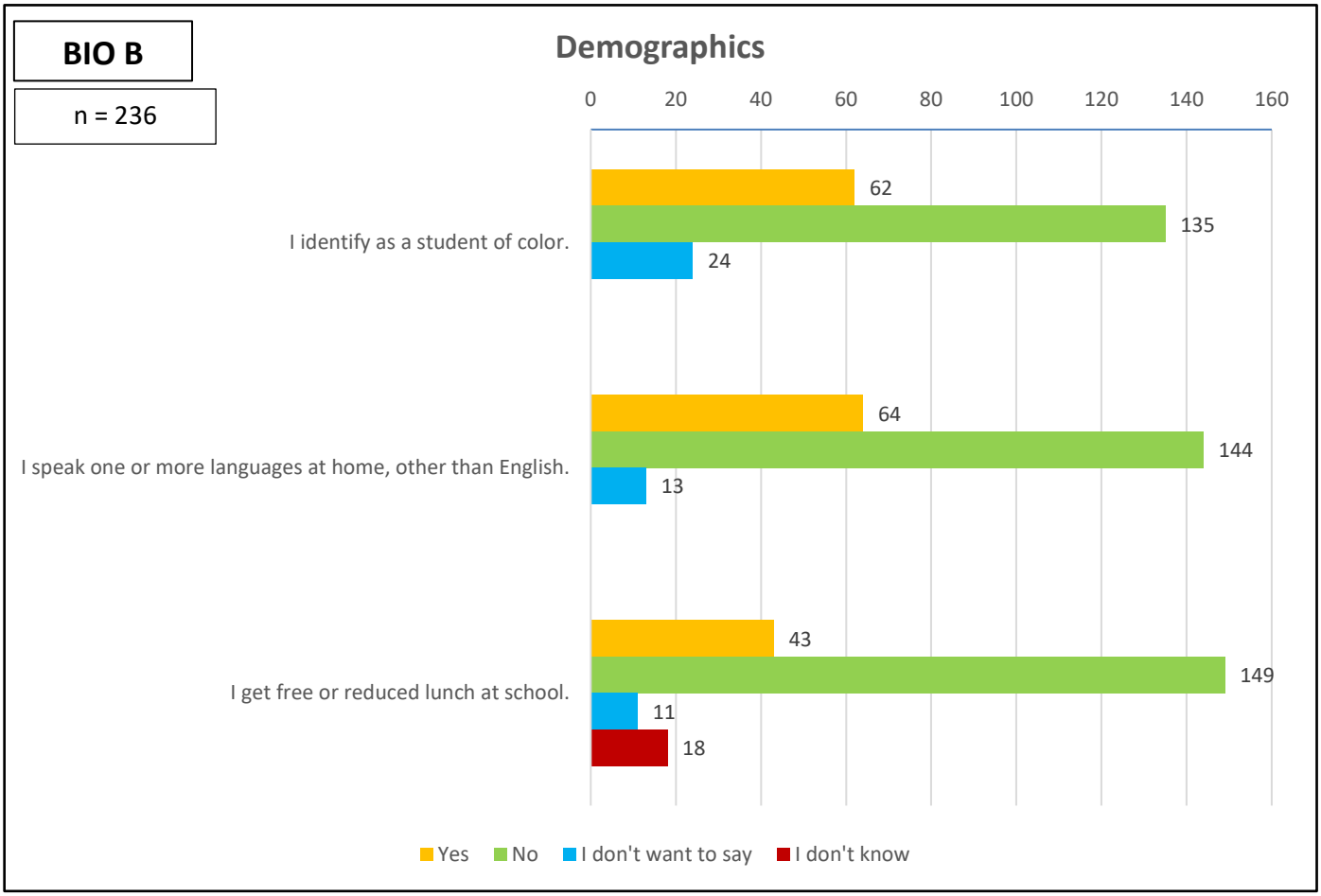


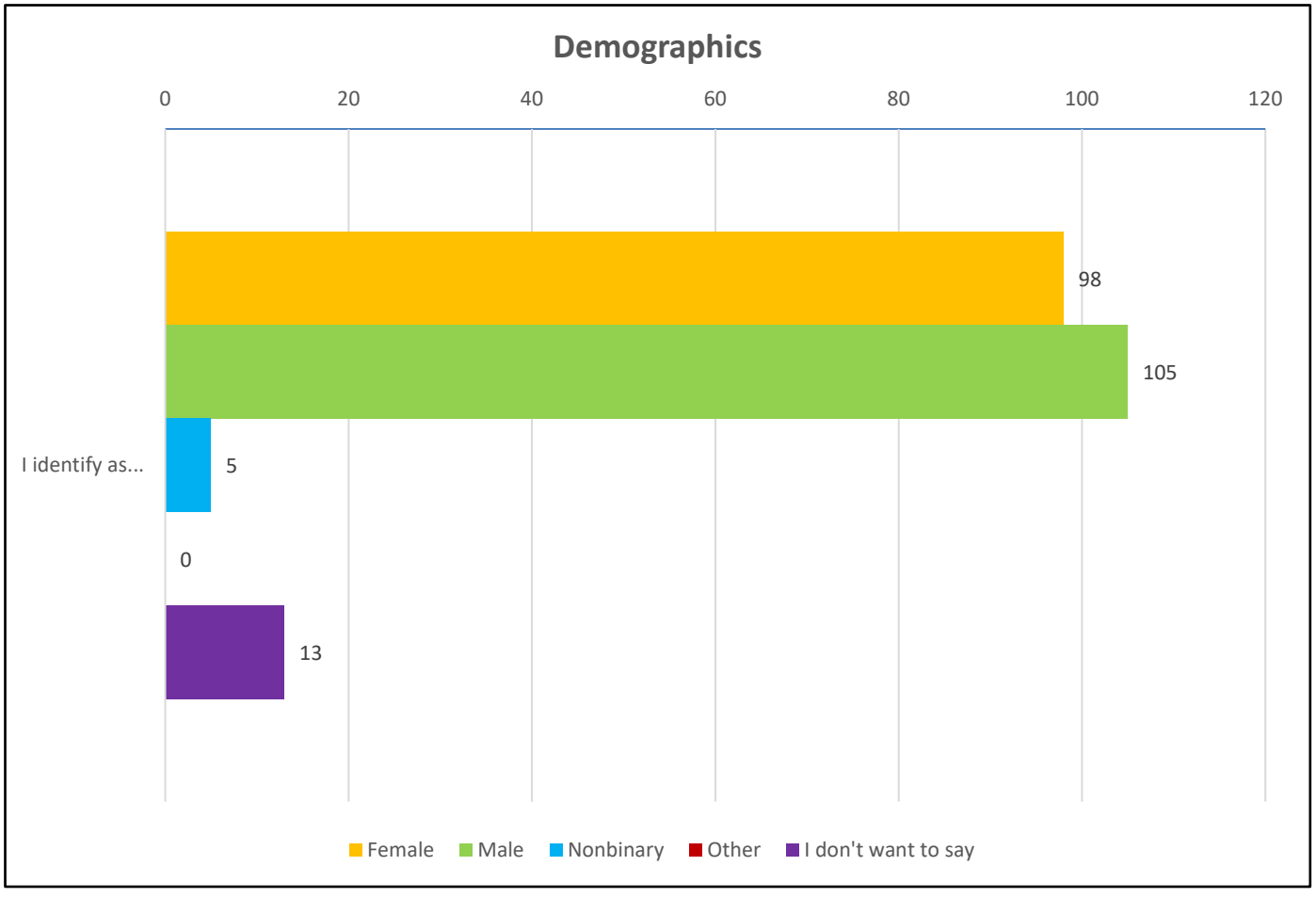
Identity, Disposition, and Learning



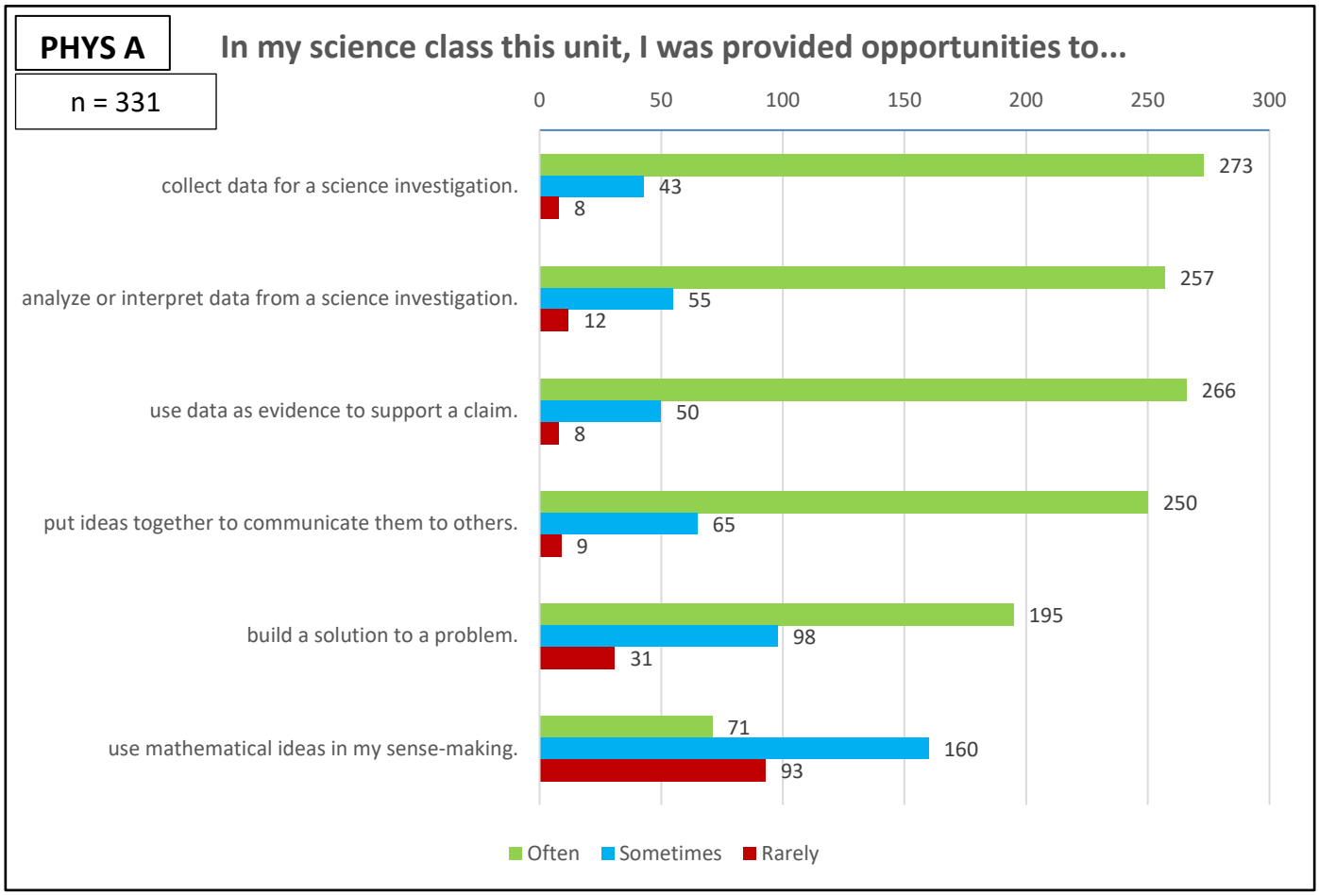
BIO B

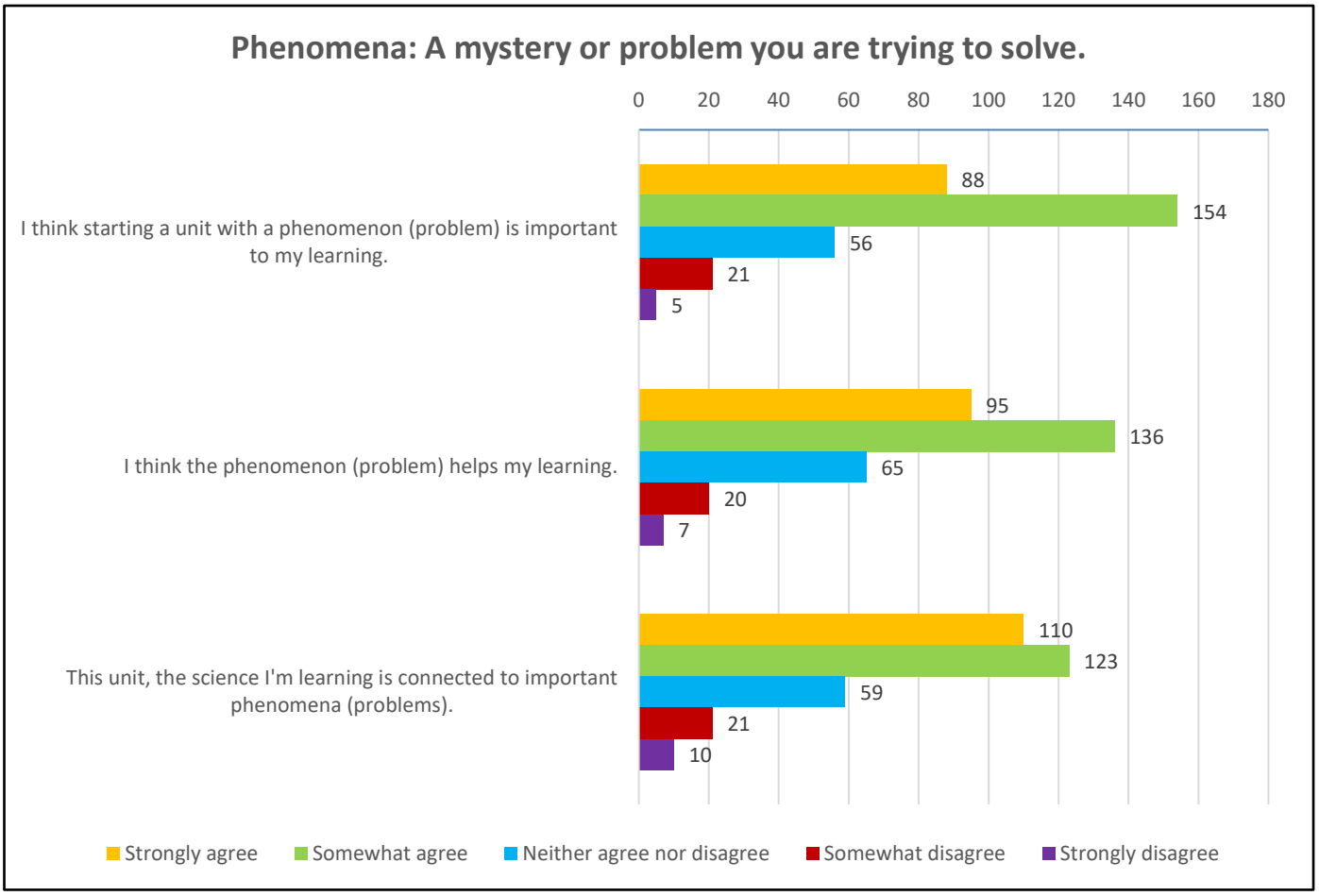
n = 236


Demographics
0
20
40
60
80
100
120
140
160
I identify as a student of color.
62
135
24
I speak one or more languages at home, other than English.
64
144
13
I get free or reduced lunch at school.
43
149
11
18
Yes
No
I don't want to say
I don't know


Demographics
0
20
40
60
80
100
120
I identify as...
98
105
5
0
13
Female
Male
Nonbinary
Other
I don't want to say

Attachment I.2

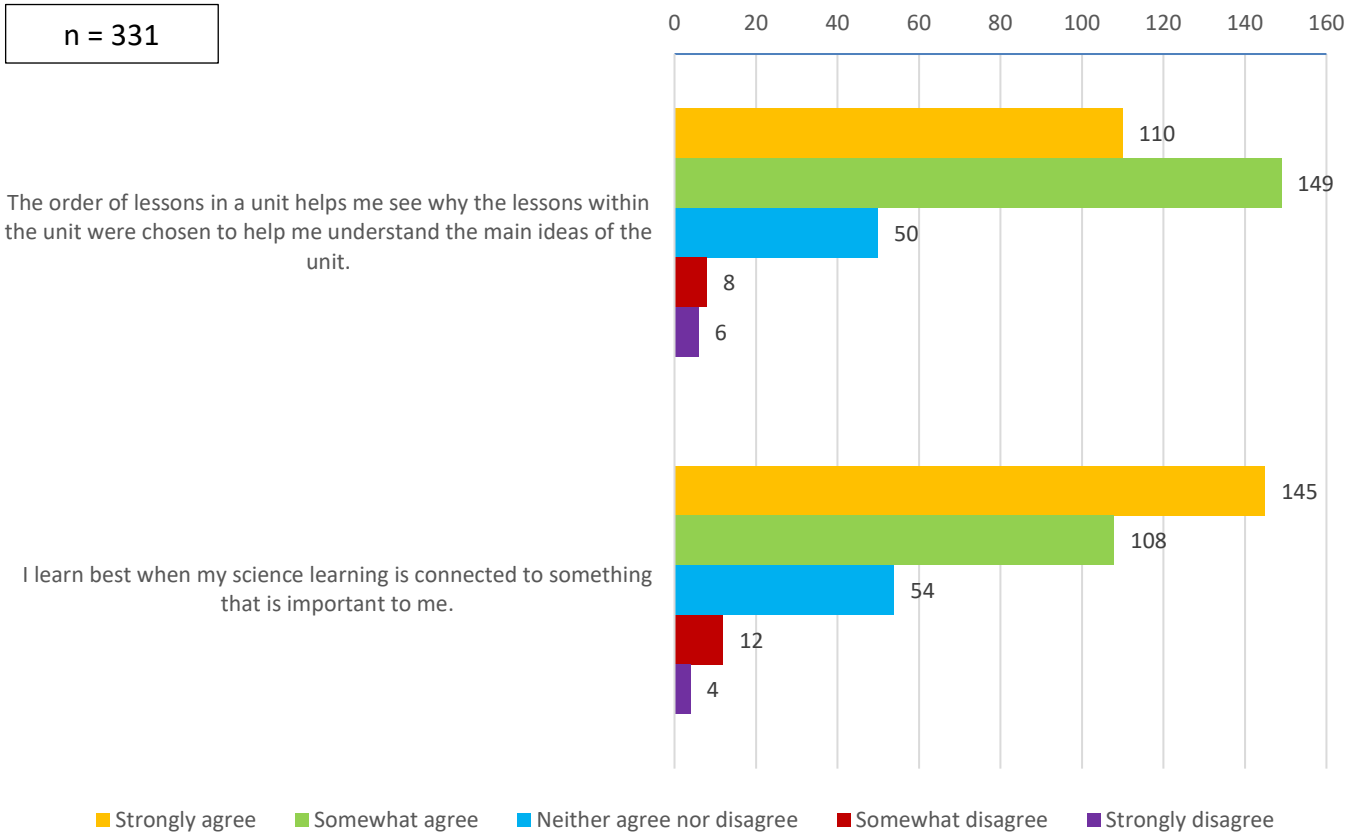




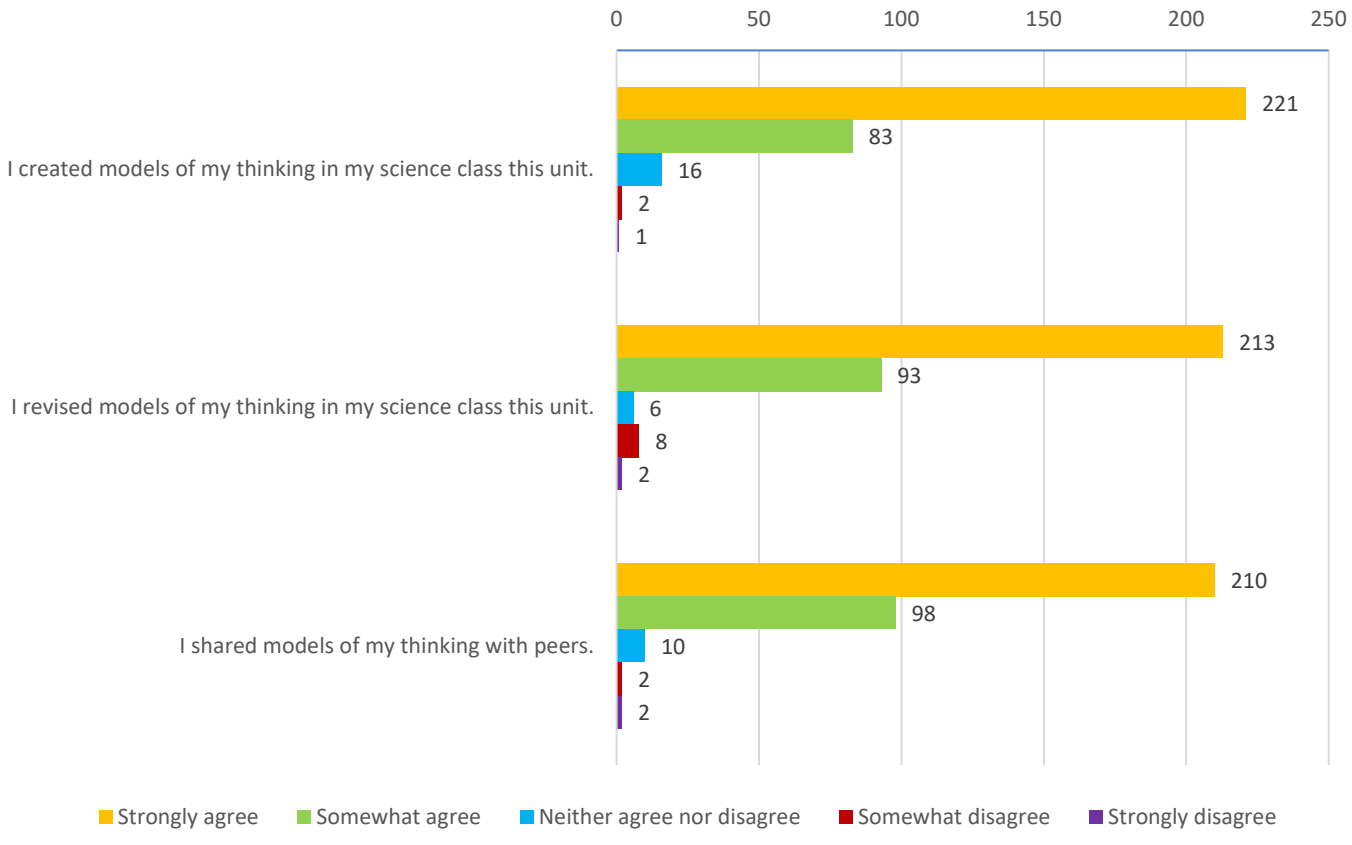
PHYS A

n = 331

Storylining



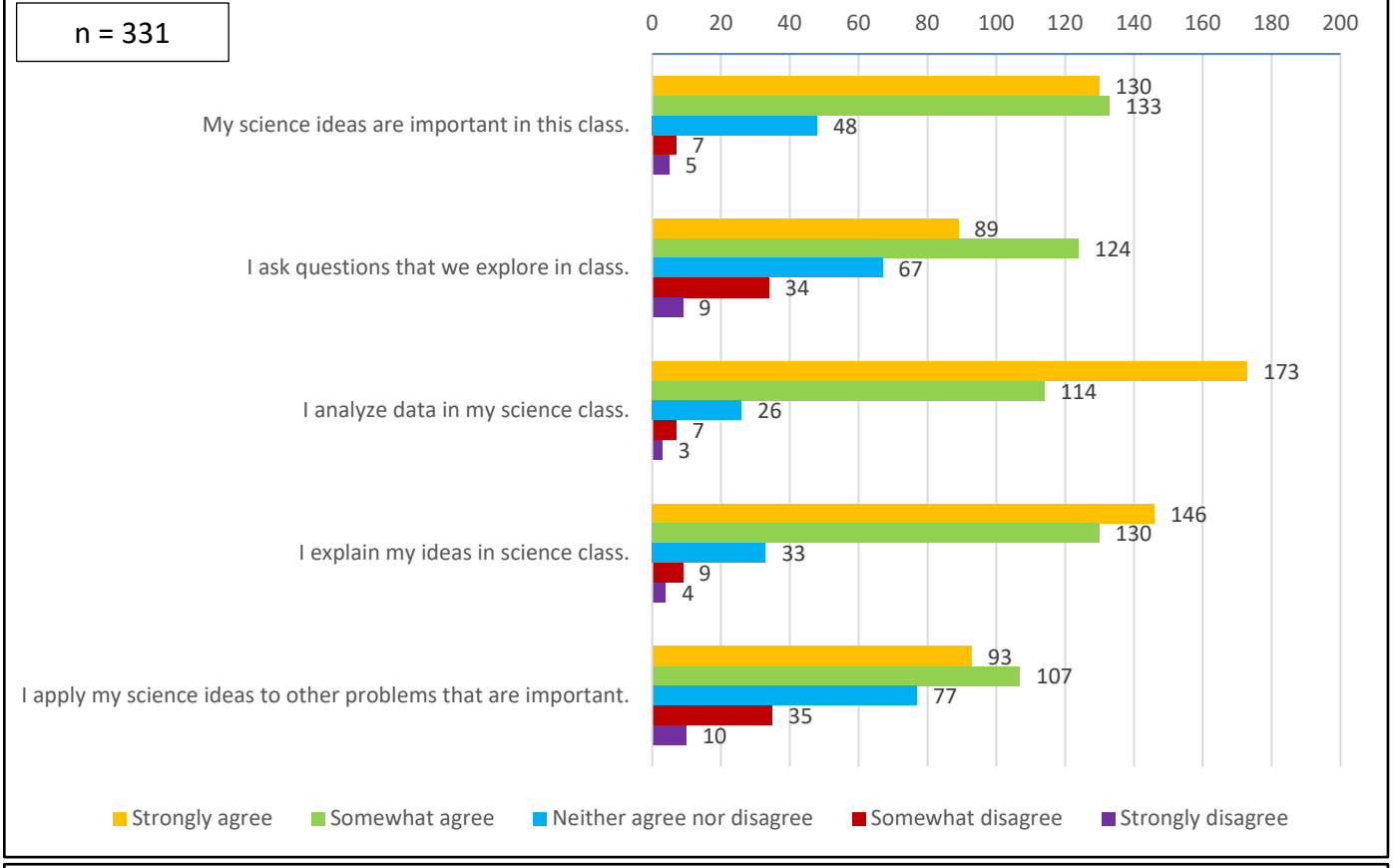
Modeling



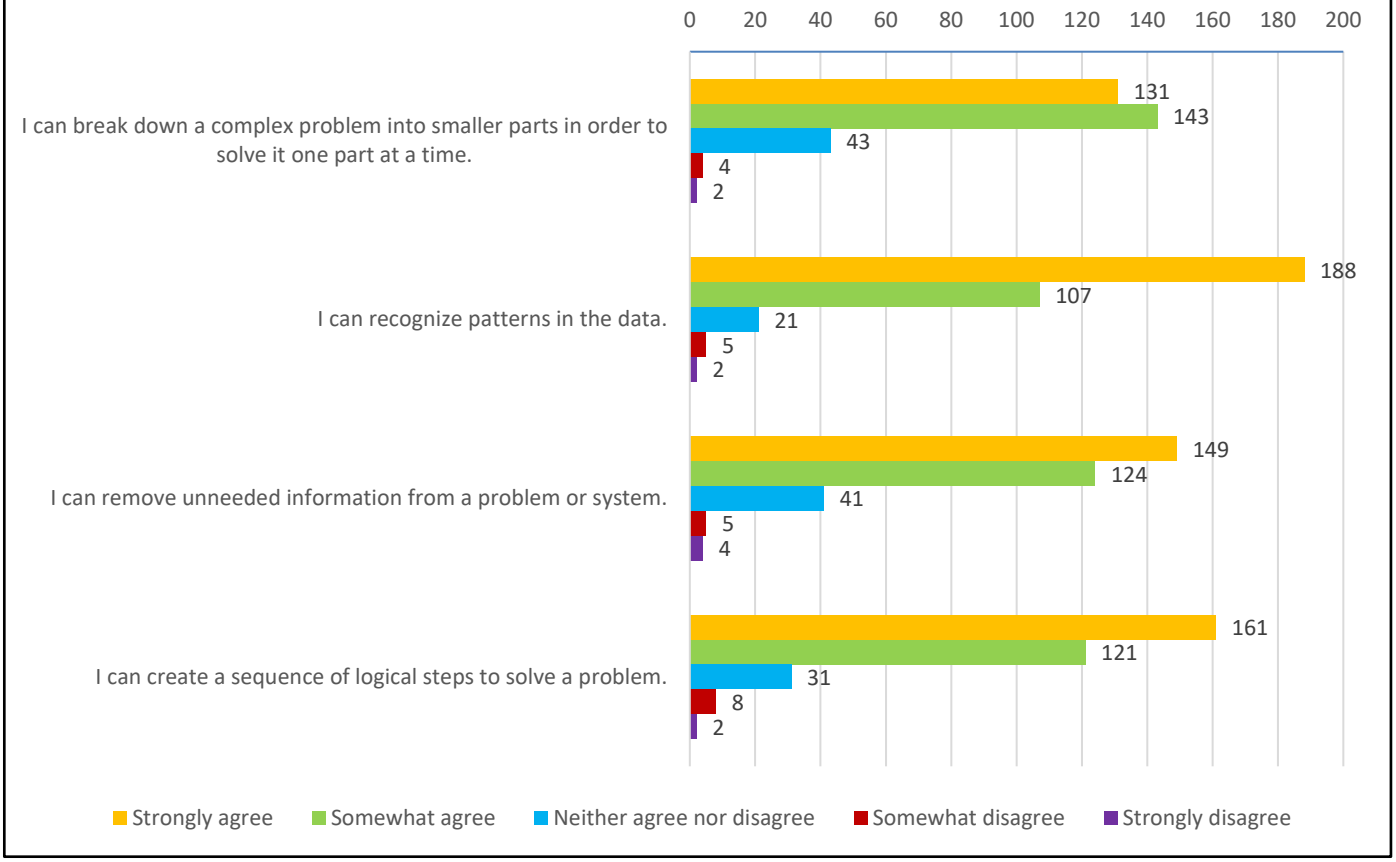
PHYS A

n = 331

Science Ideas & Doing Science

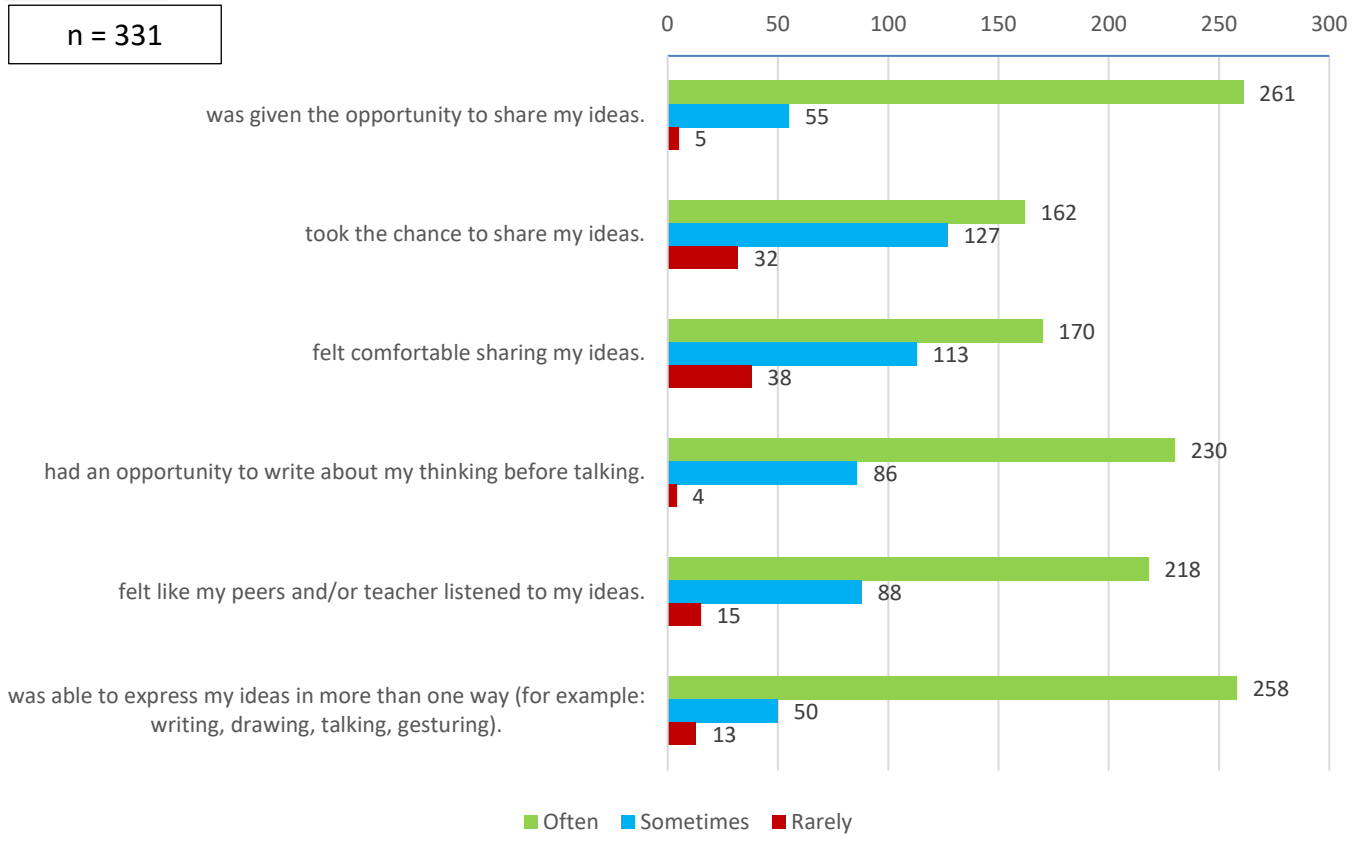


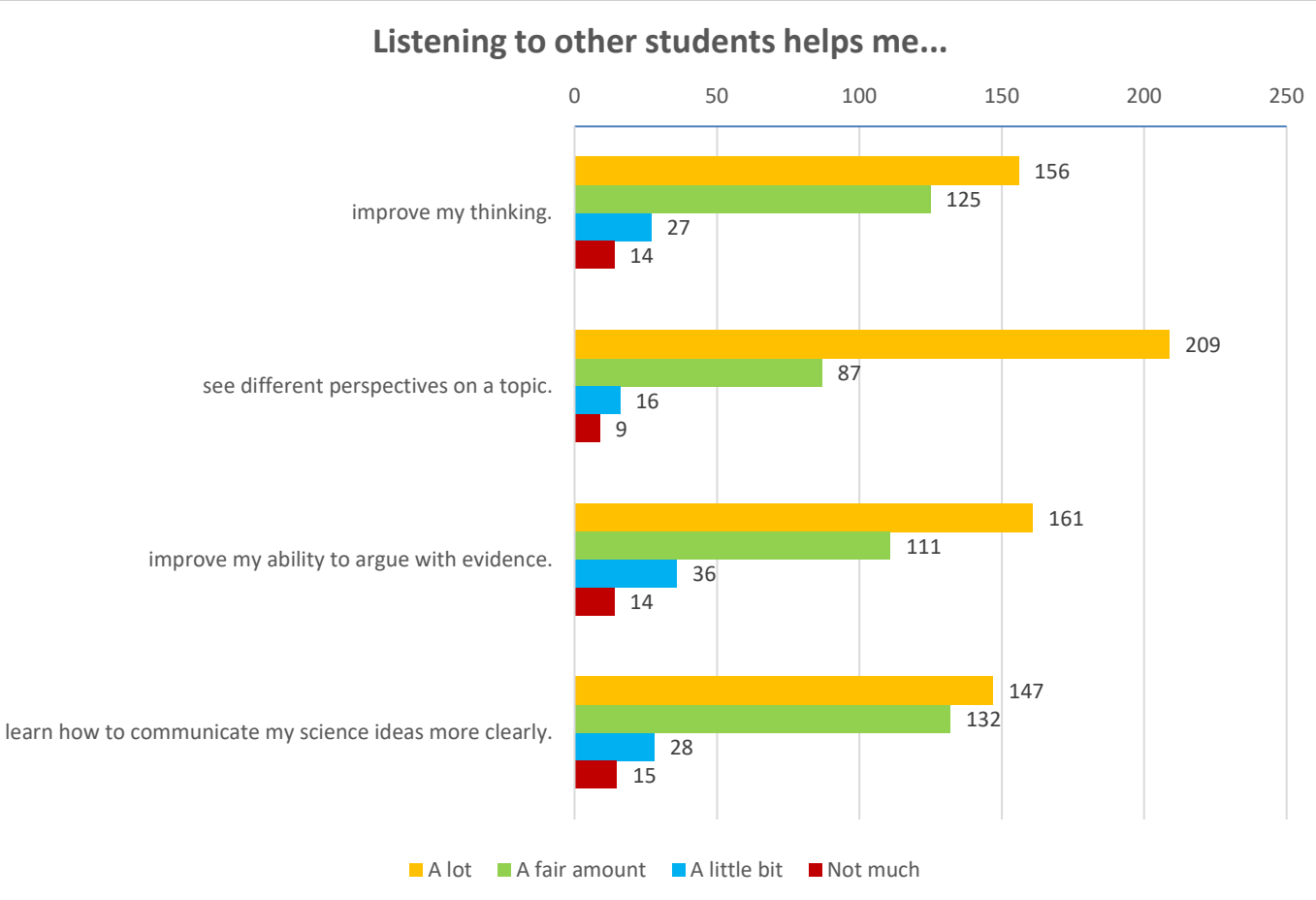
Computational Thinking



PHYS A

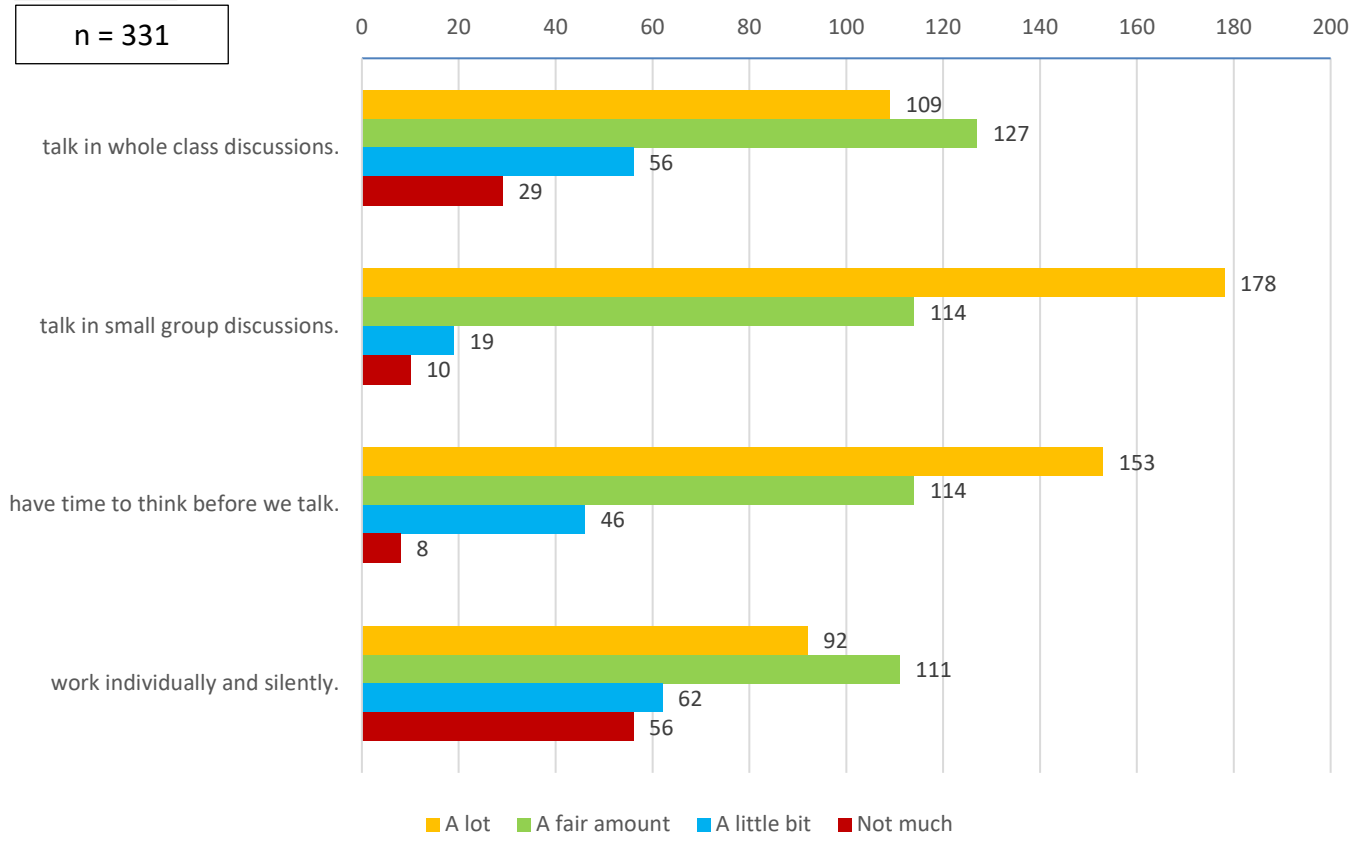
n = 331

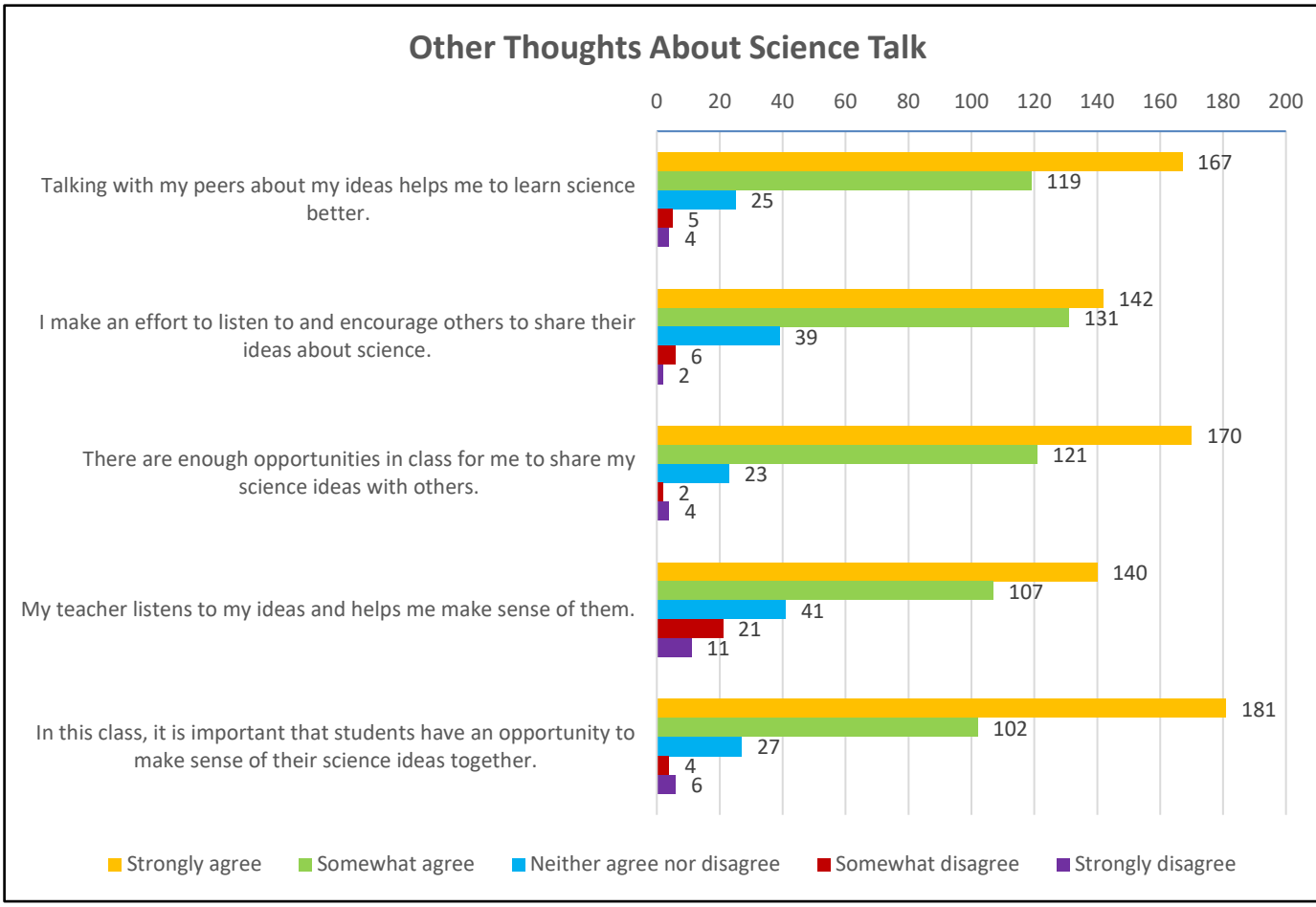

In science class this unit, I...
0
50
100
150
200
250
300
was given the opportunity to share my ideas.
261
55
5
took the chance to share my ideas.
162
127
32
felt comfortable sharing my ideas.
170
113
38
had an opportunity to write about my thinking before talking.
230
86
4
felt like my peers and/or teacher listened to my ideas.
218
88
15
was able to express my ideas in more than one way (for example: writing, drawing, talking, gesturing).
258
50
13
Often
Sometimes
Rarely


Listening to other students helps me...
0
50
100
150
200
250
improve my thinking.
156
125
27
14
see different perspectives on a topic.
209
87
16
9
improve my ability to argue with evidence.
161
111
36
14
learn how to communicate my science ideas more clearly.
147
132
28
15
A lot
A fair amount
A little bit
Not much

PHYS A

n = 331

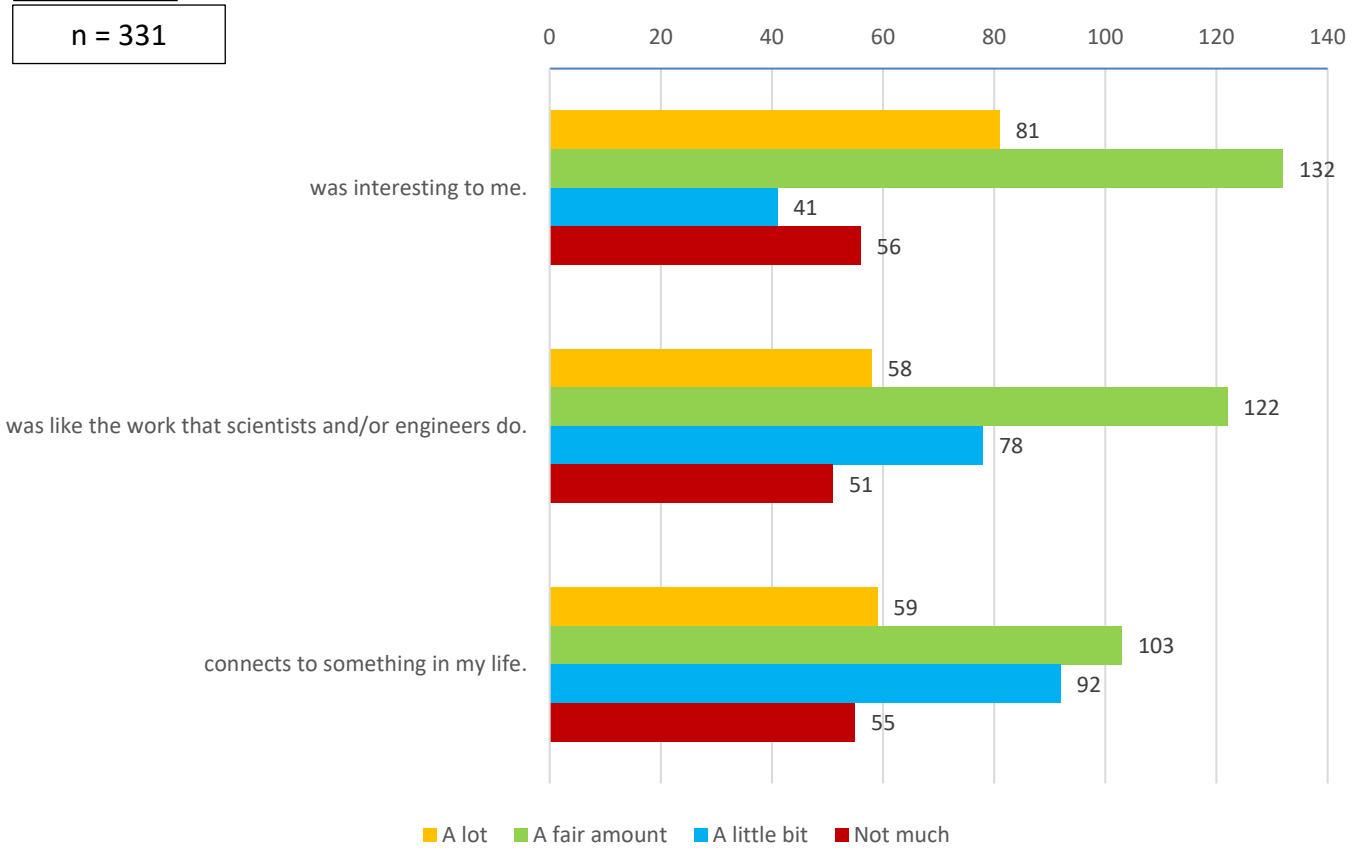

I learn a lot better when we...
0
20
40
60
80
100
120
140
160
180
200
talk in whole class discussions.
109
127
56
29
talk in small group discussions.
178
114
19
10
have time to think before we talk.
153
114
46
8
work individually and silently.
92
111
62
56
A lot
A fair amount
A little bit
Not much


Other Thoughts About Science Talk
0
20
40
60
80
100
120
140
160
180
200
Talking with my peers about my ideas helps me to learn science better.
167
119
25
5
4
I make an effort to listen to and encourage others to share their ideas about science.
142
131
39
6
2
There are enough opportunities in class for me to share my science ideas with others.
170
121
23
2
4
My teacher listens to my ideas and helps me make sense of them.
140
107
41
21
11
In this class, it is important that students have an opportunity to make sense of their science ideas together.
181
102
27
4
6
Strongly agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Strongly disagree

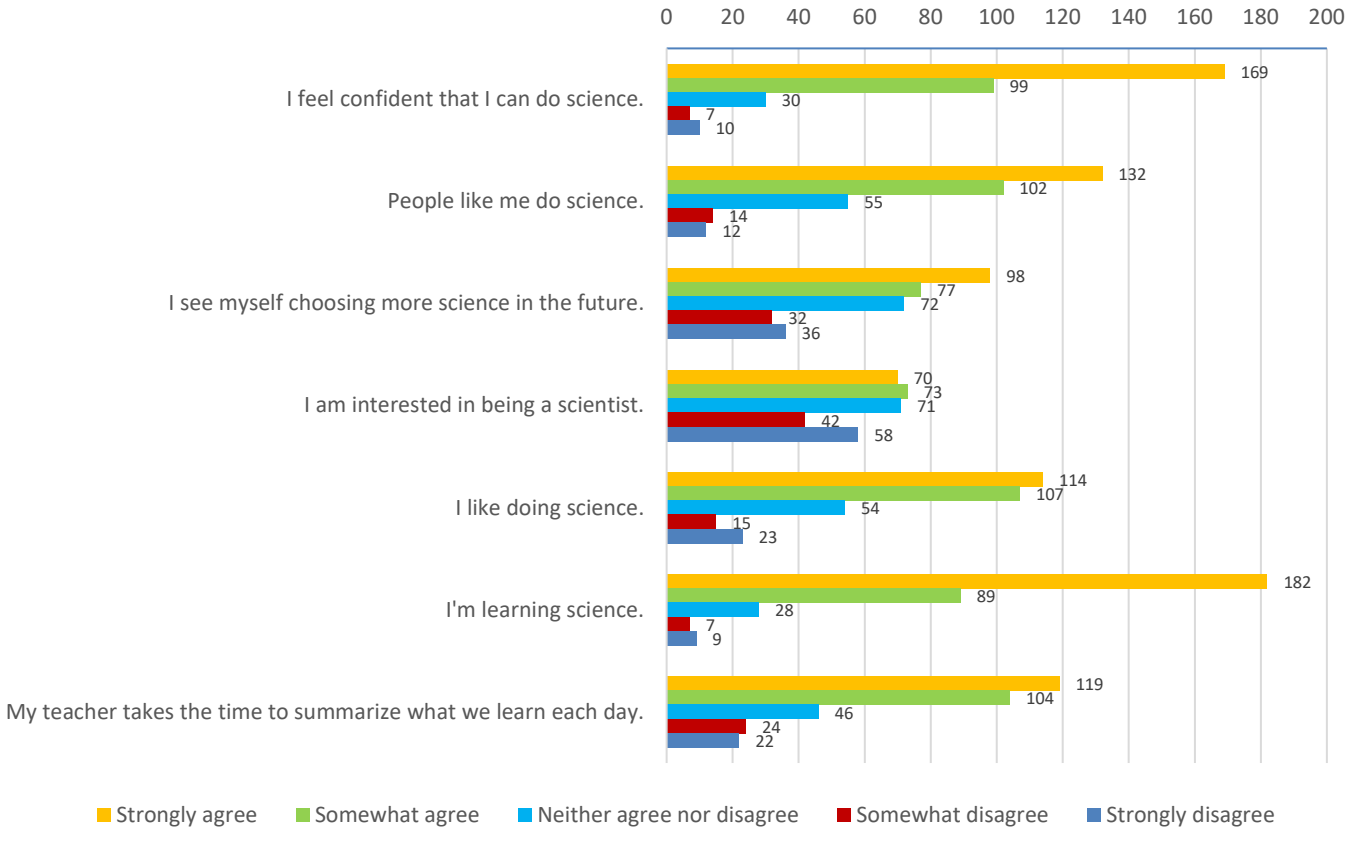
PHYS A

n = 331

The work we did in science class this unit...

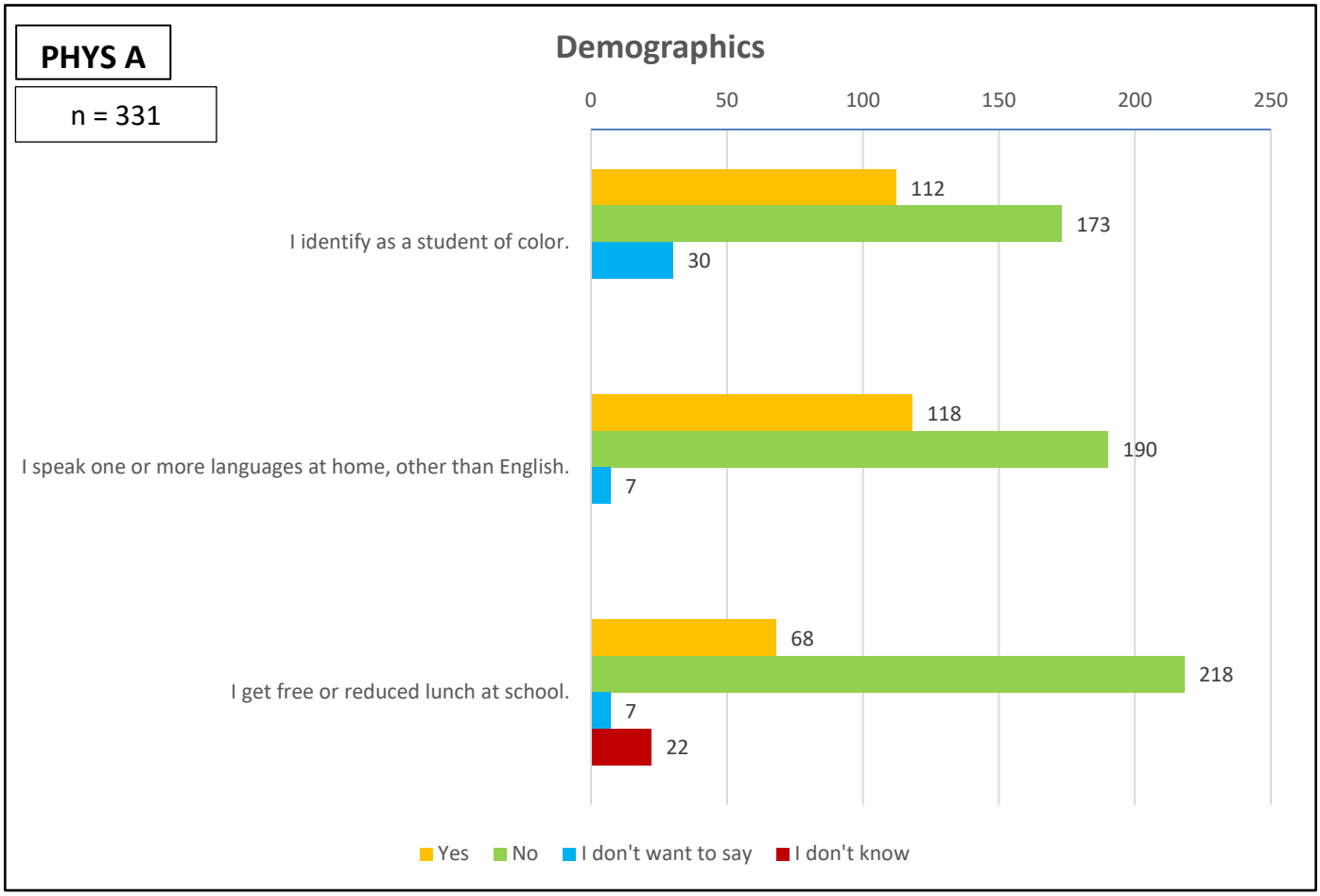


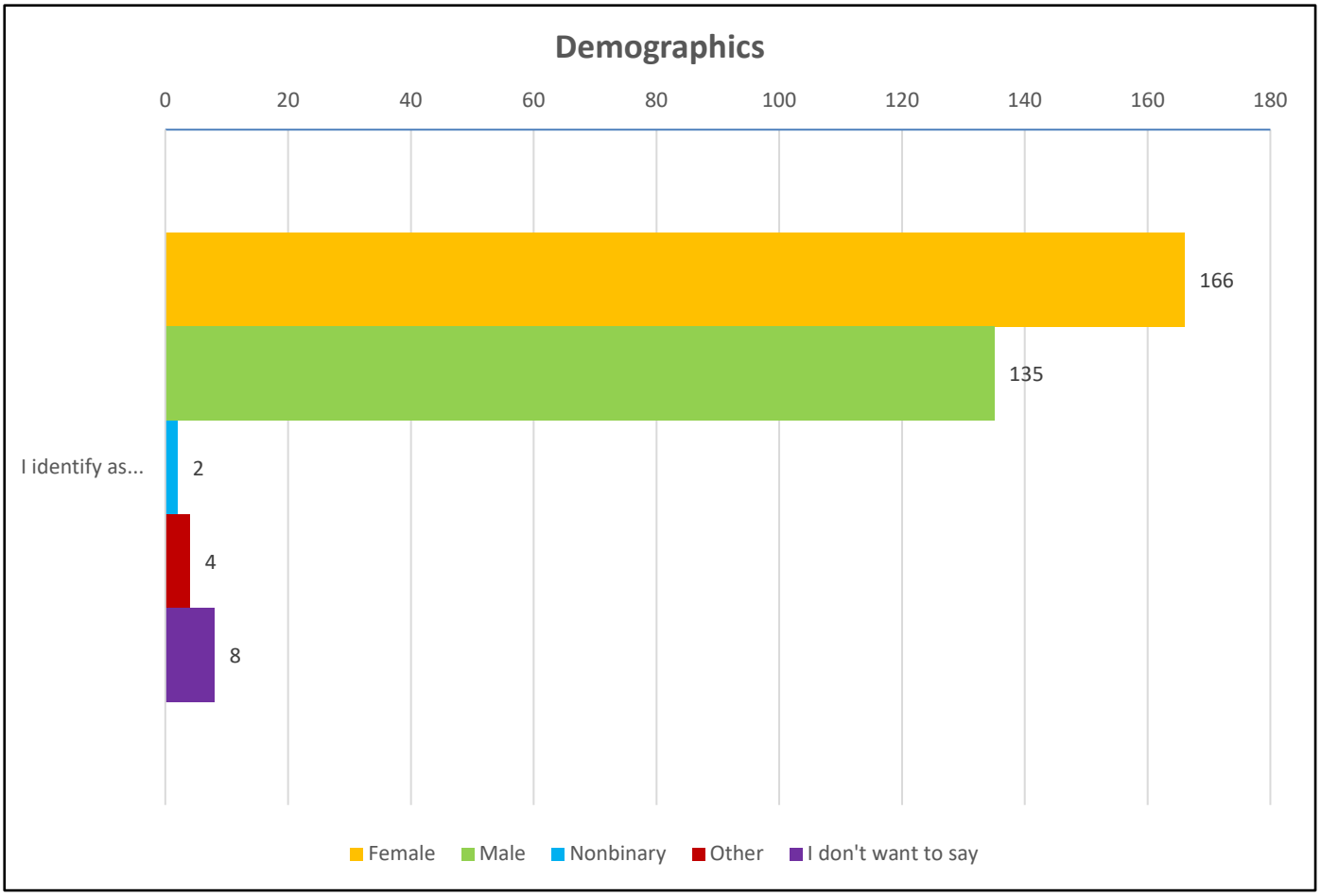
Identity, Disposition, and Learning



PHYS A

n = 331

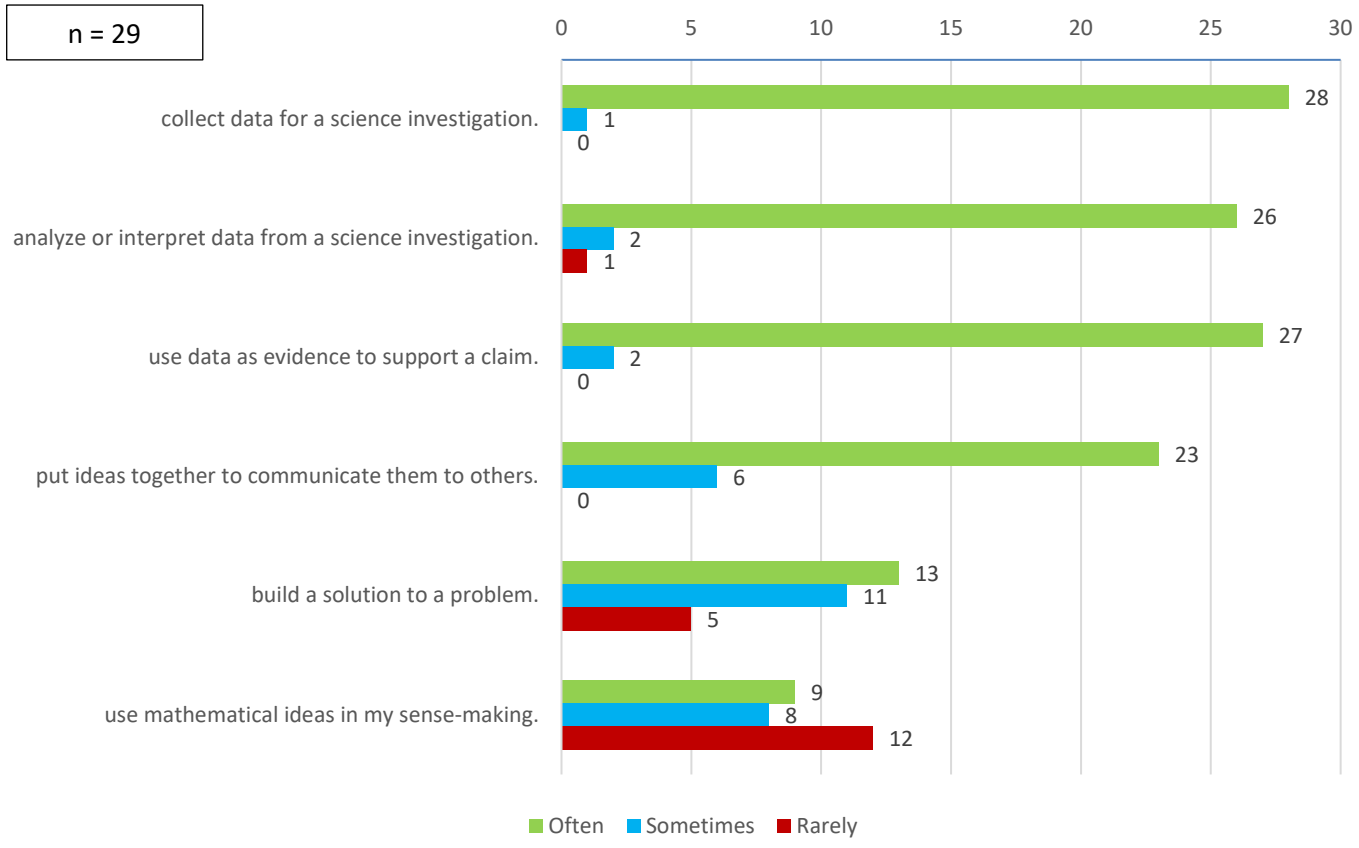

Demographics
0
50
100
150
200
250
I identify as a student of color.
112
173
30
I speak one or more languages at home, other than English.
118
190
7
I get free or reduced lunch at school.
68
218
7
22
Yes
No
I don't want to say
I don't know


Demographics
0
20
40
60
80
100
120
140
160
180
I identify as...
166
135
2
4
8
Female
Male
Nonbinary
Other
I don't want to say

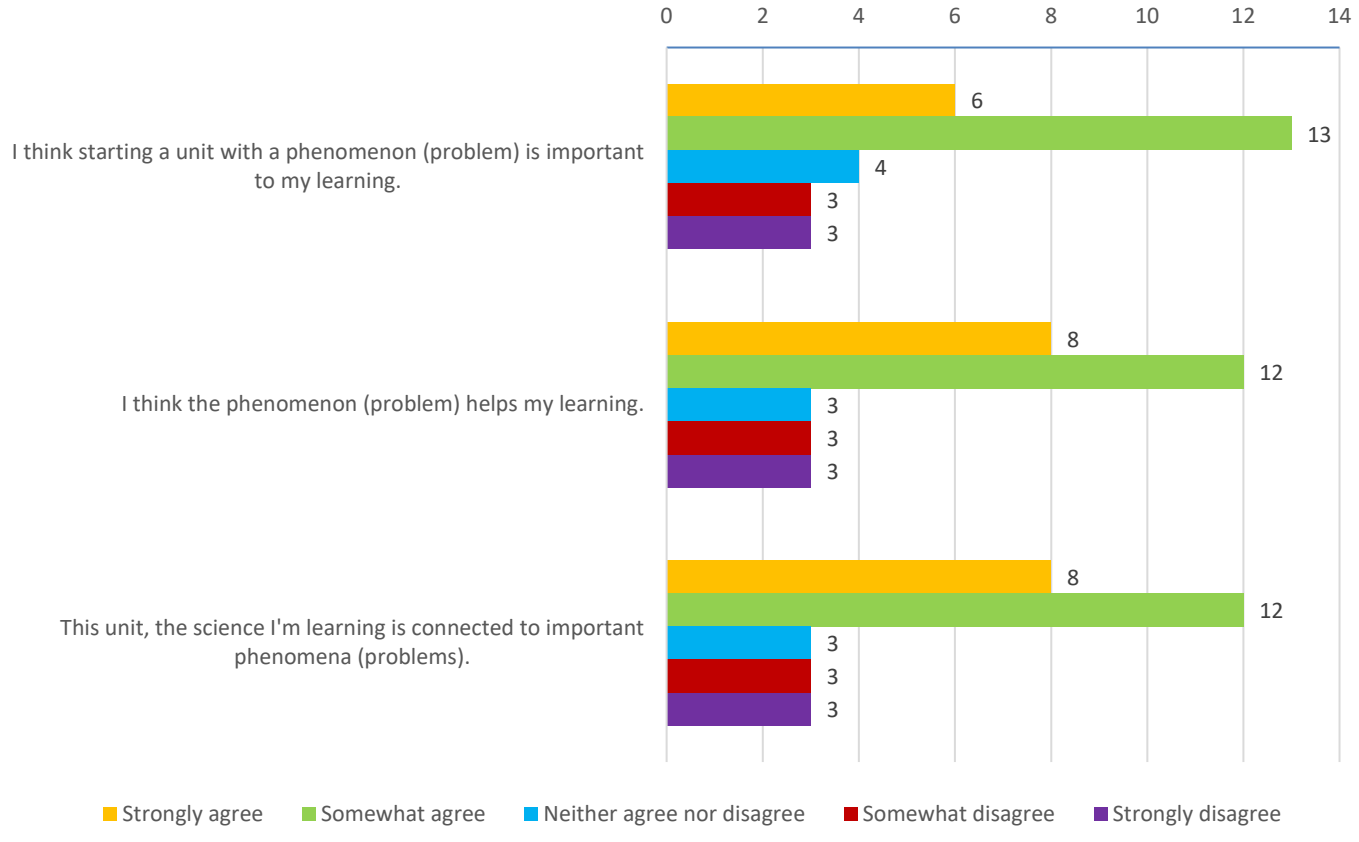
PHYS B

n = 29

In my science class this unit, I was provided opportunities to...



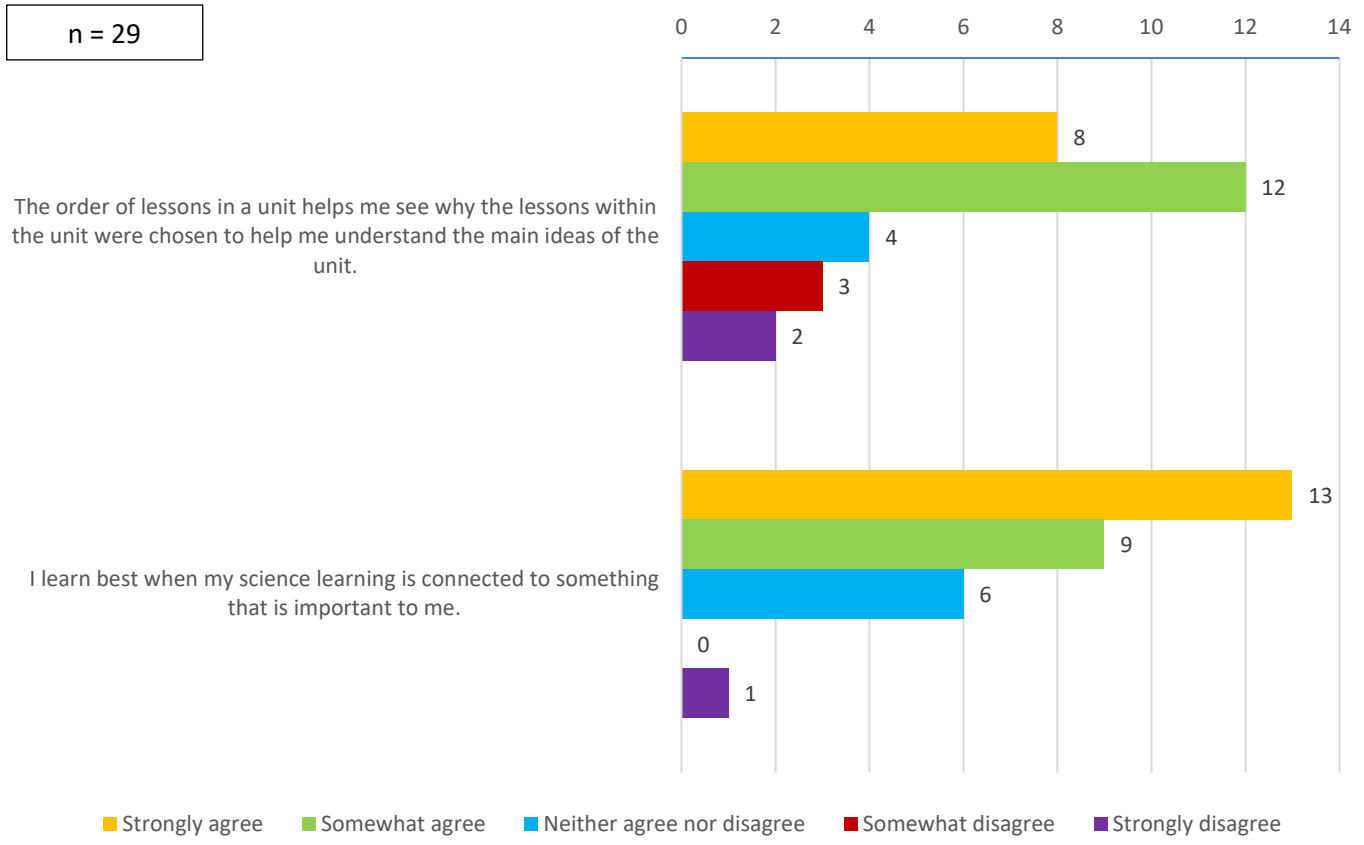
Phenomena: A mystery or problem you are trying to solve.



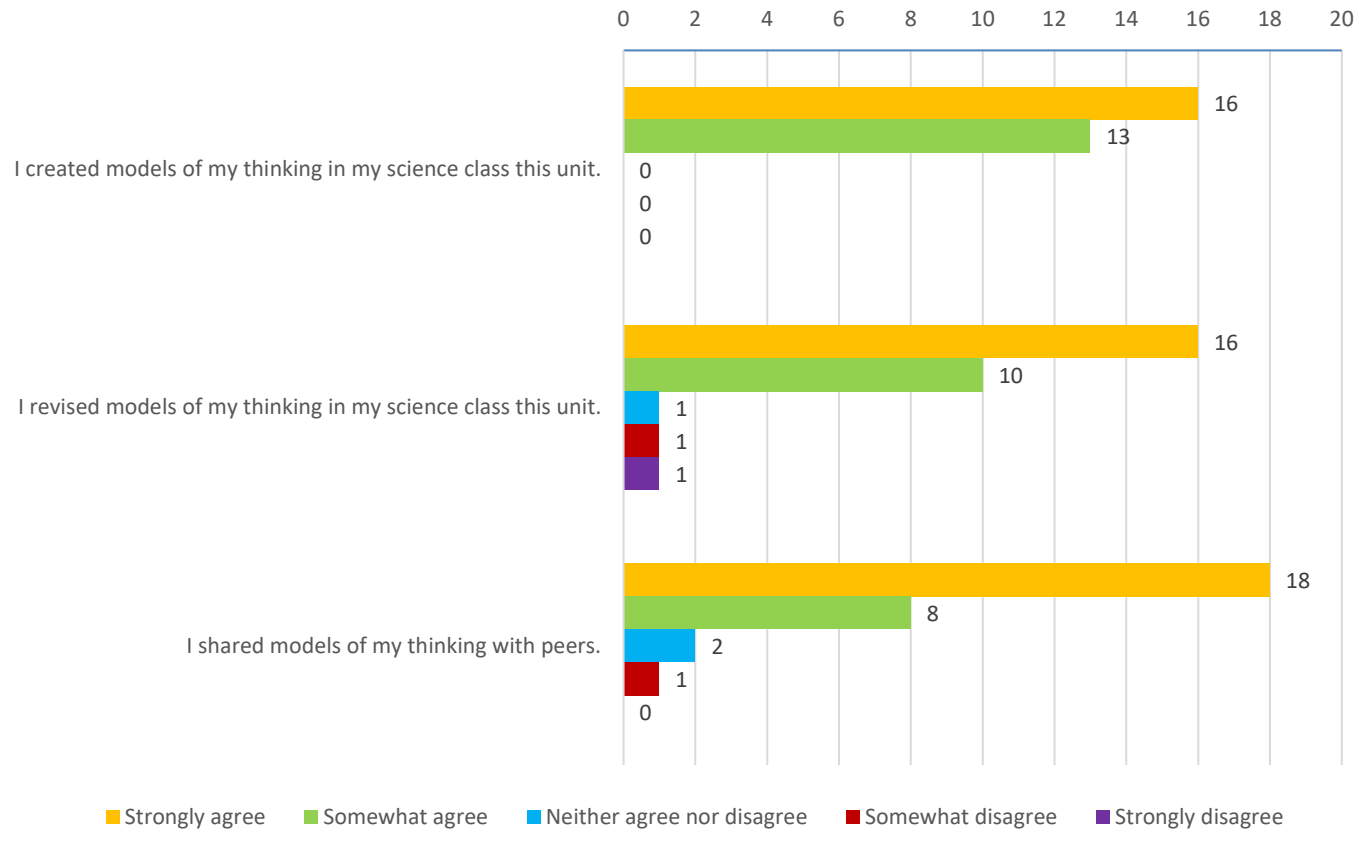
PHYS B

n = 29

Storylining



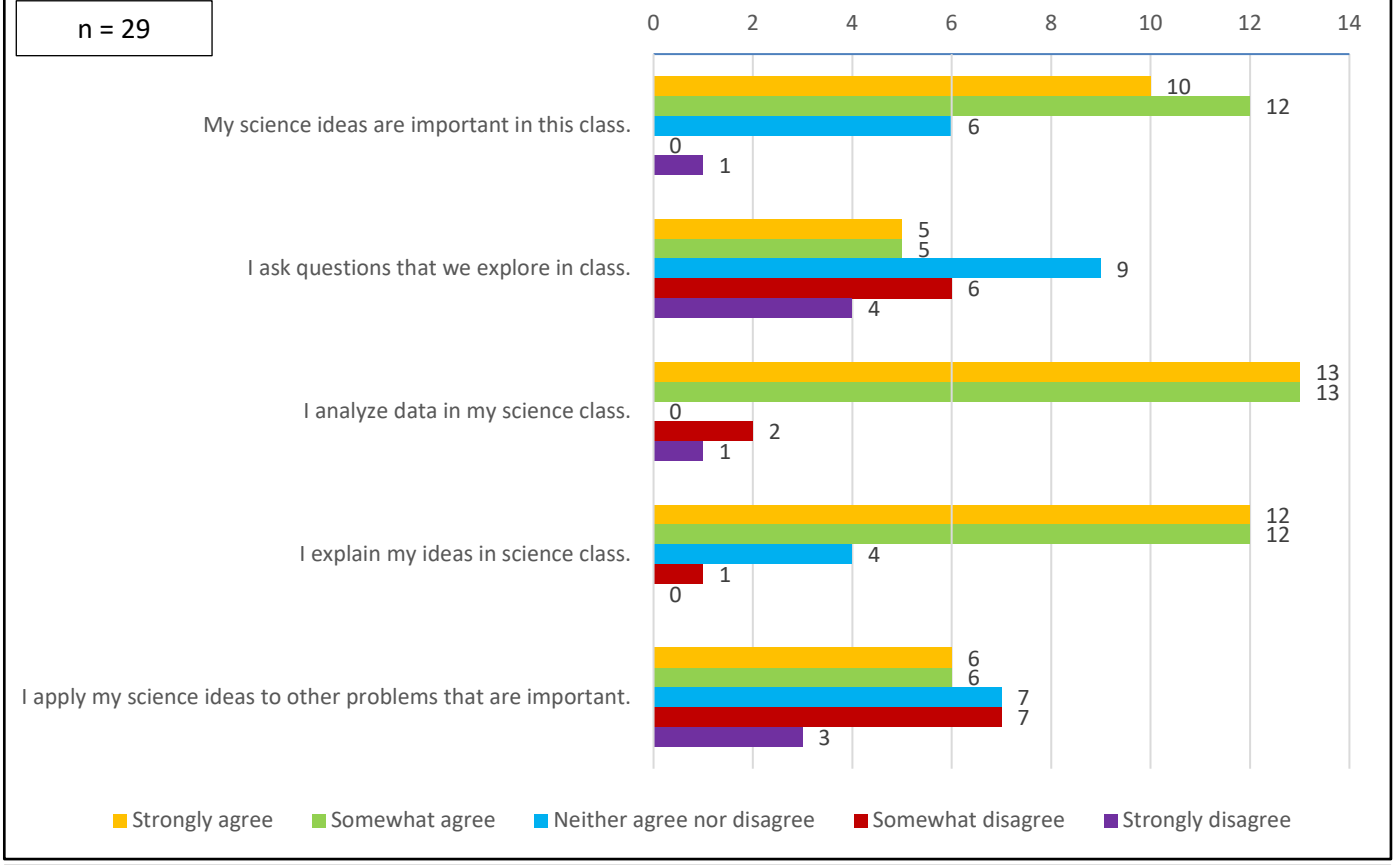
Modeling



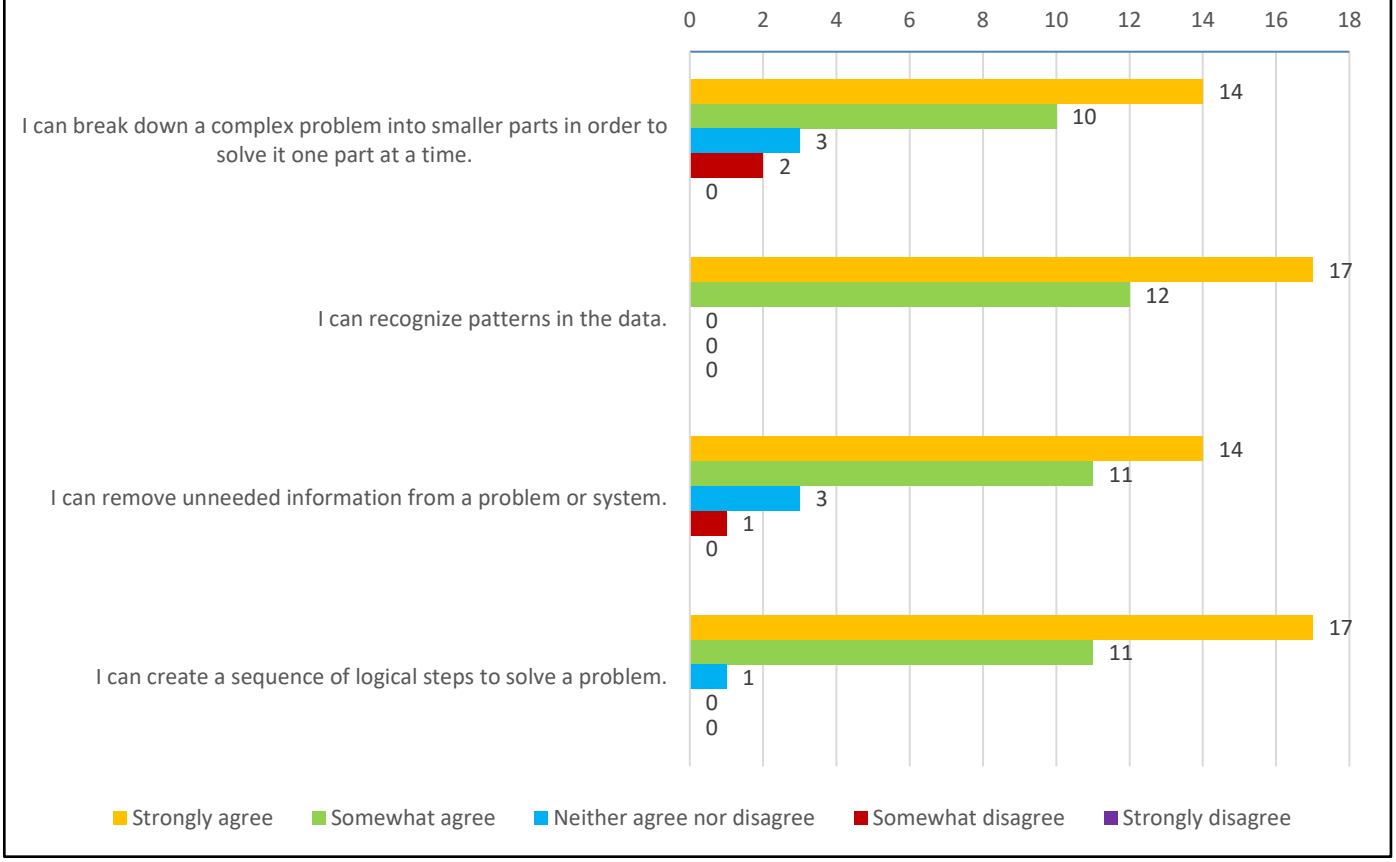
PHYS B

n = 29

Science Ideas & Doing Science



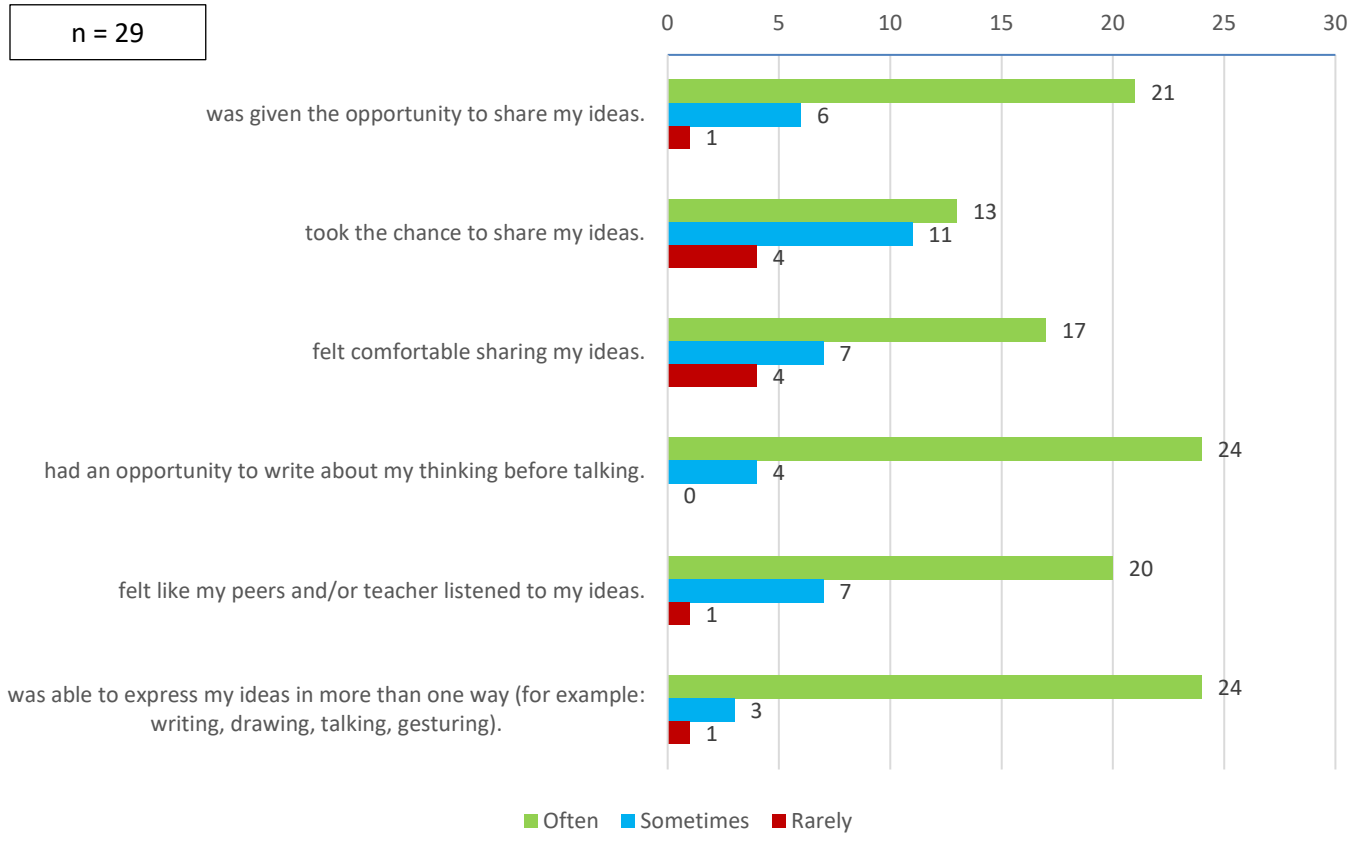
Computational Thinking



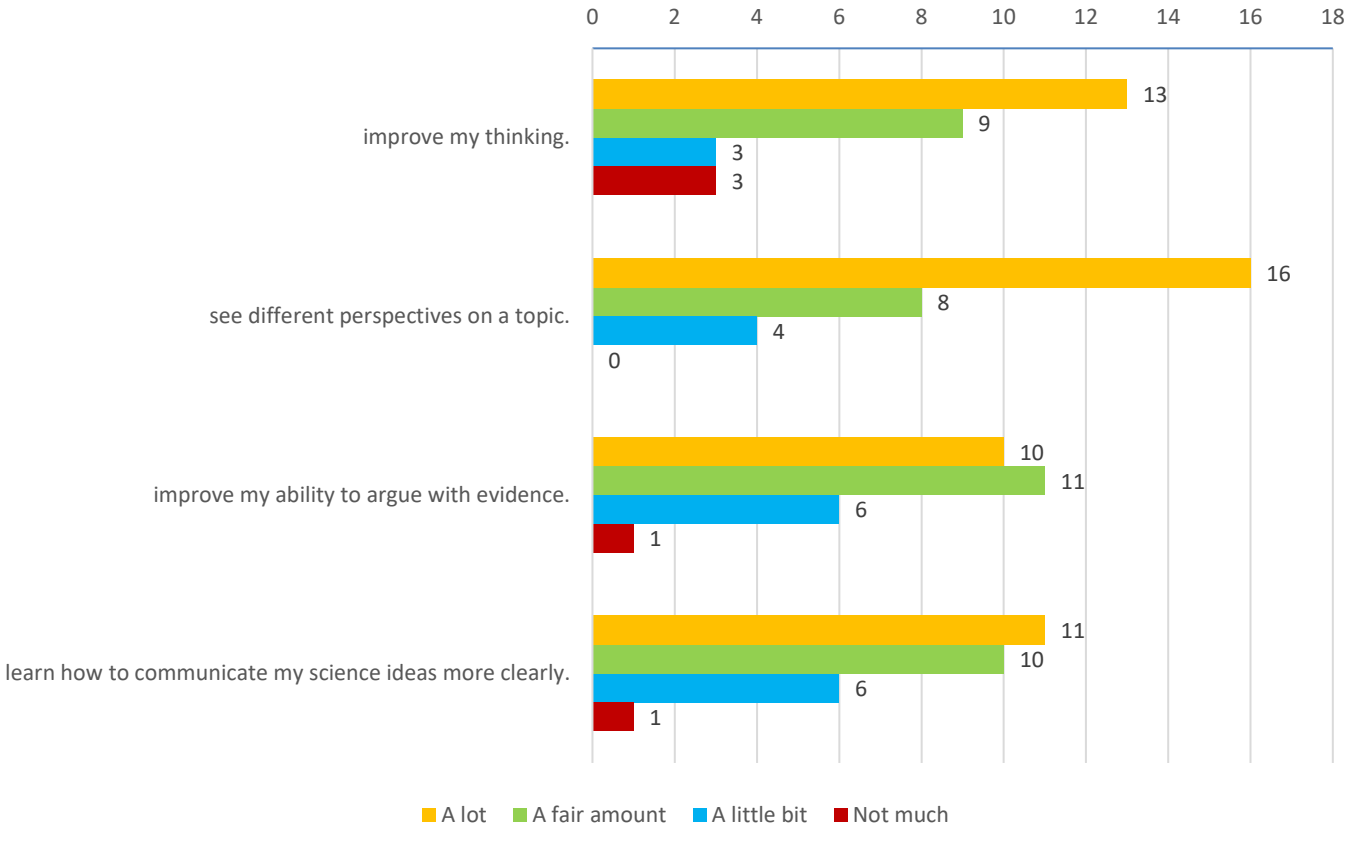
PHYS B

n = 29

In science class this unit, I...

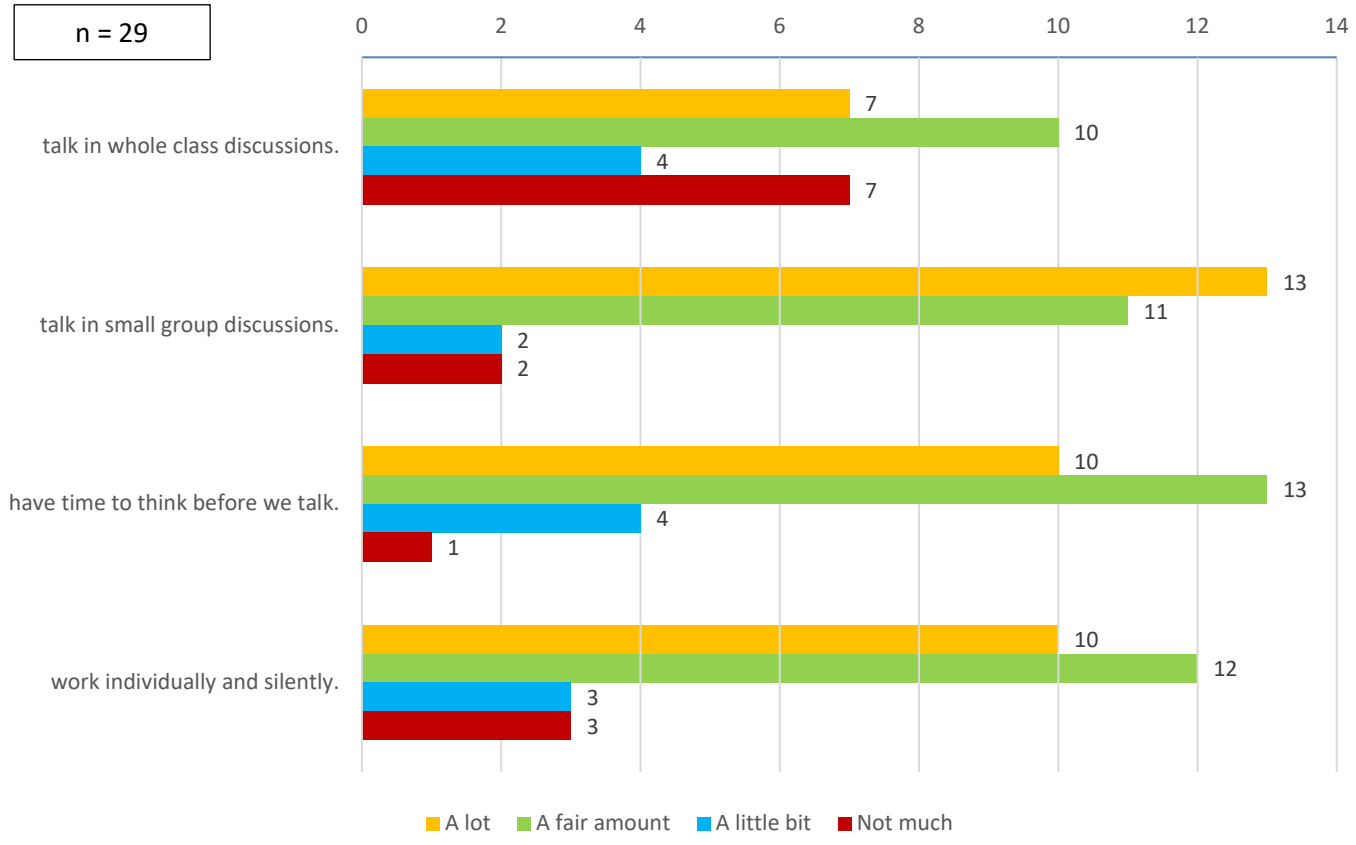


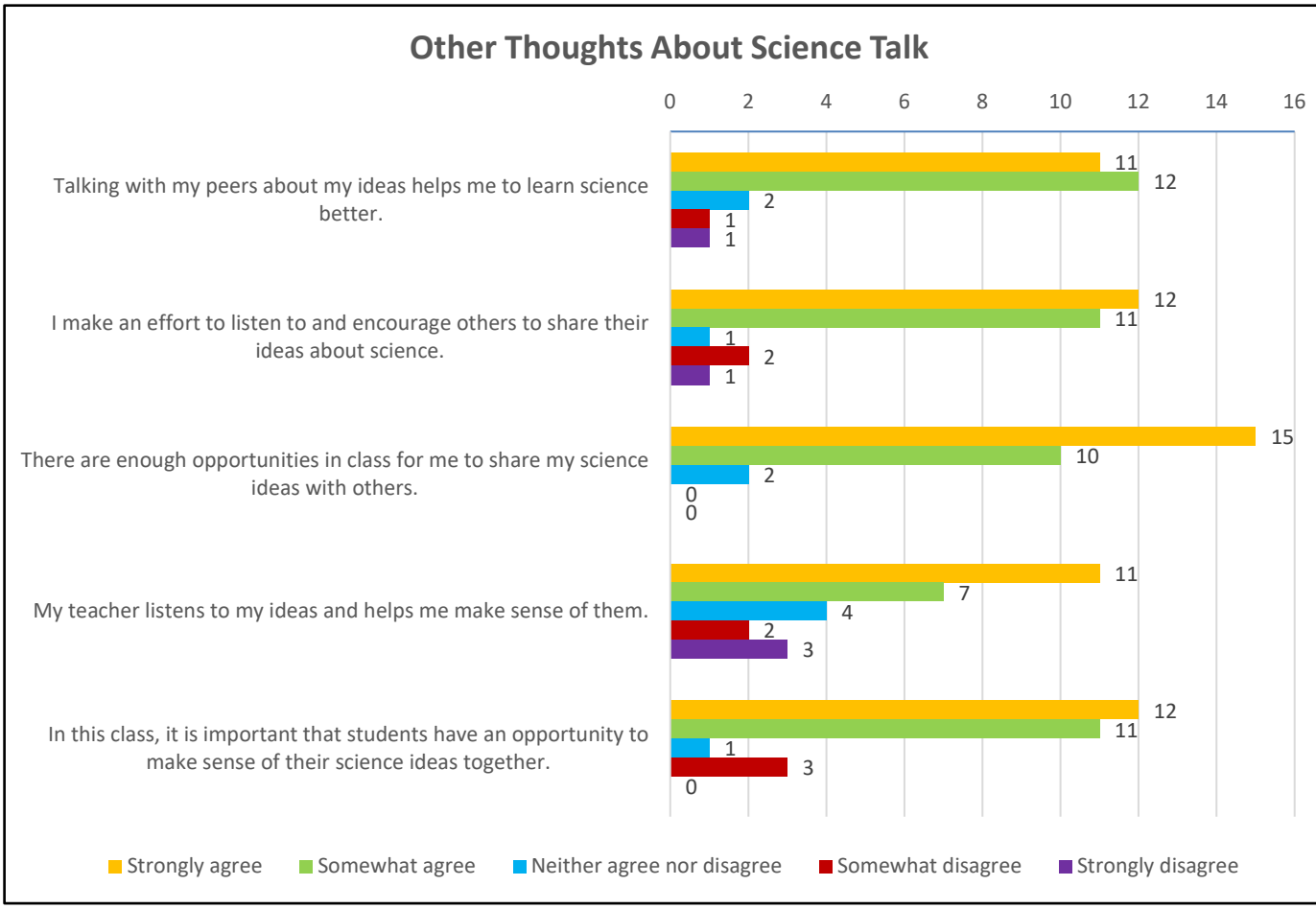
Listening to other students helps me...



PHYS B

n = 29

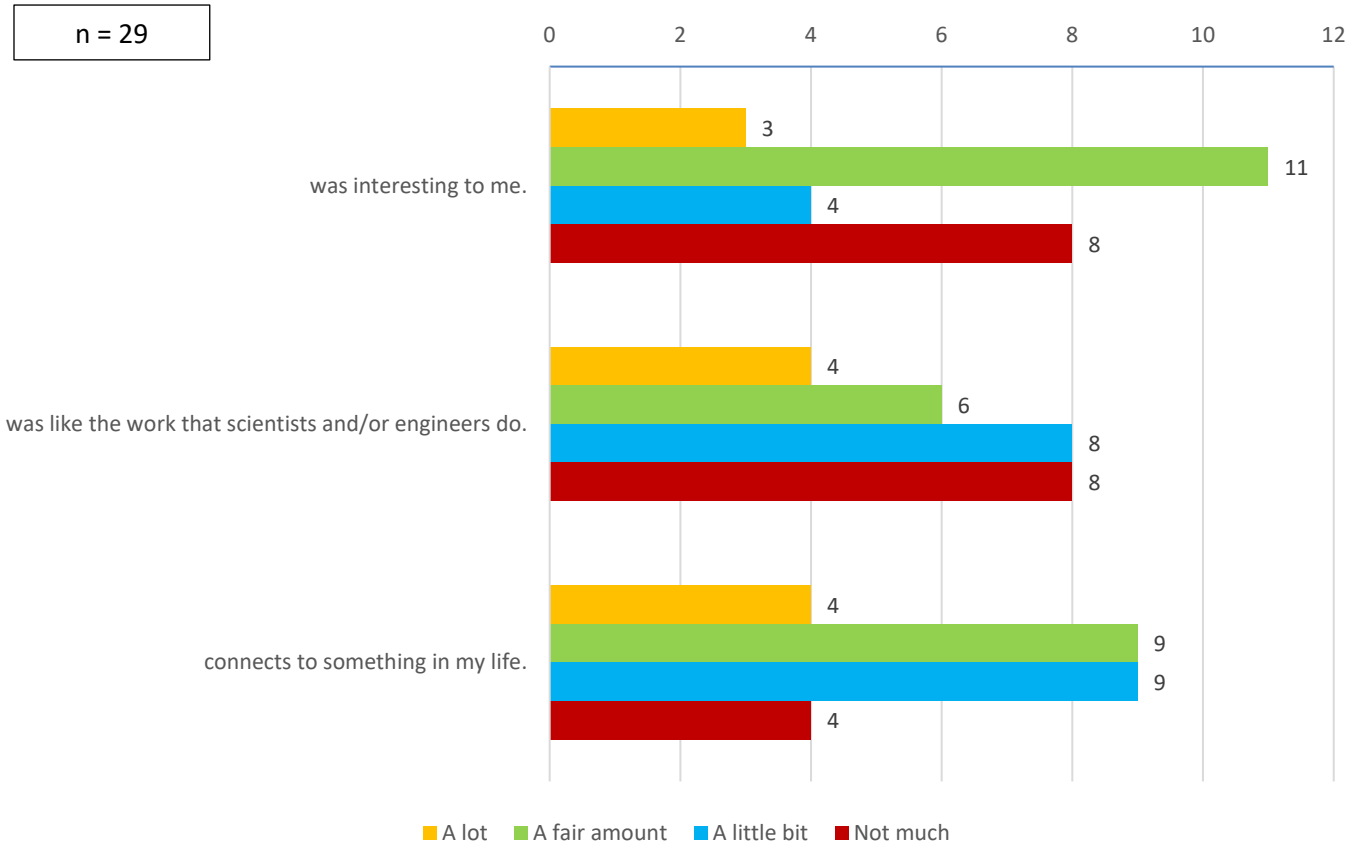

I learn a lot better when we...
0
2
4
6
8
10
12
14
talk in whole class discussions.
7
10
4
7
talk in small group discussions.
13
11
2
2
have time to think before we talk.
10
13
4
1
work individually and silently.
10
12
3
3
A lot
A fair amount
A little bit
Not much


Other Thoughts About Science Talk
0
2
4
6
8
10
12
14
16
Talking with my peers about my ideas helps me to learn science better.
11
12
2
1
1
I make an effort to listen to and encourage others to share their ideas about science.
12
11
1
2
1
There are enough opportunities in class for me to share my science ideas with others.
15
10
2
0
0
My teacher listens to my ideas and helps me make sense of them.
11
7
4
2
3
In this class, it is important that students have an opportunity to make sense of their science ideas together.
12
11
1
3
0
Strongly agree
Somewhat agree
Neither agree nor disagree
Somewhat disagree
Strongly disagree

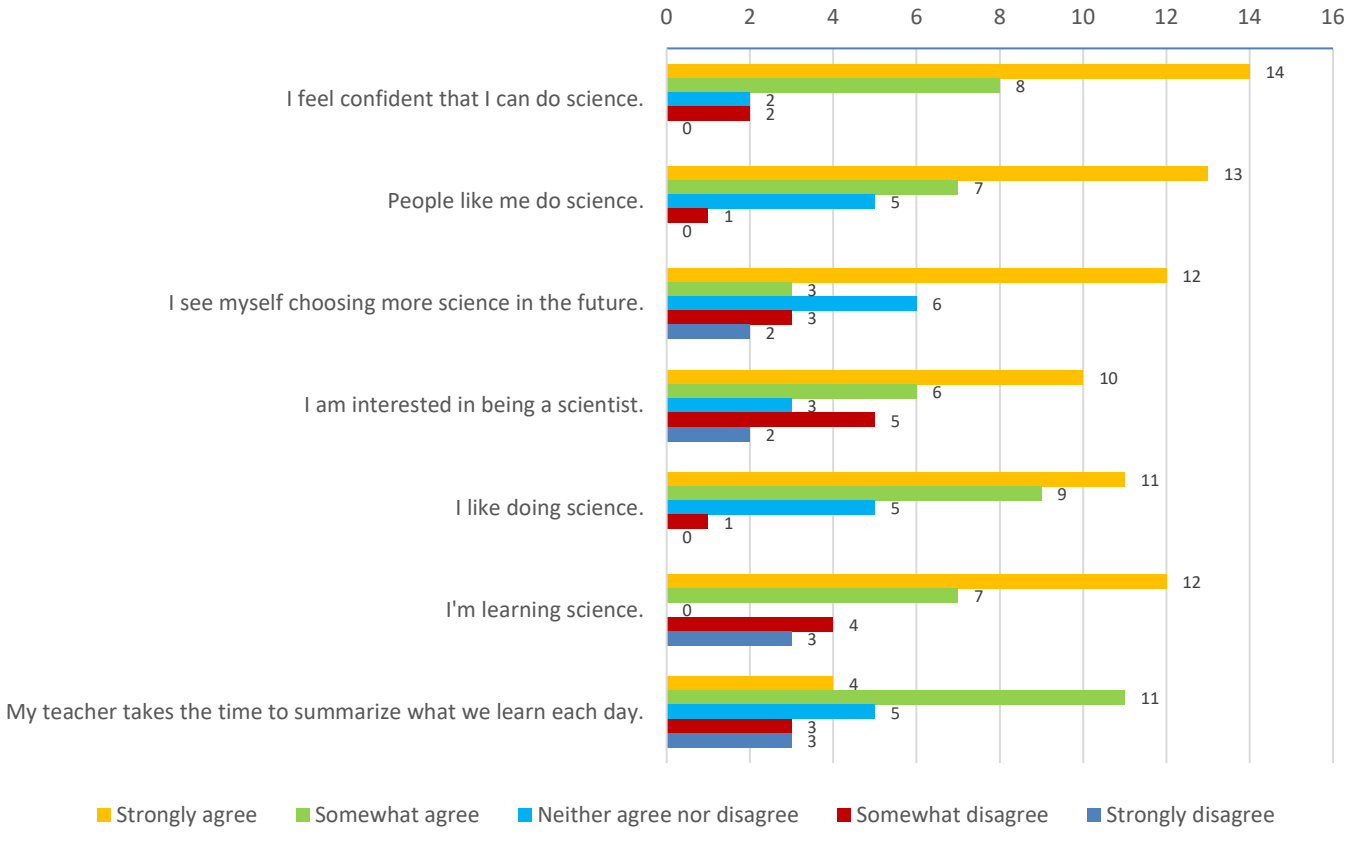
PHYS B

n = 29

The work we did in science class this unit...

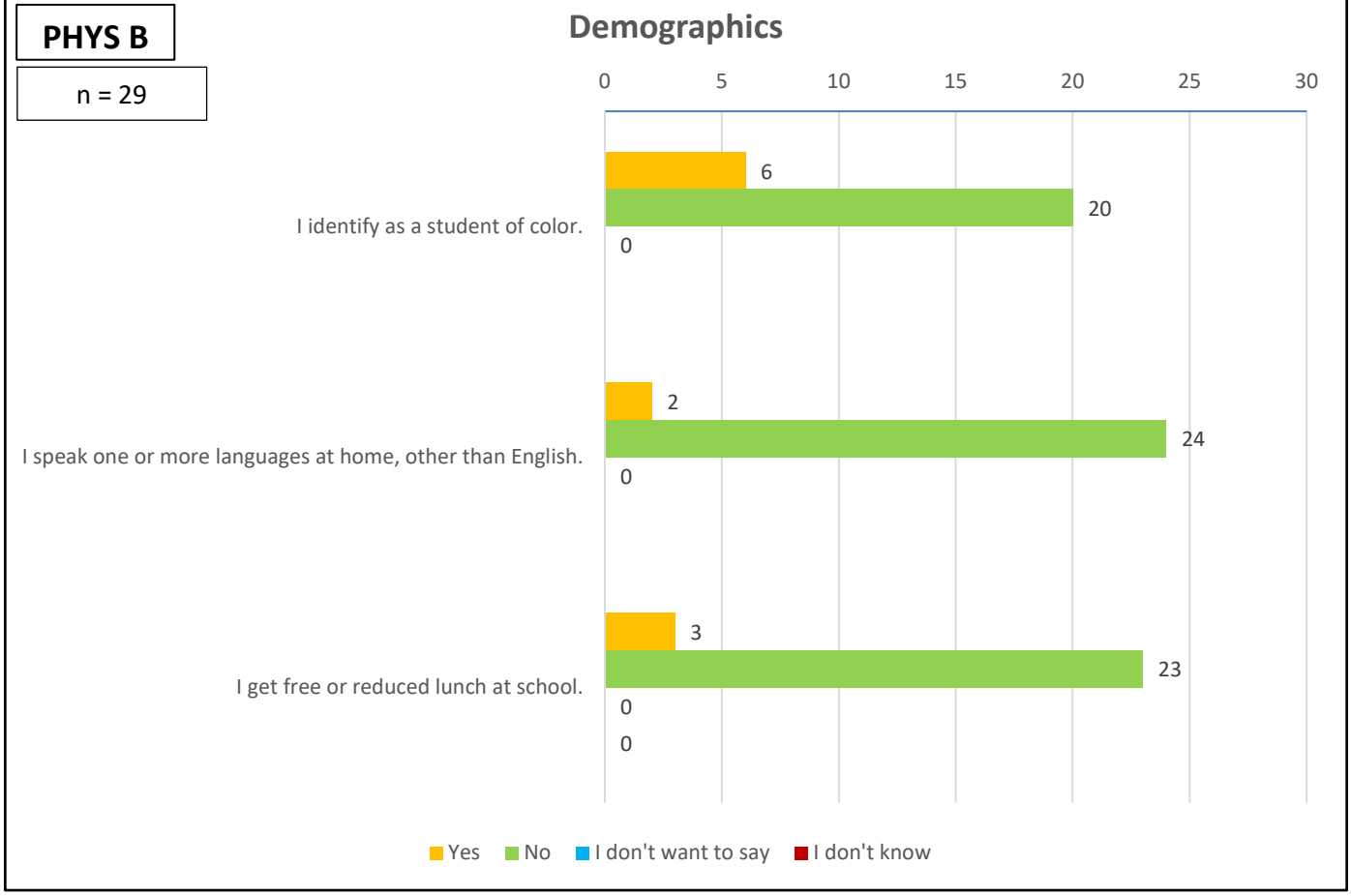


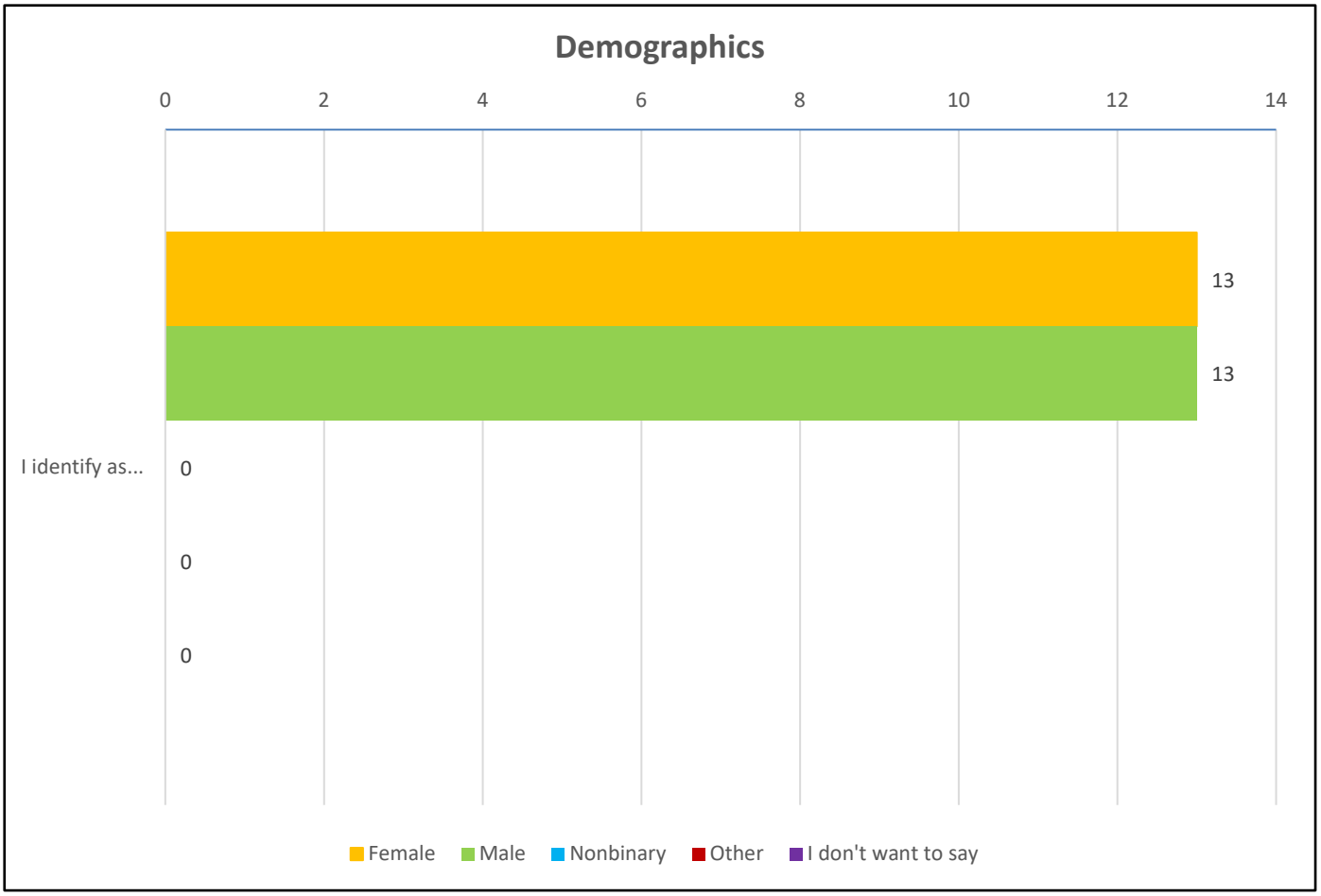
Identity, Disposition, and Learning



PHYS B

n = 29


Demographics
0
5
10
15
20
25
30
I identify as a student of color.
6
20
0
I speak one or more languages at home, other than English.
2
24
0
I get free or reduced lunch at school.
3
23
0
0
Yes
No
I don't want to say
I don't know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4
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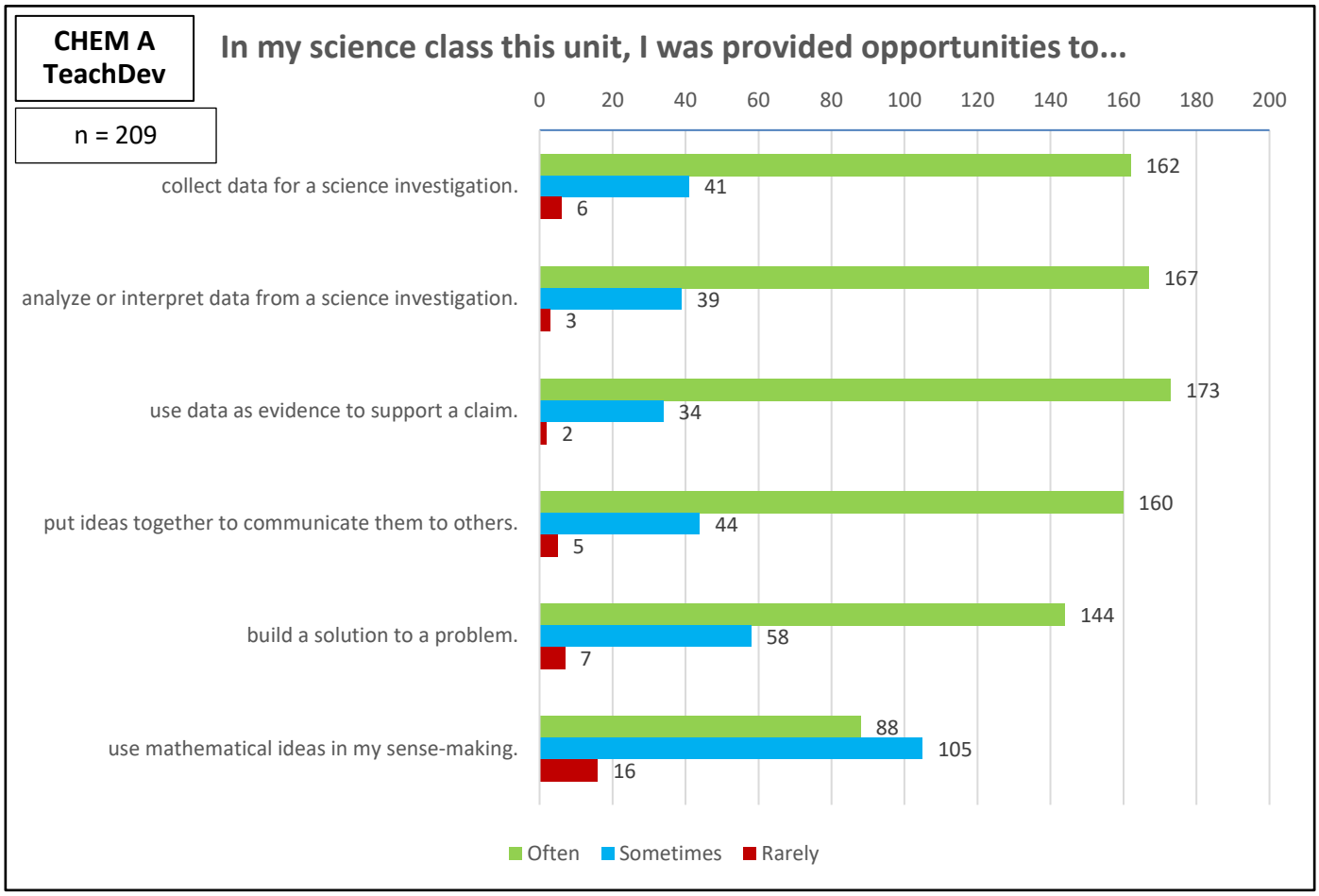
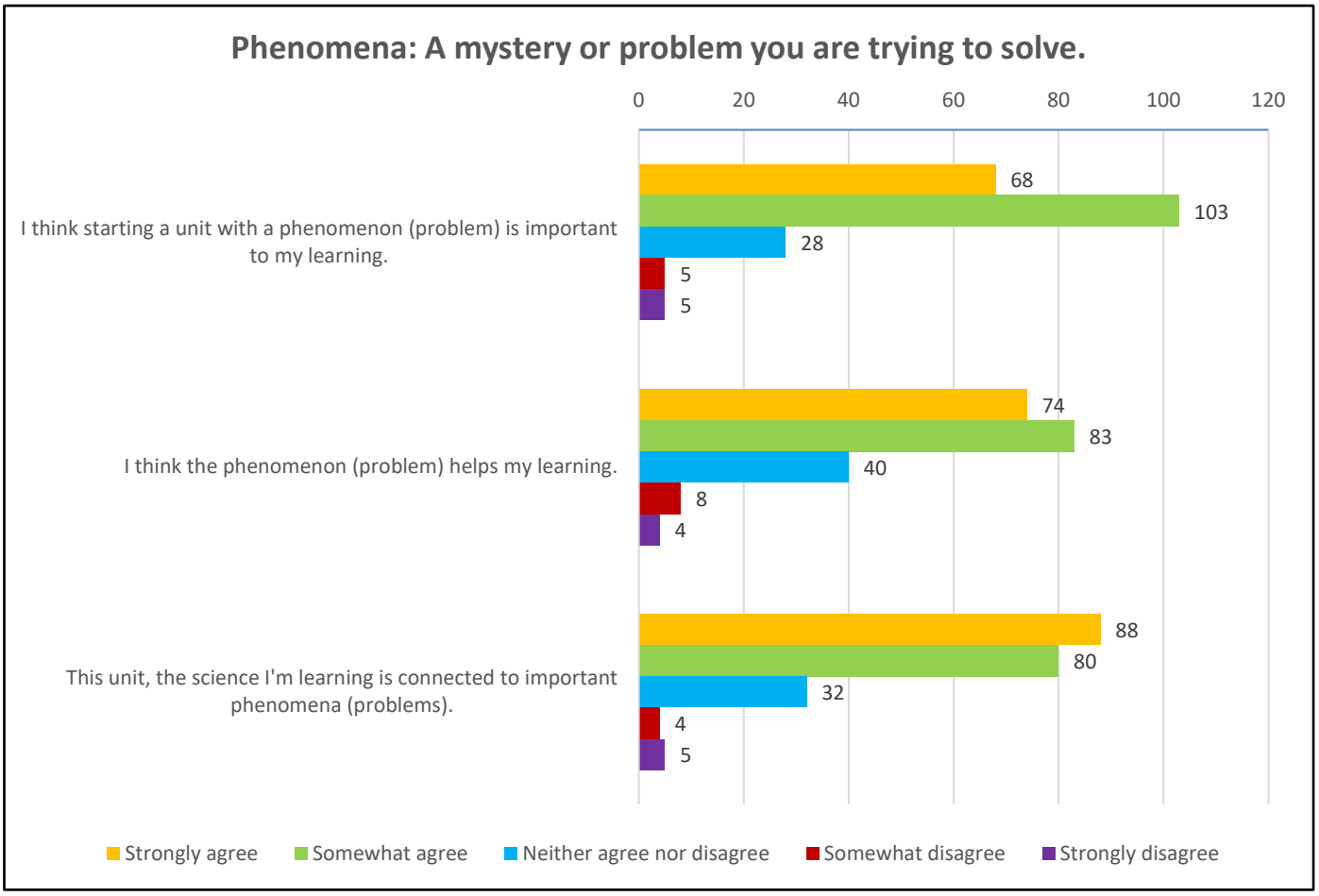
Female
Male
Nonbinary
Other
I don't want to say

Attachment I.2

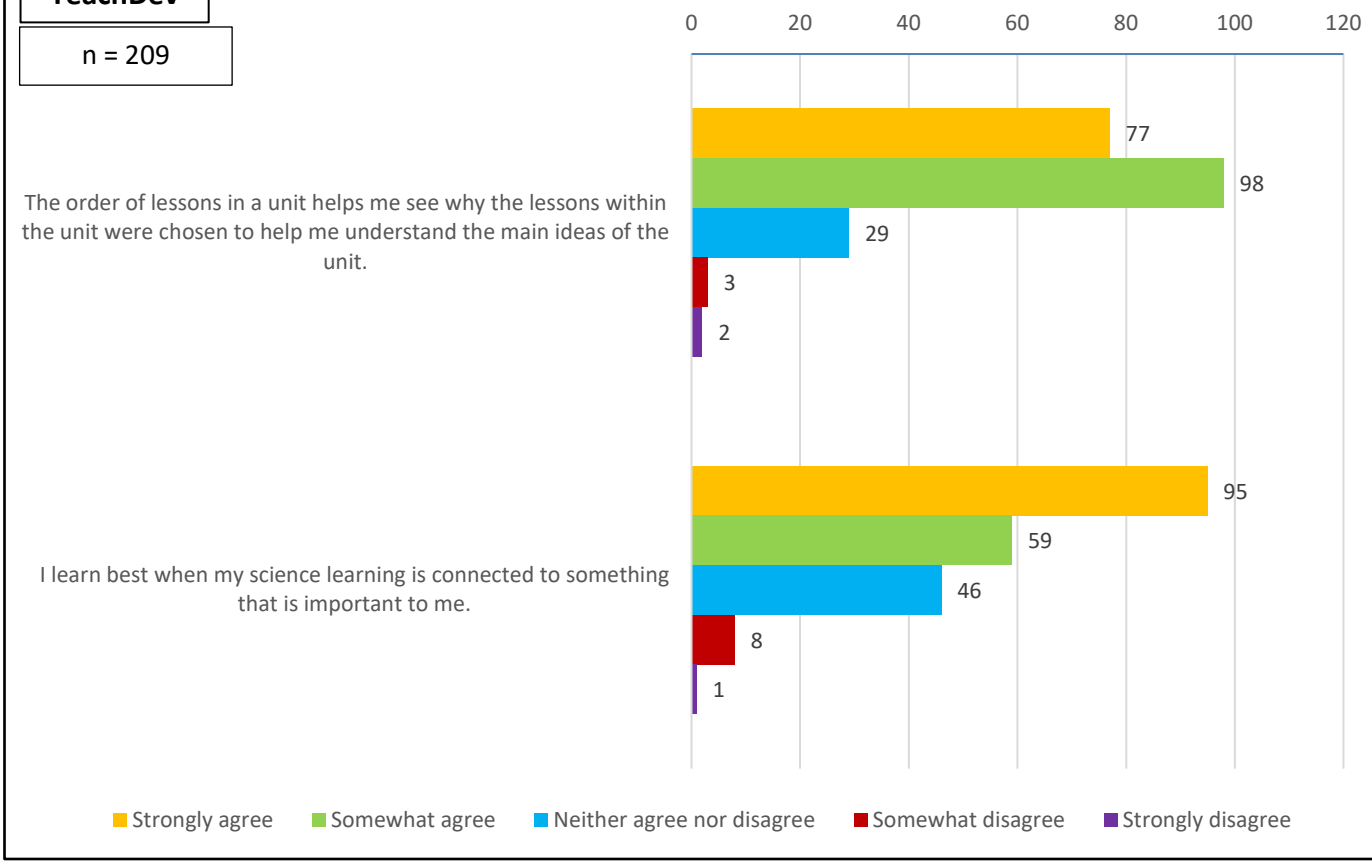




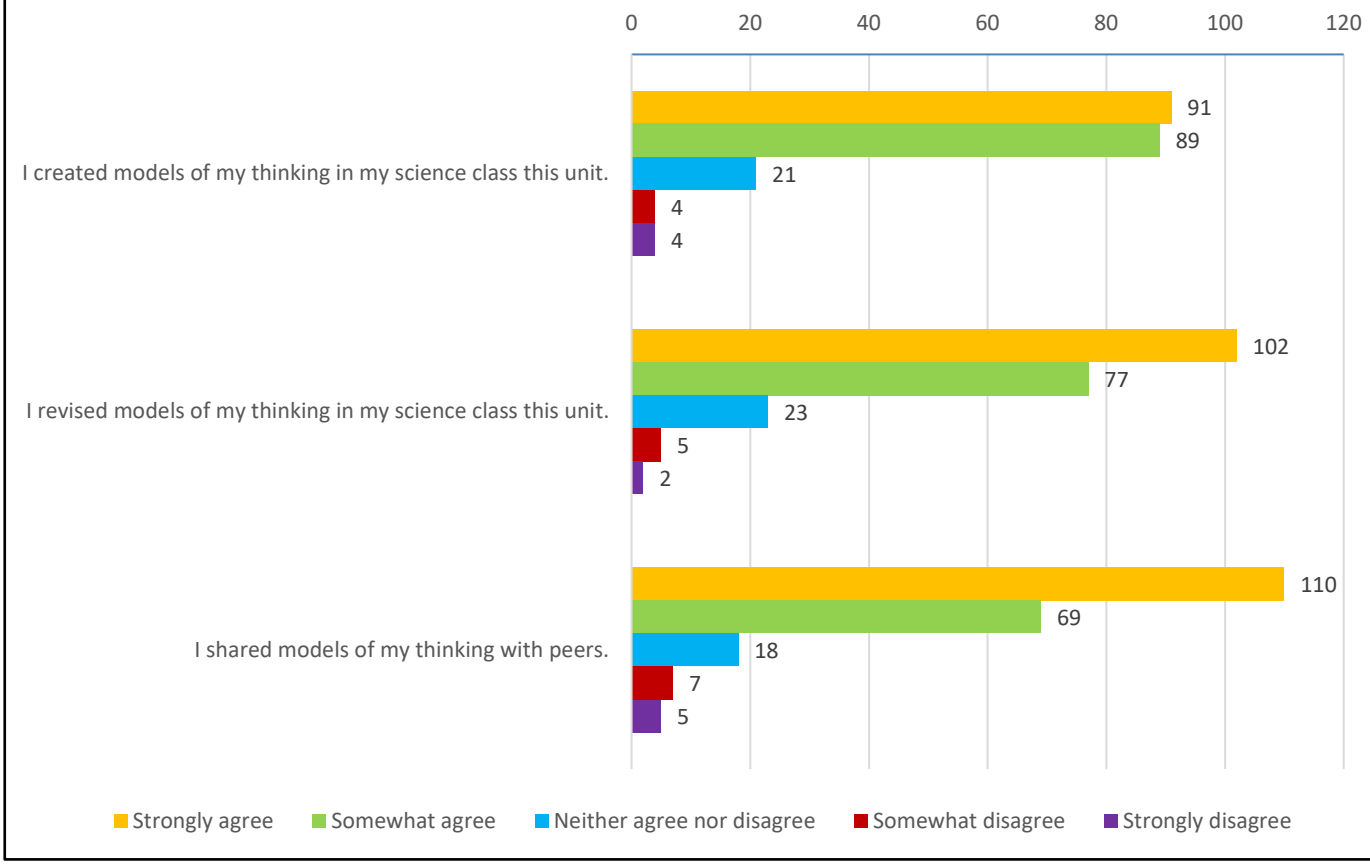
CHEM A TeachDev

n = 209

Storylining



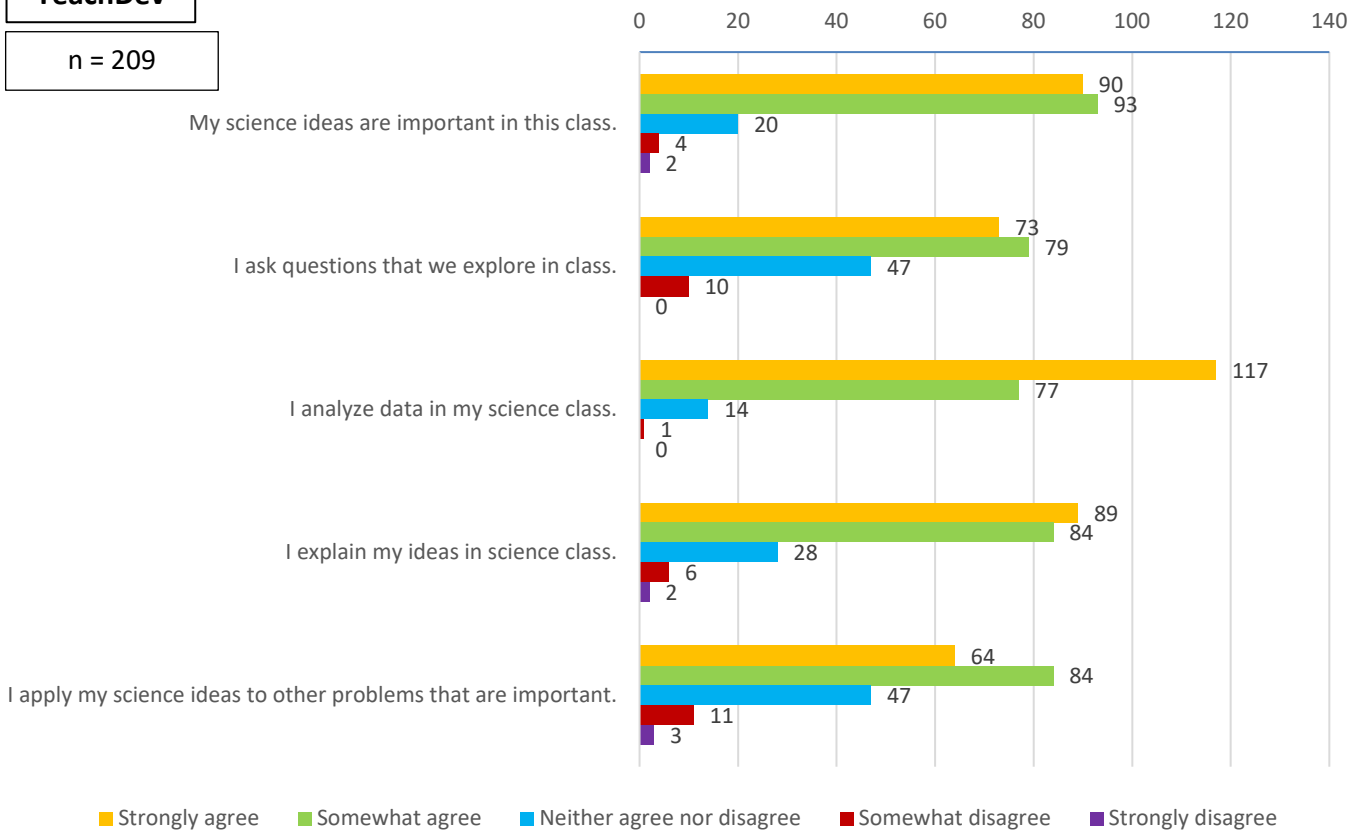
Modeling



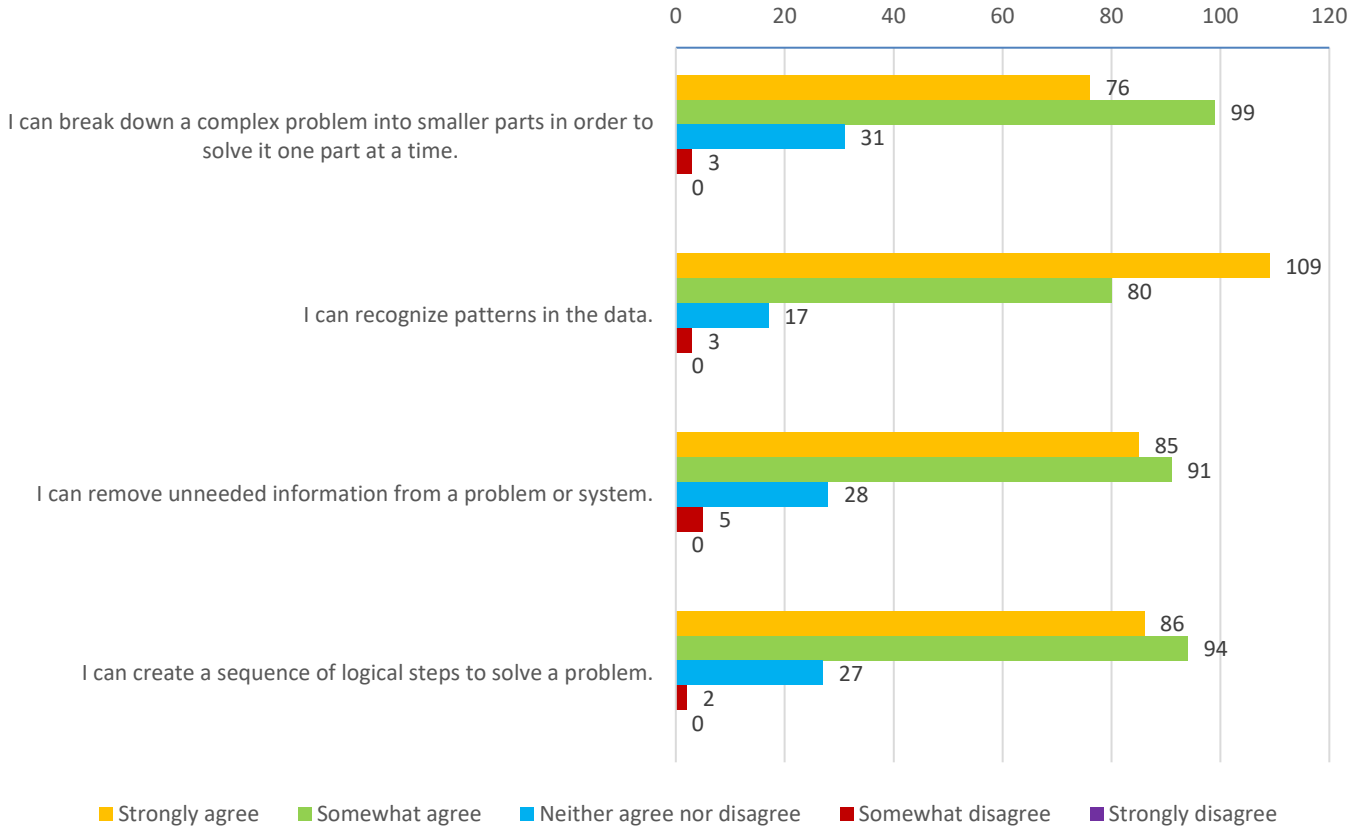
CHEM A TeachDev

n = 209

Science Ideas & Doing Science



Computational Thinking



CHEM A TeachDev

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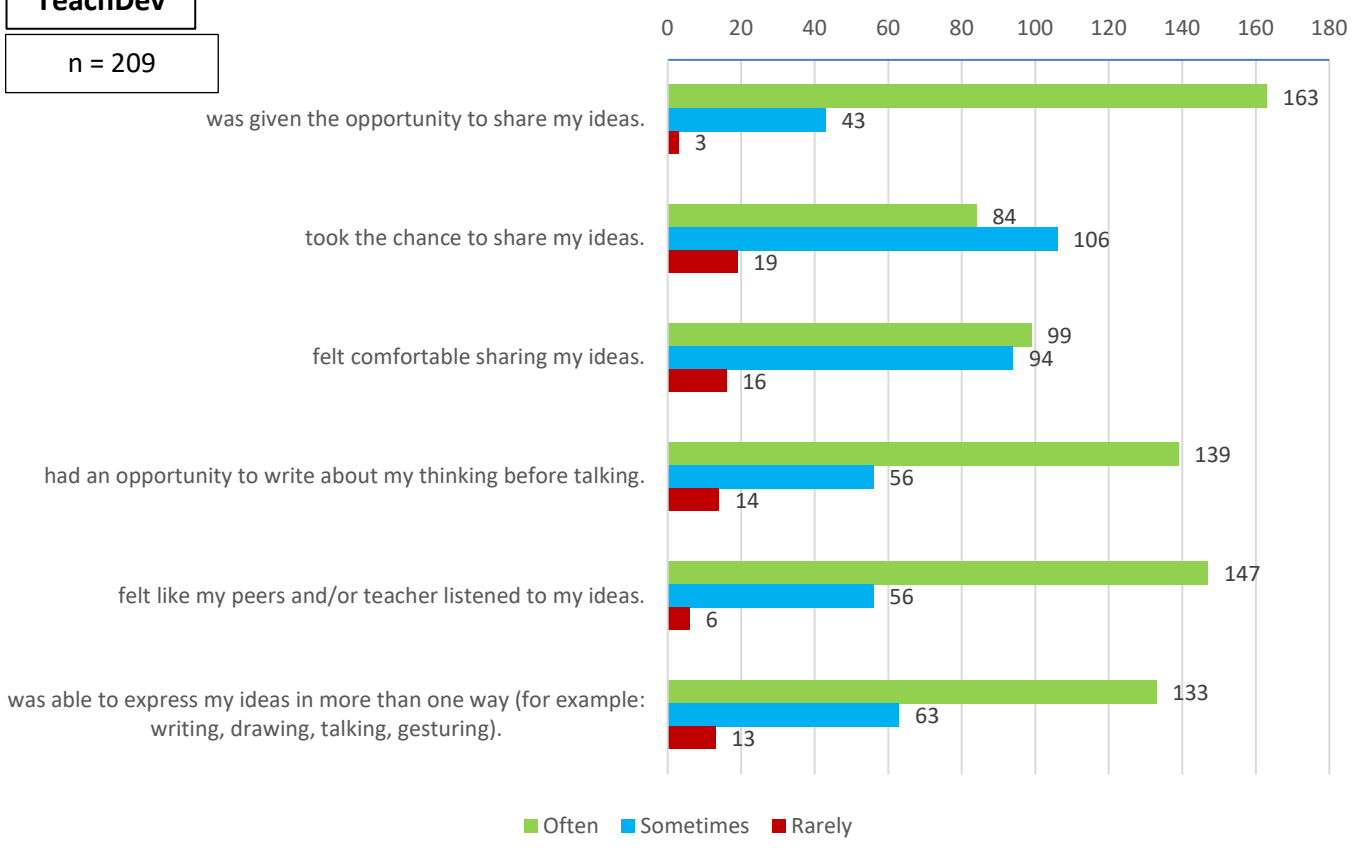

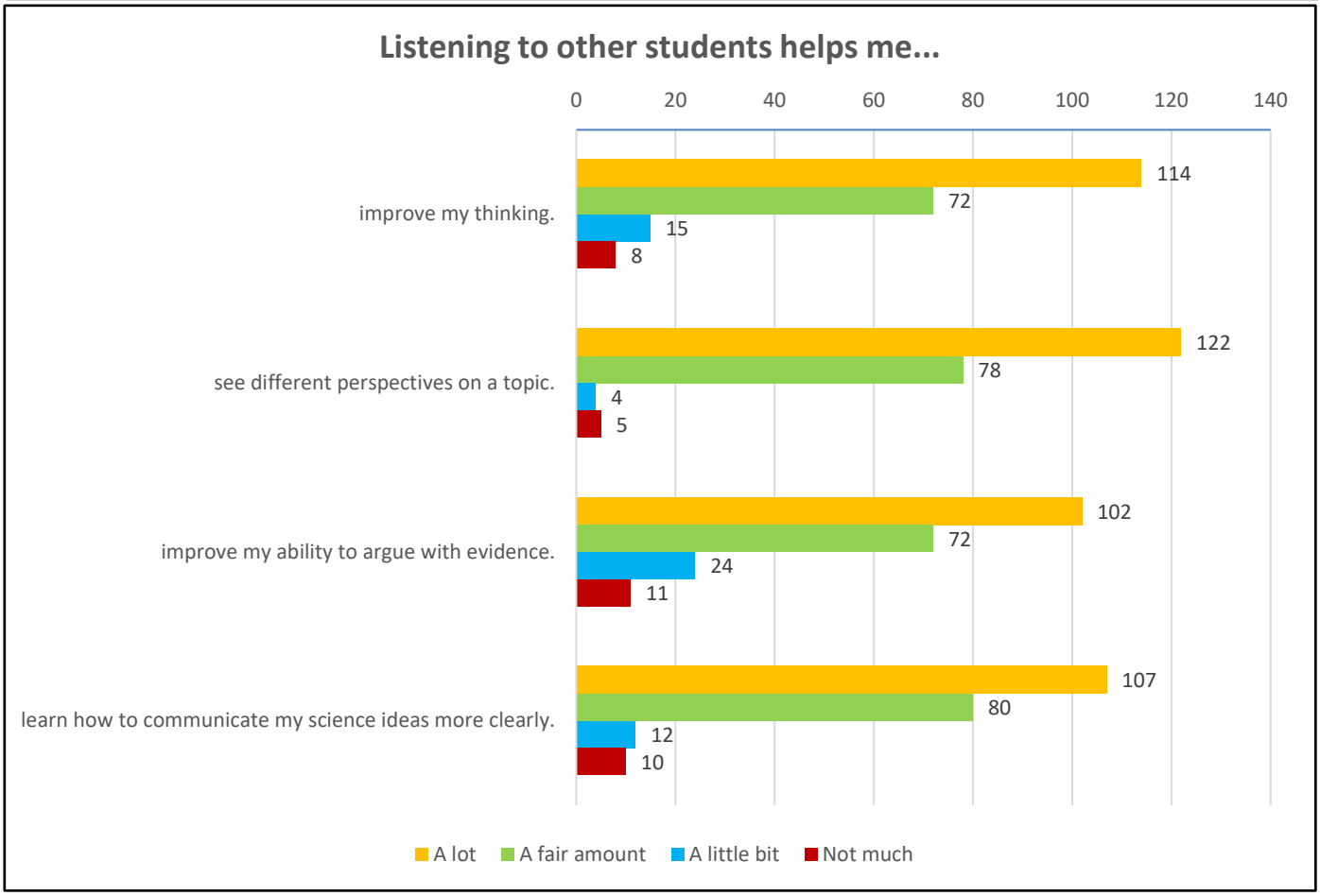

CHEM A TeachDev

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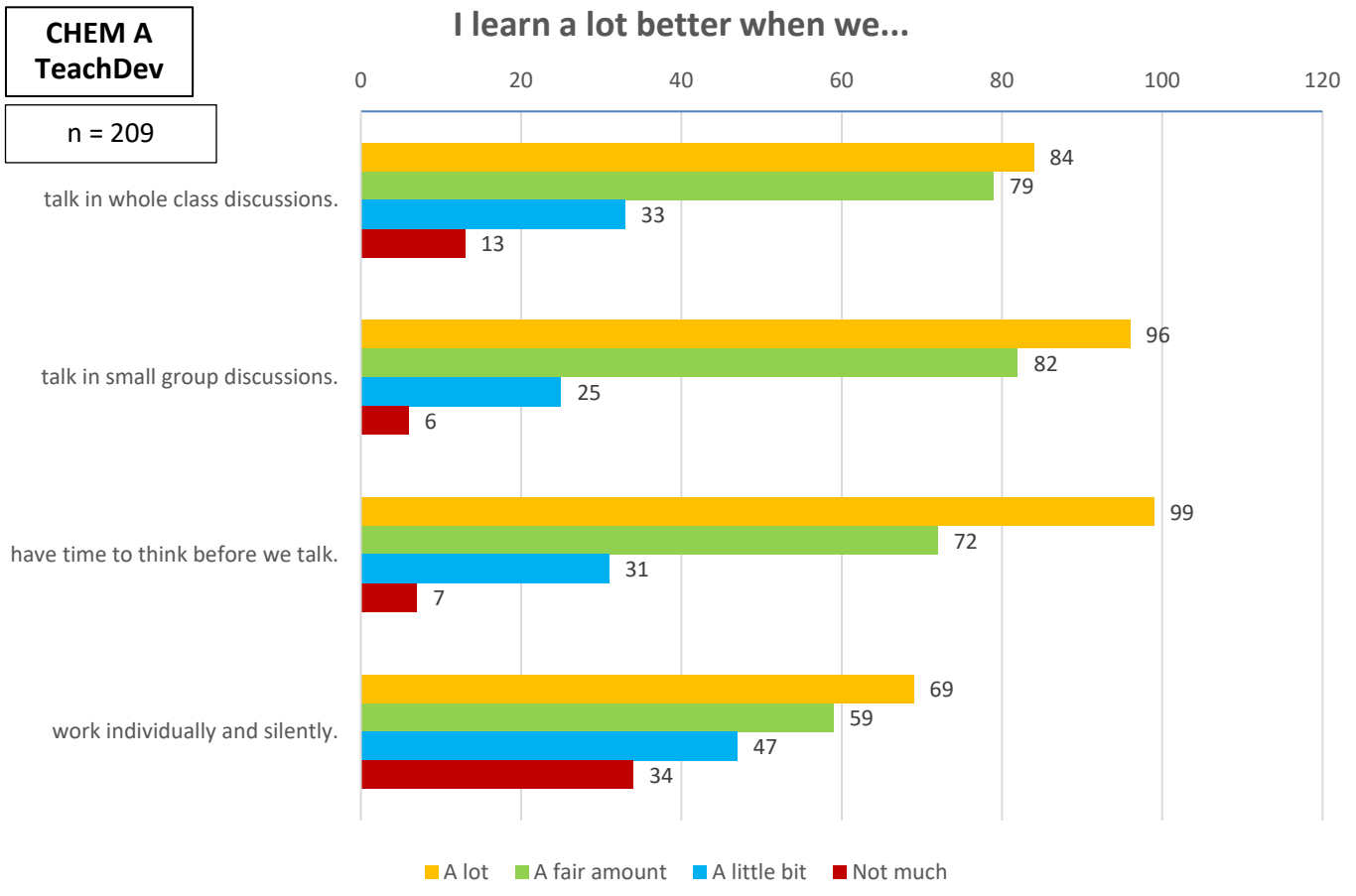

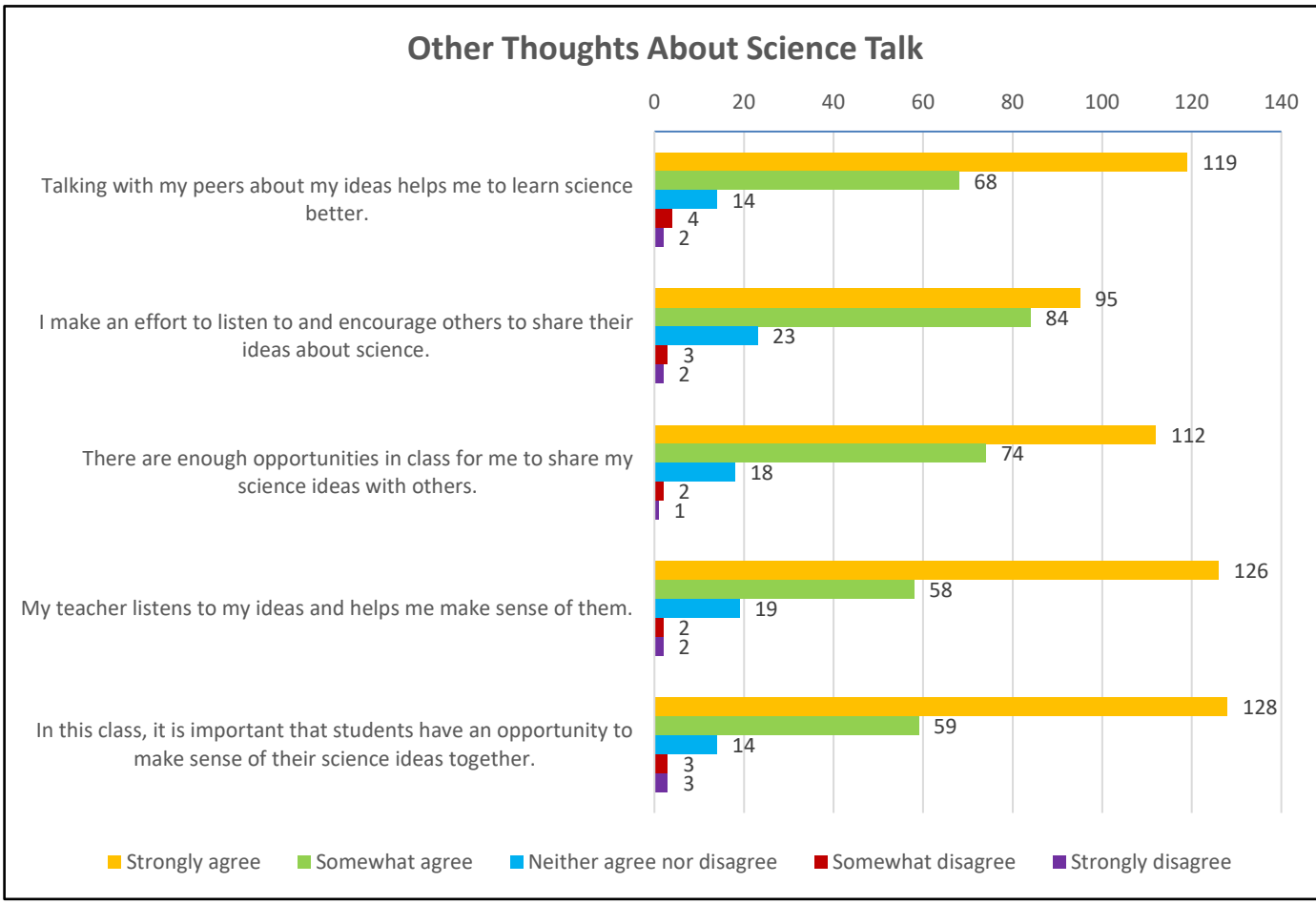

CHEM A TeachDev

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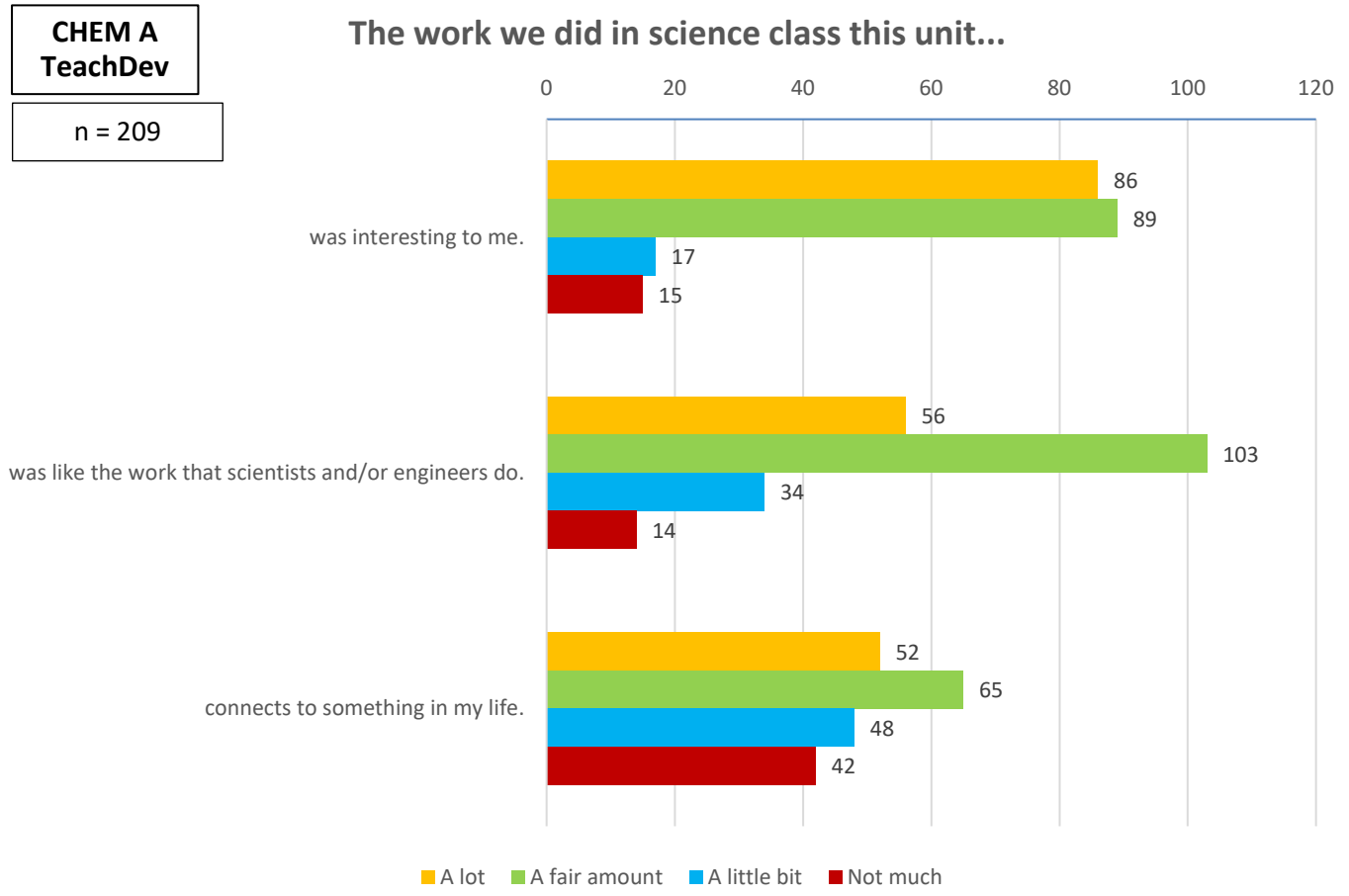

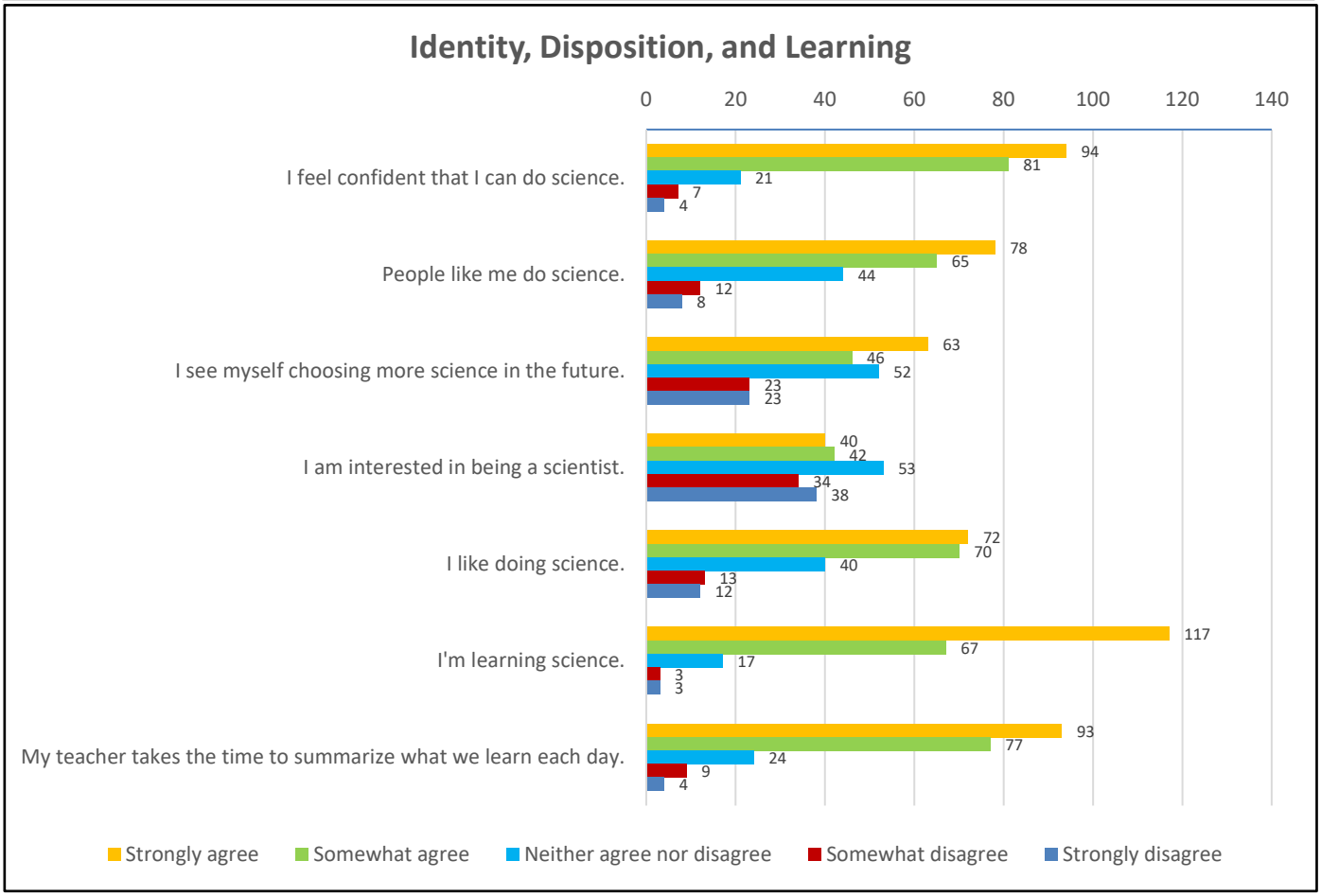

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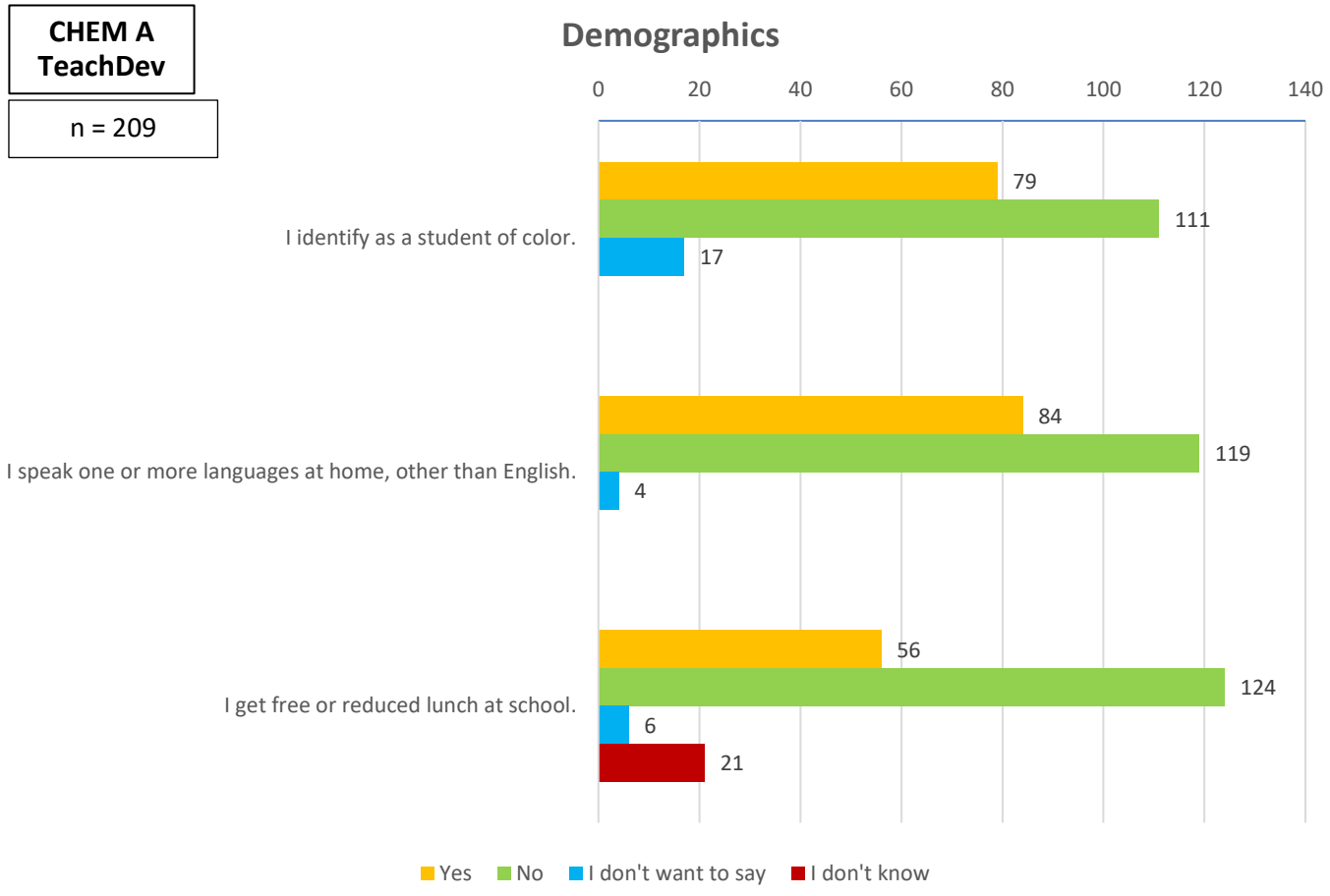
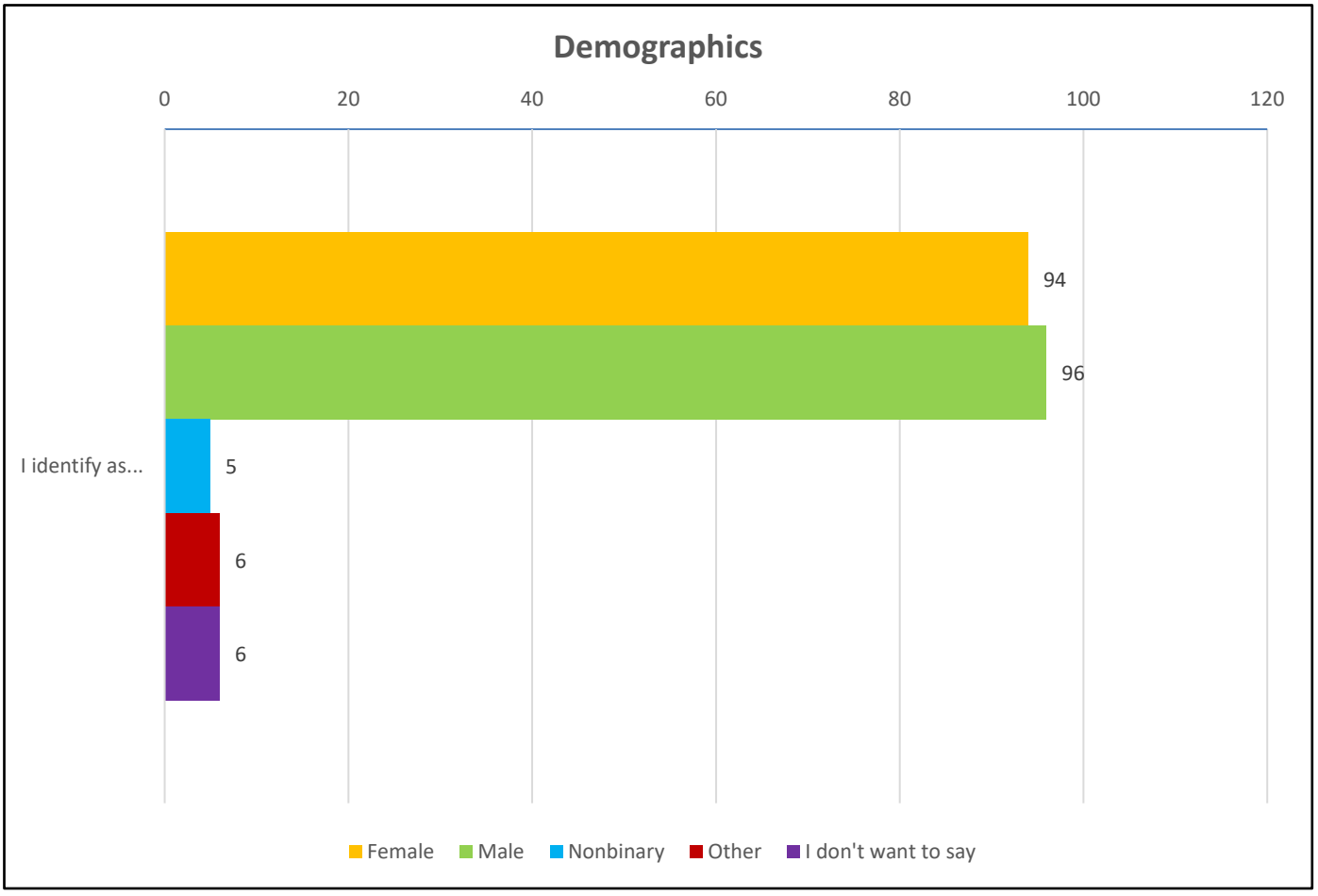
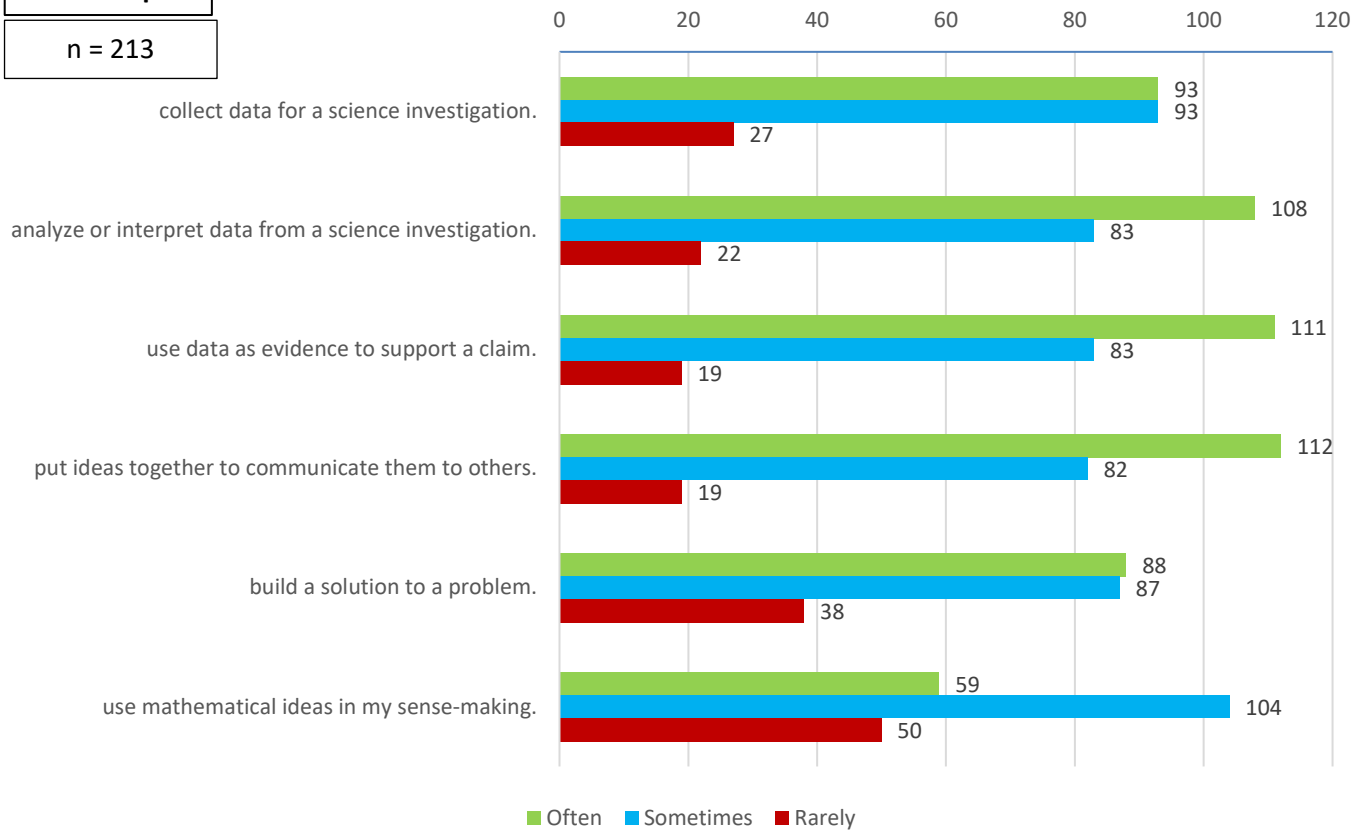




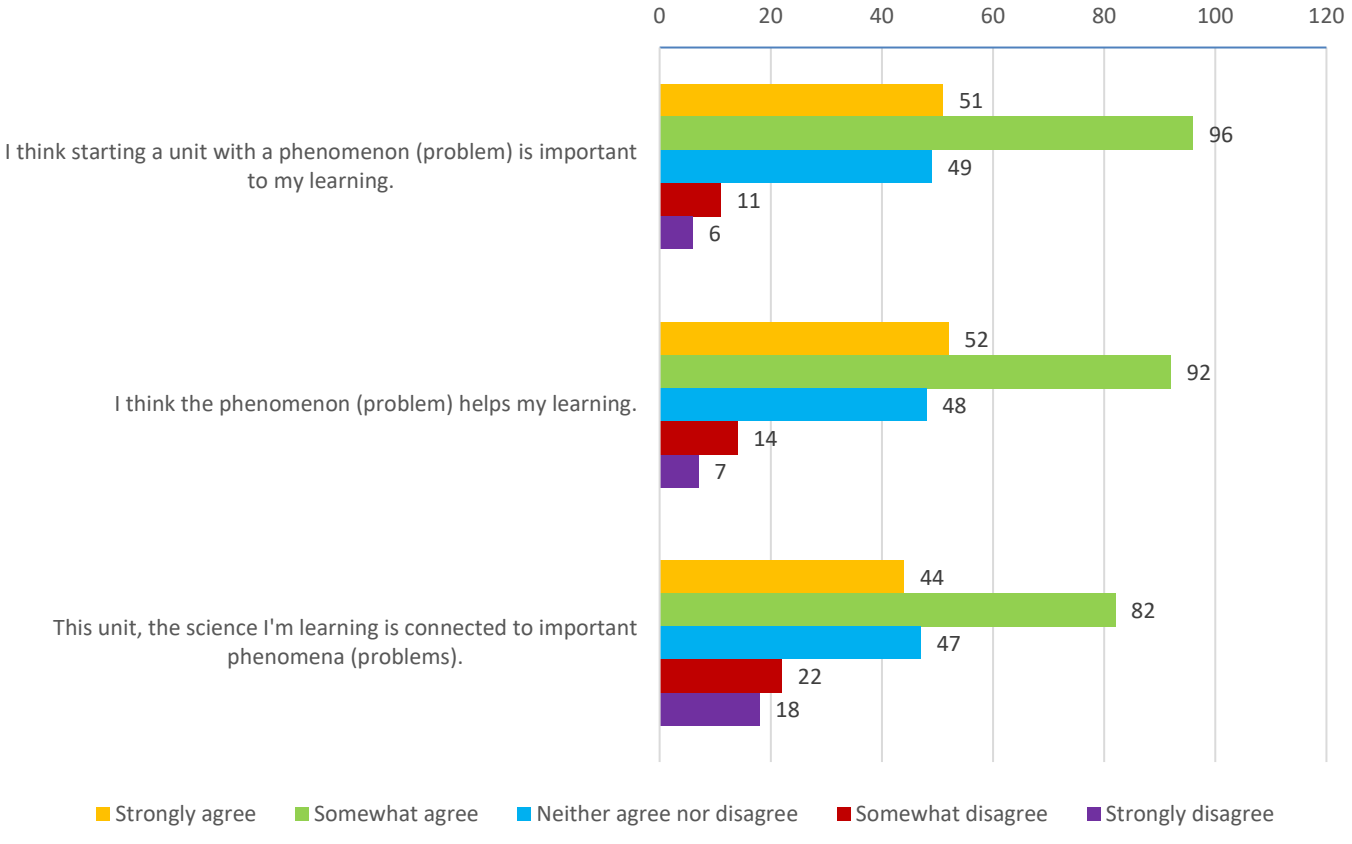
CHEM A STEMScopes

n = 213

In my science class this unit, I was provided opportunities to...



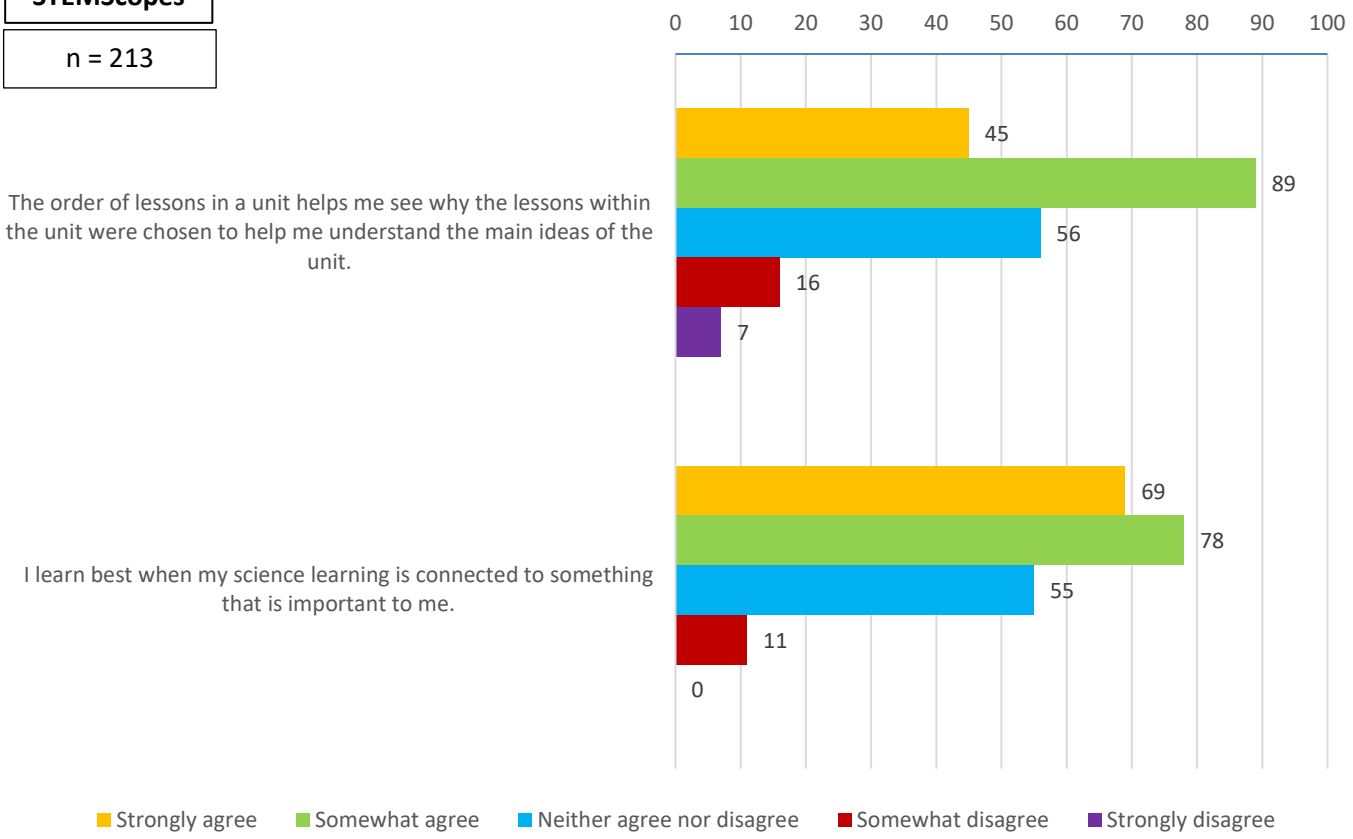
Phenomena: A mystery or problem you are trying to solve.



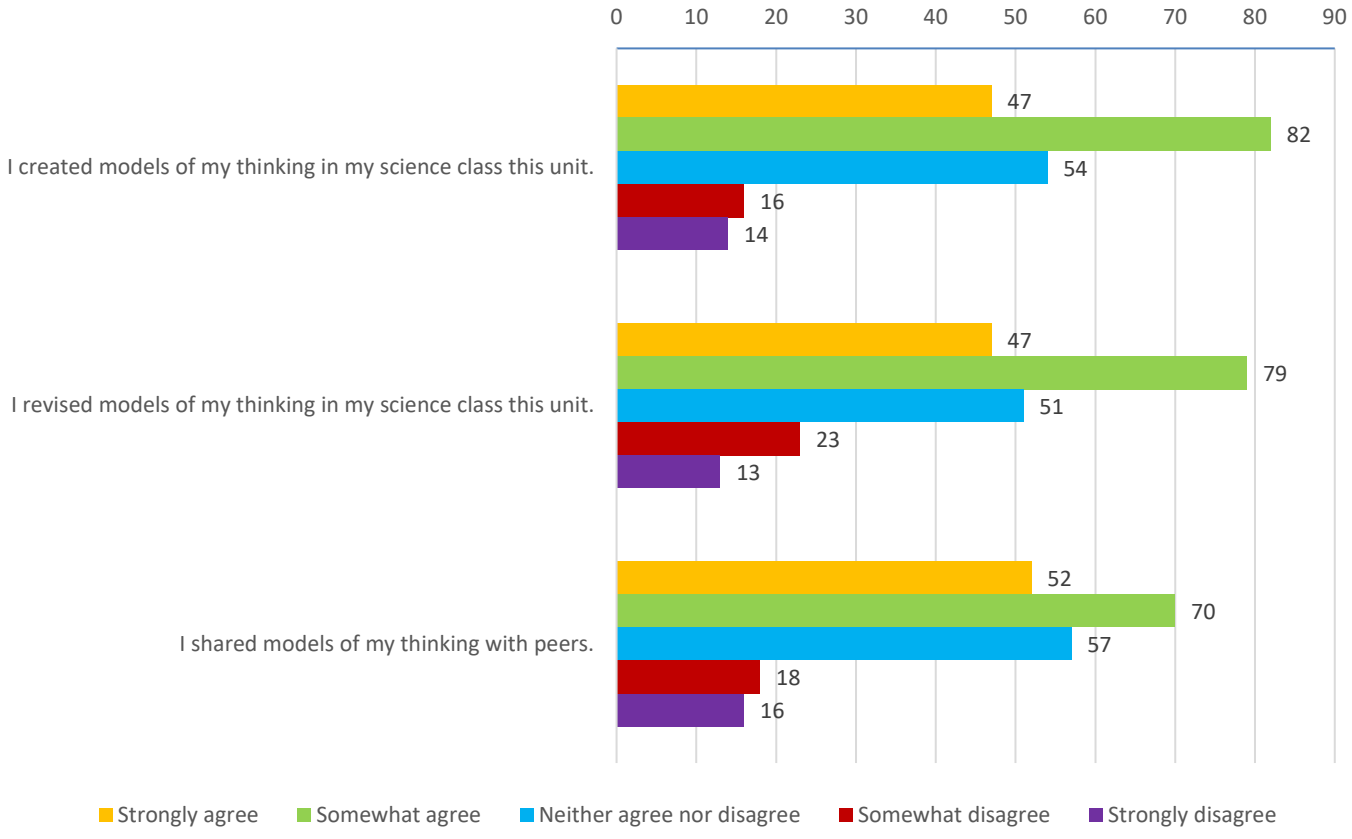
CHEM A
STEMScopes

n = 213

Storylining



Modeling



CHEM A STEMScopes

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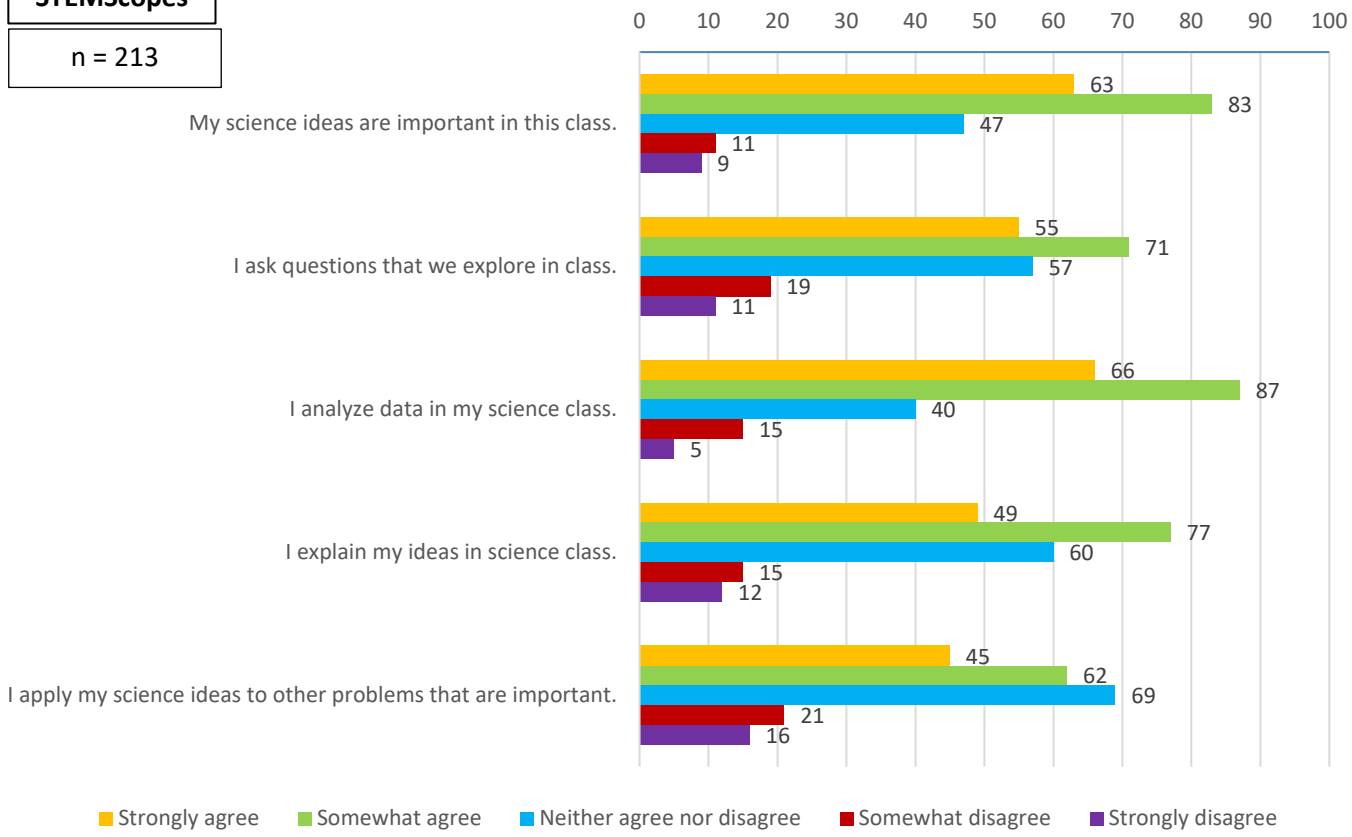
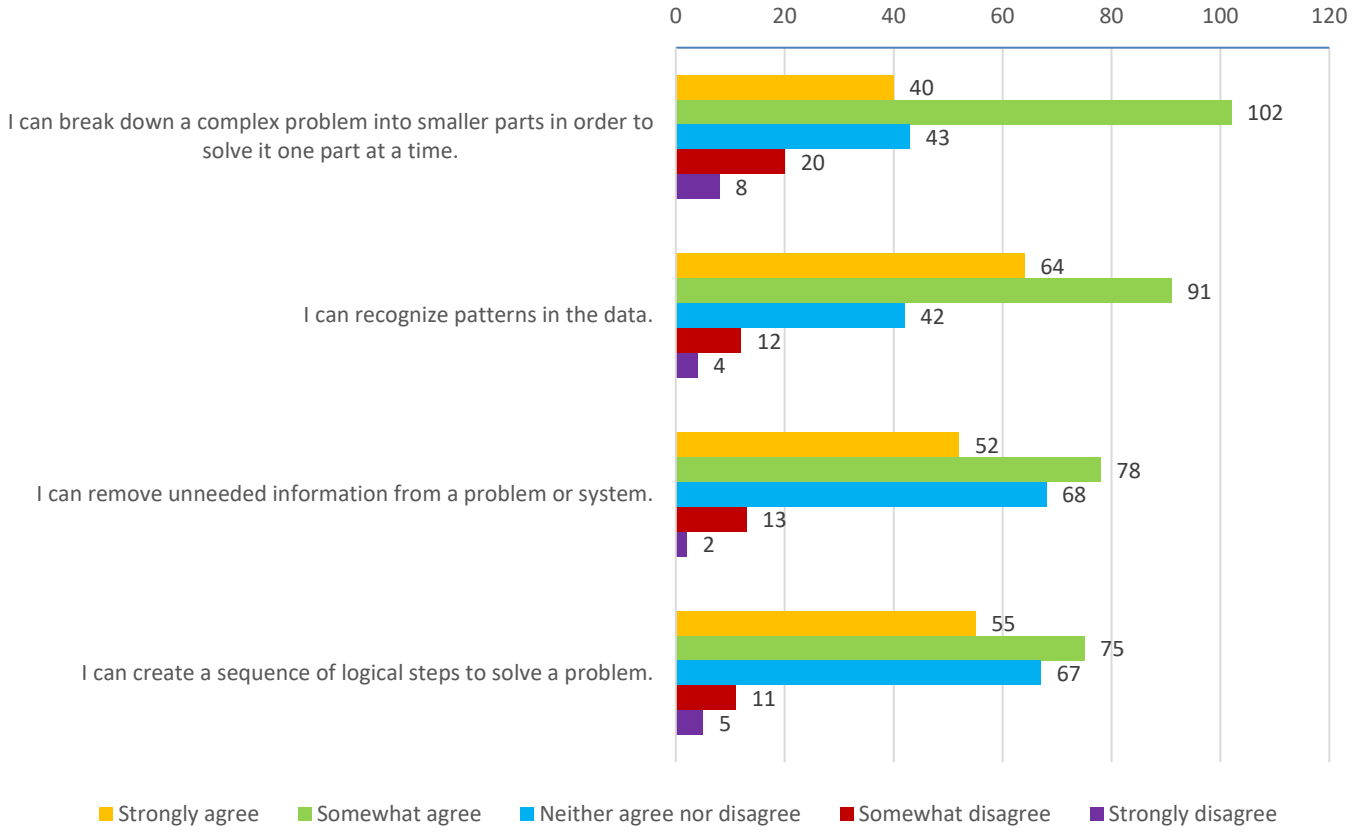
Science Ideas & Doing Science



Computational Thinking



CHEM A STEMScopes

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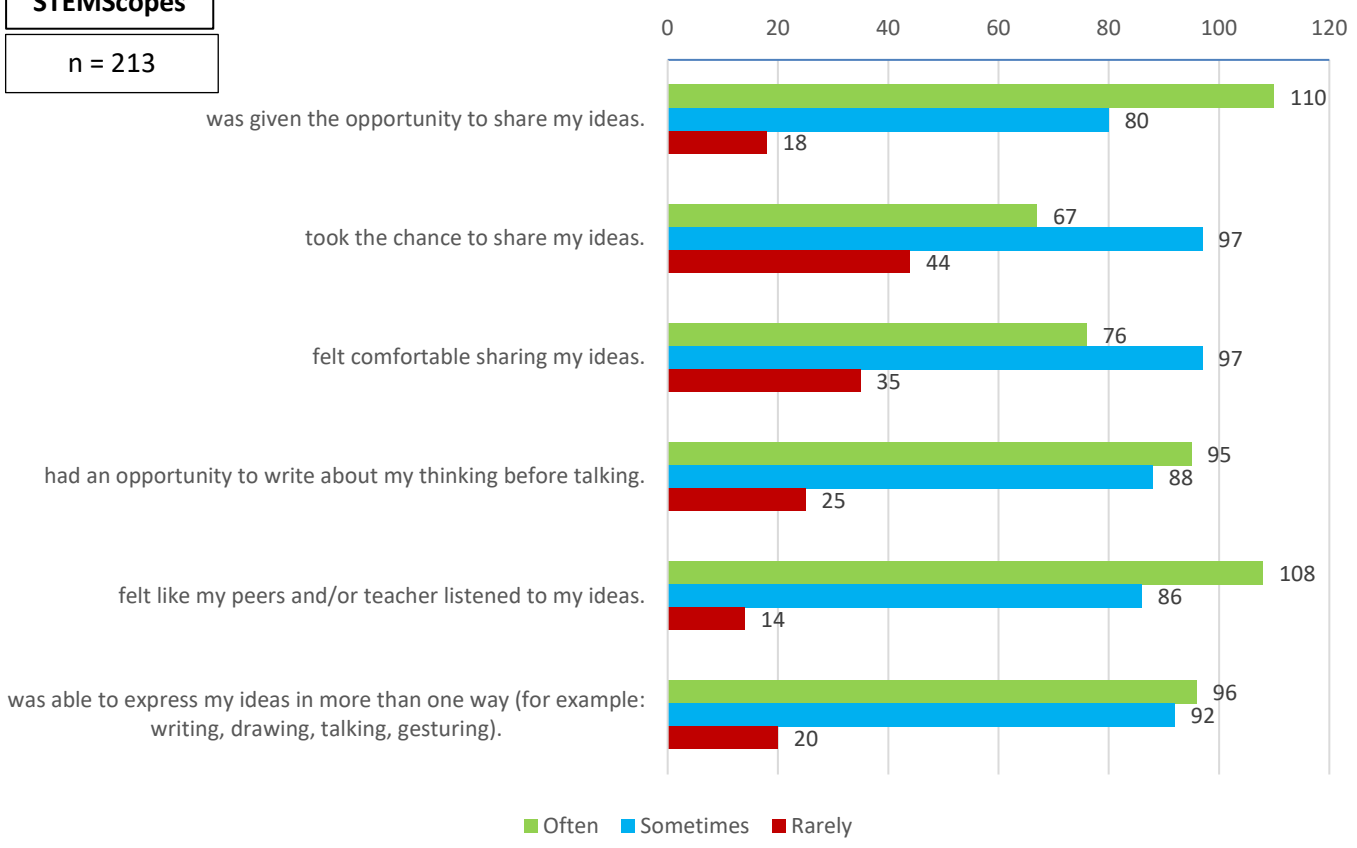

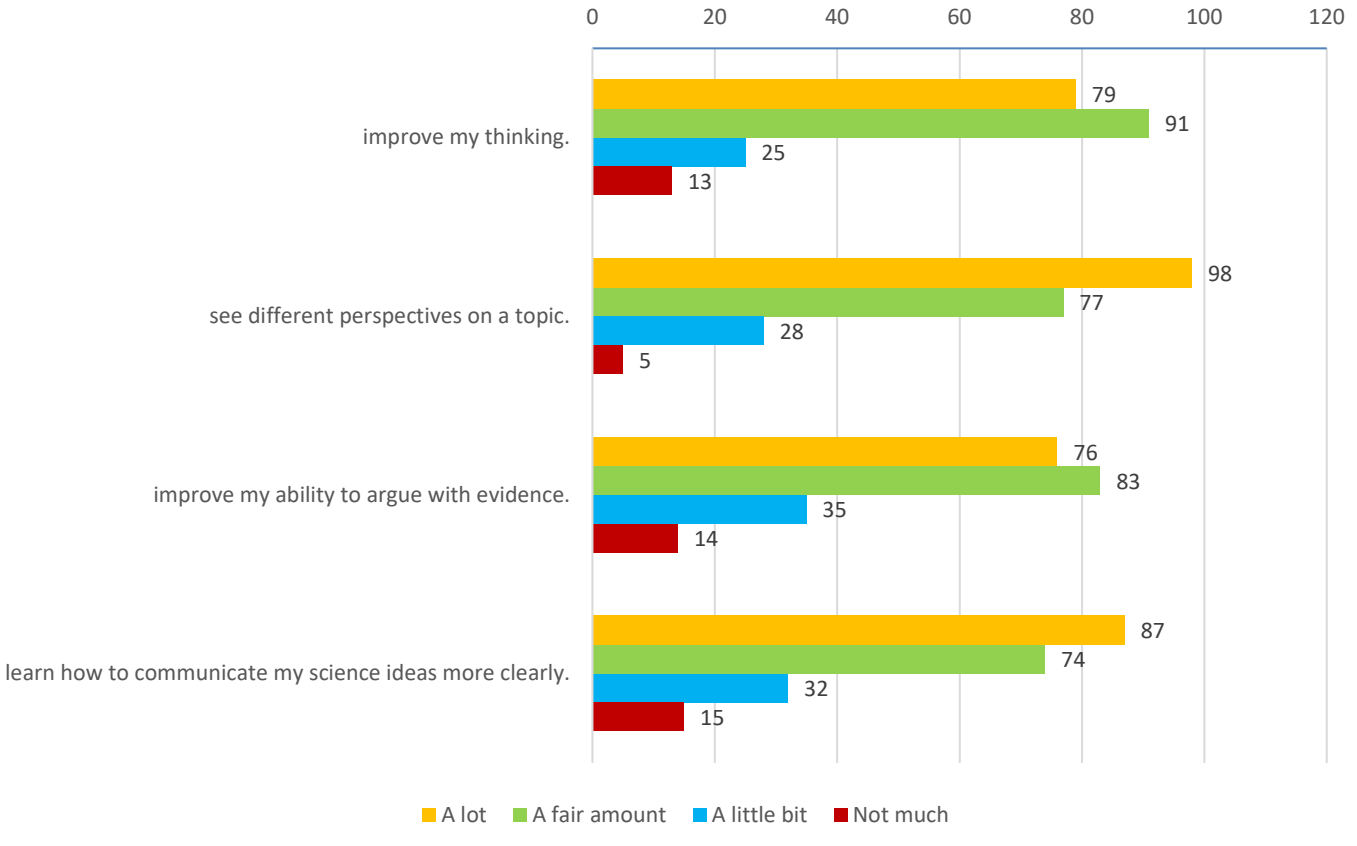

CHEM A STEMScopes

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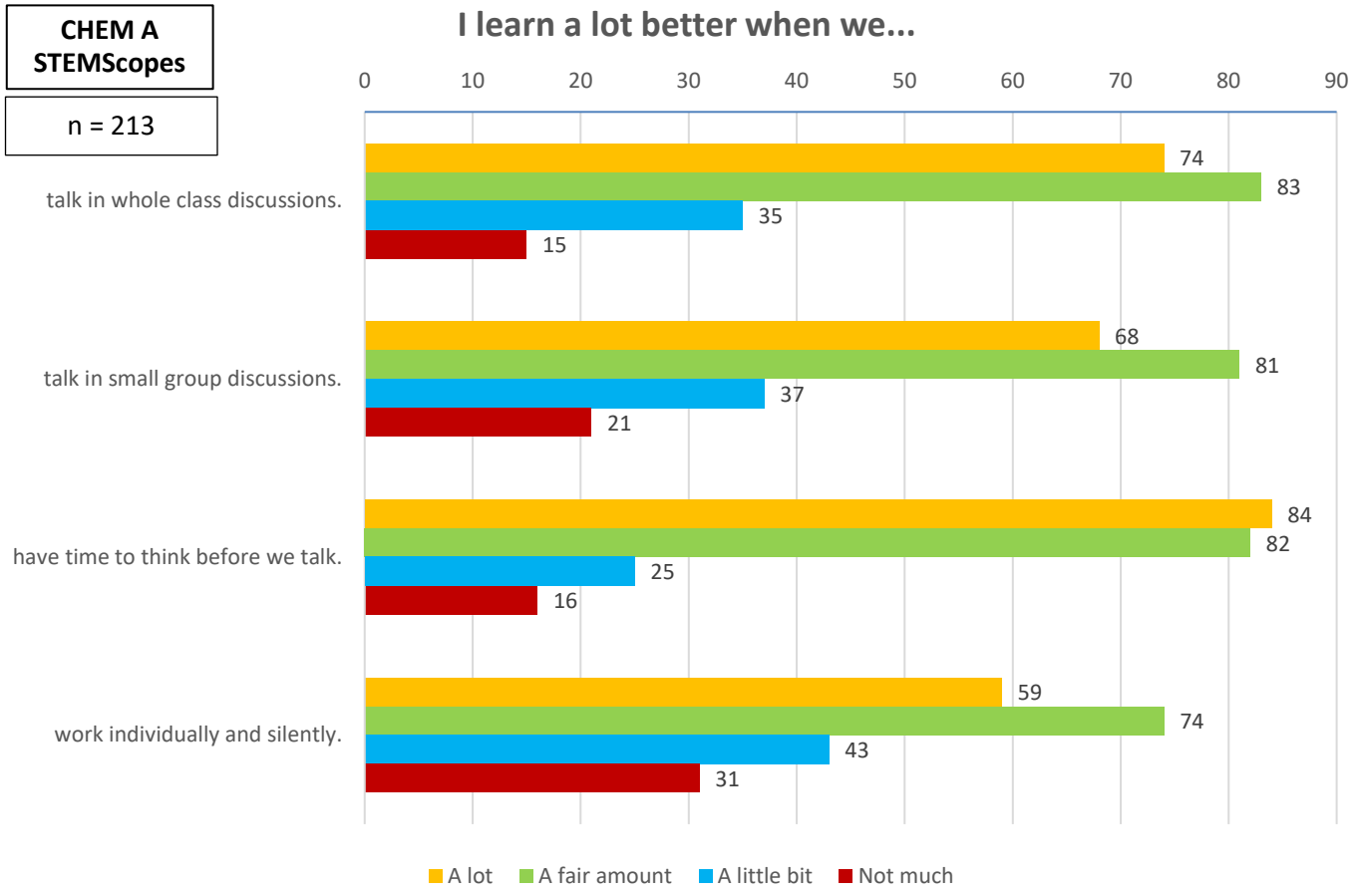

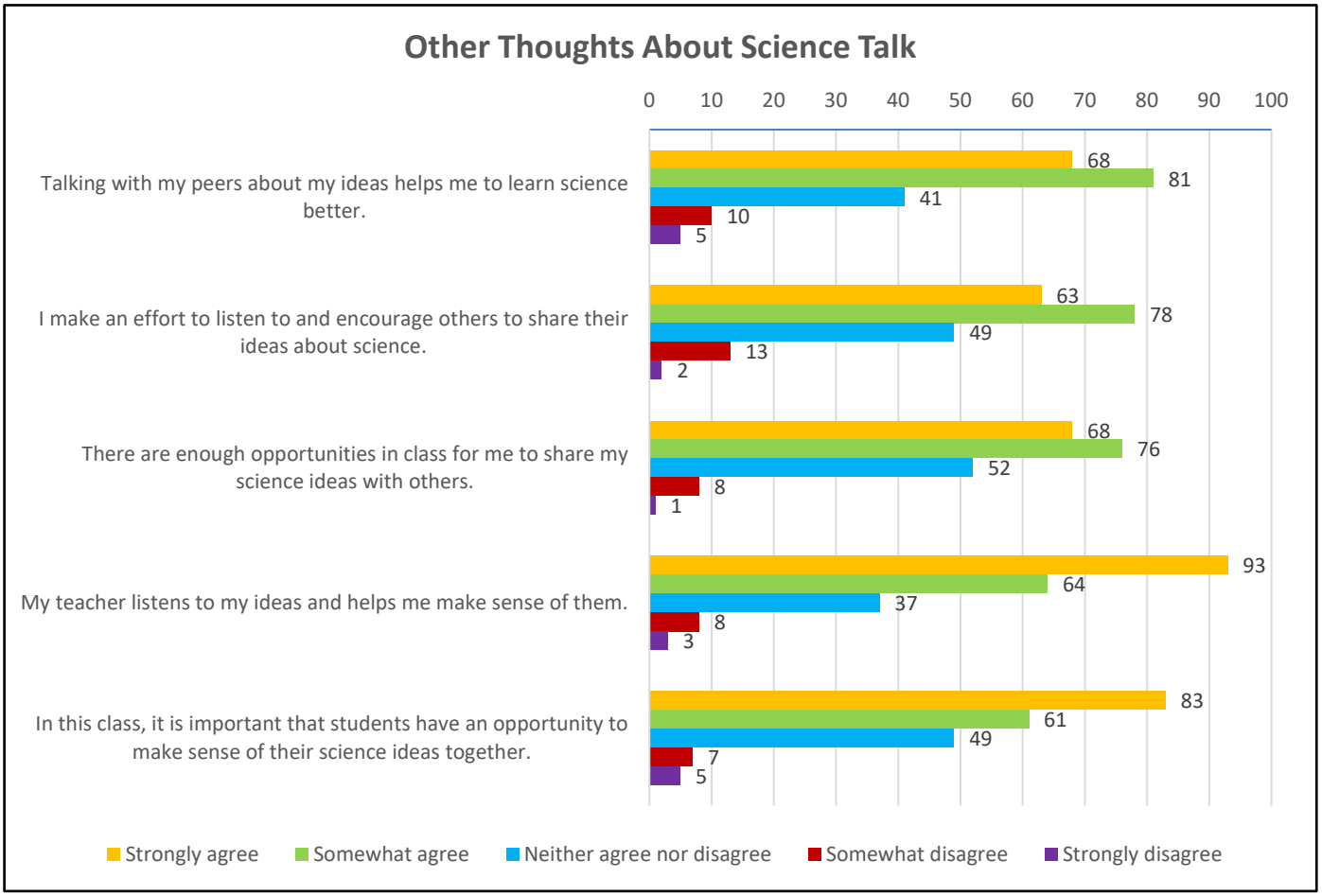

CHEM A STEMScopes

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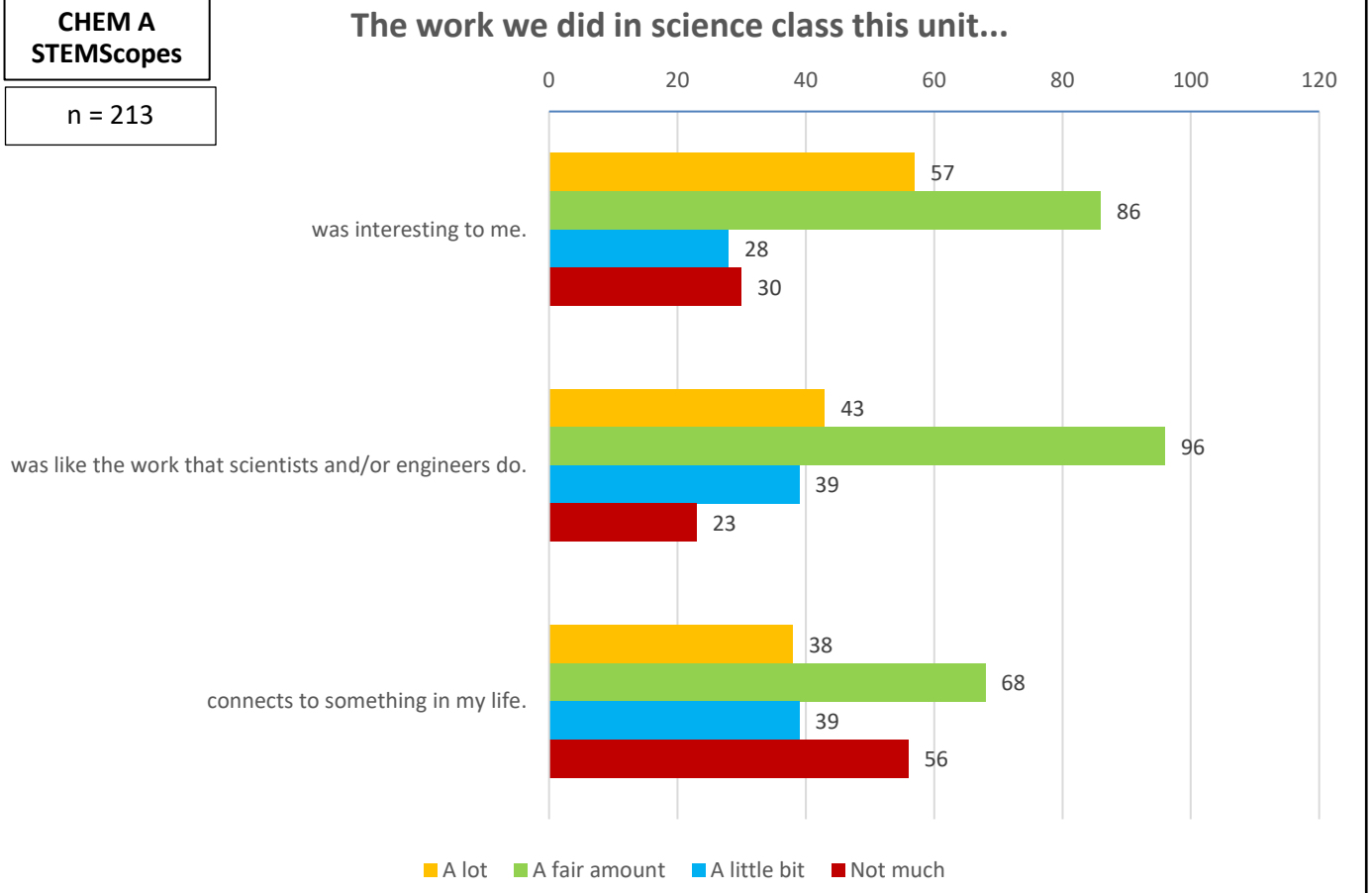

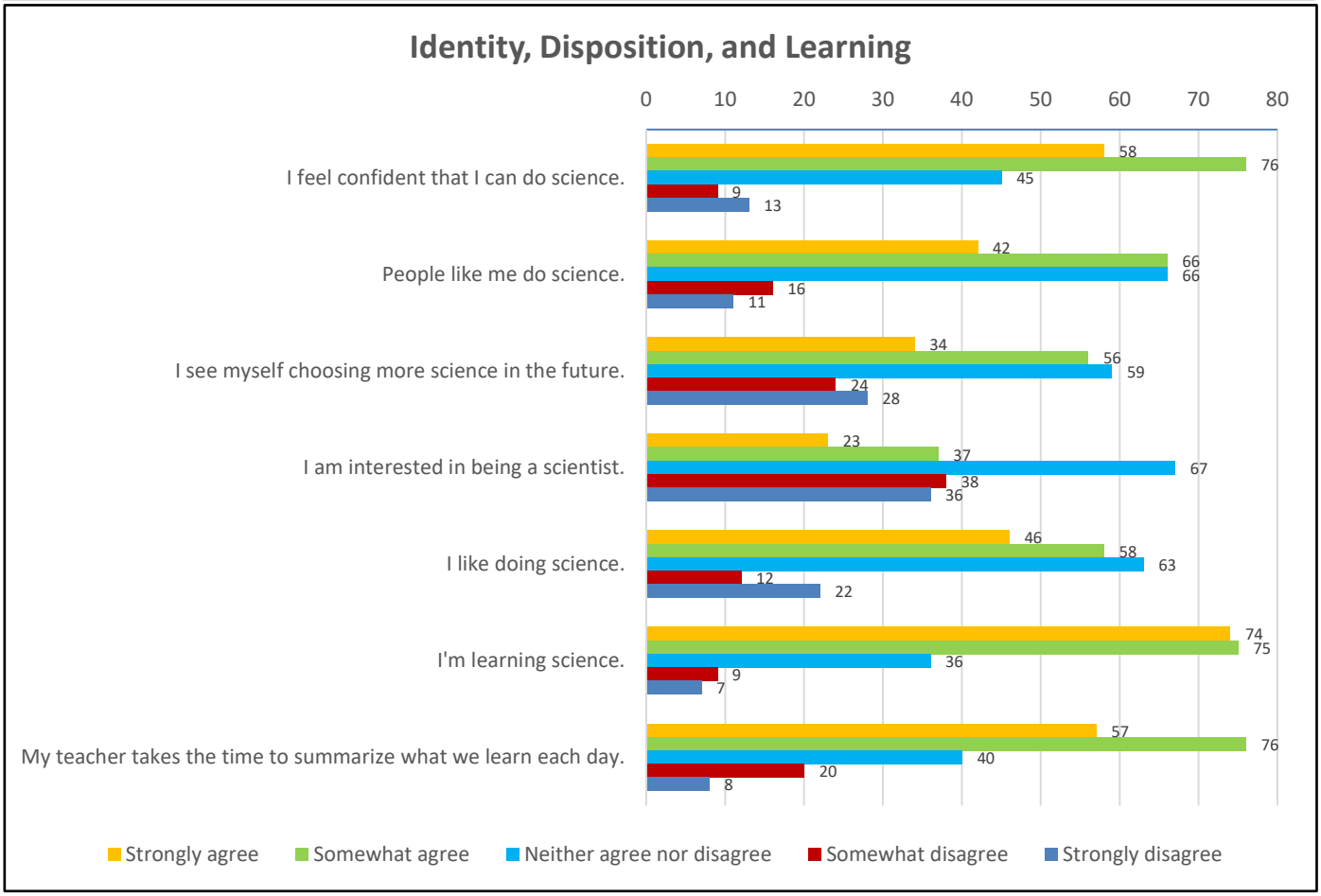

CHEM A STEMScopes

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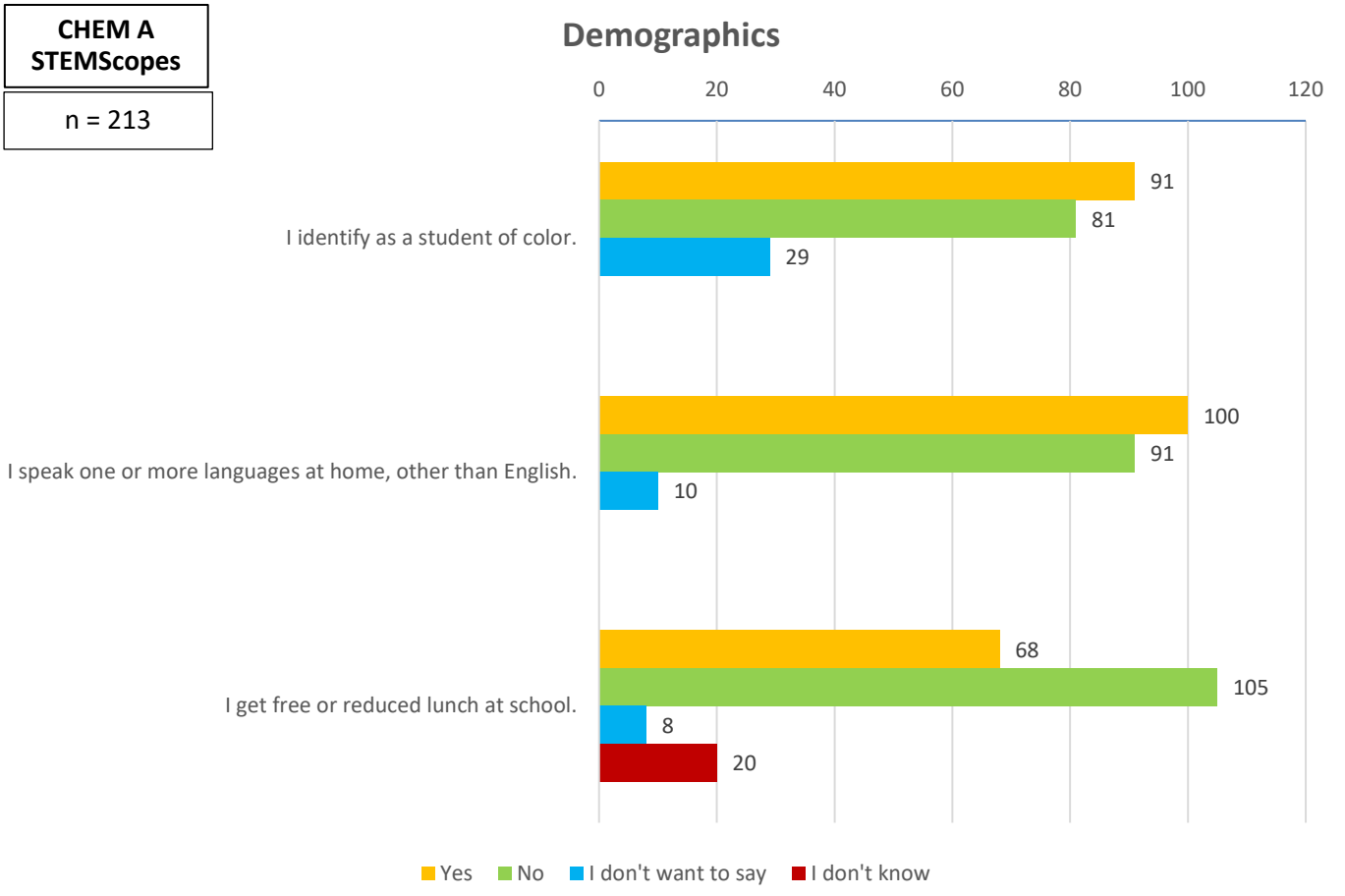

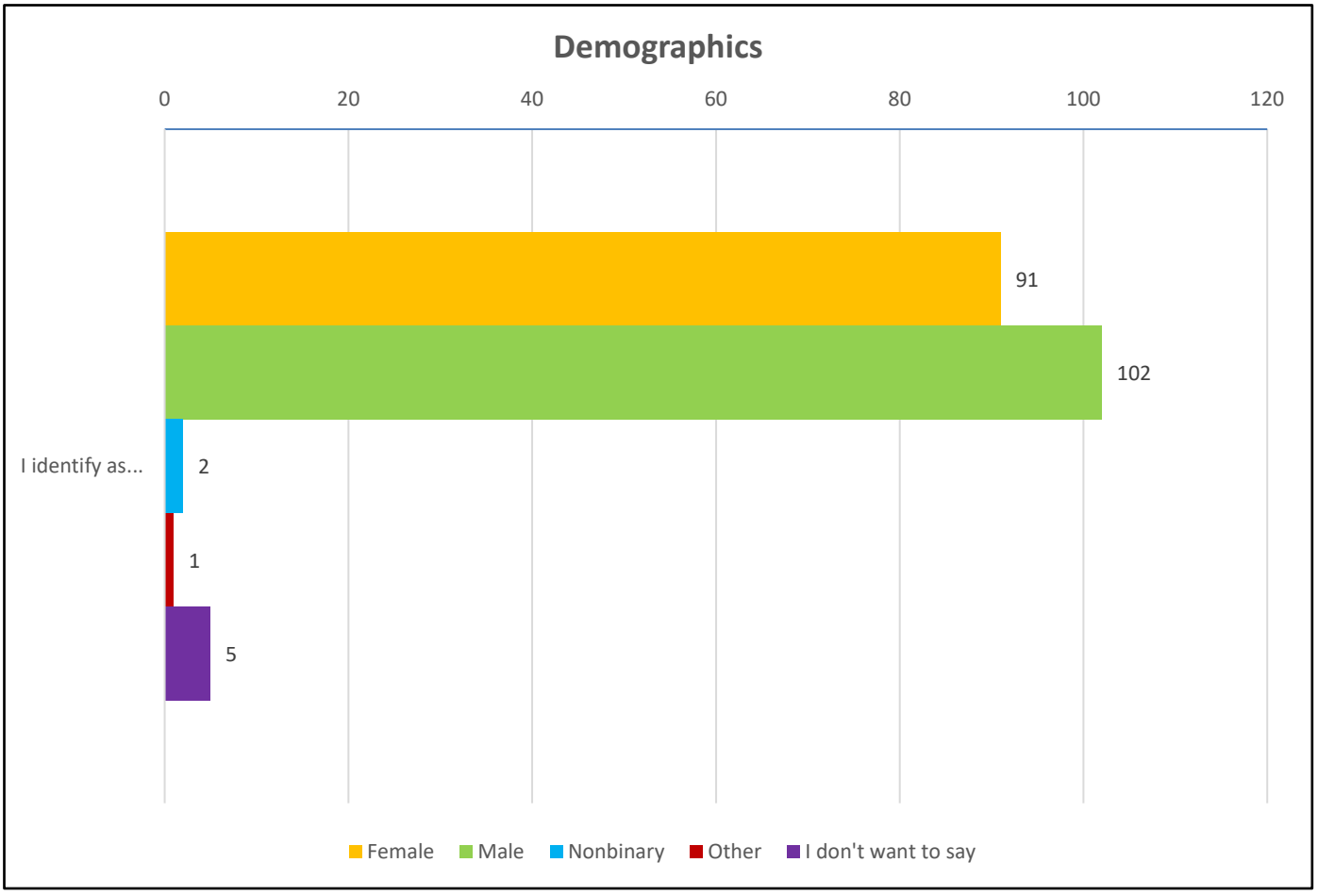

Attachment I.2

CHEM B STEMScopes

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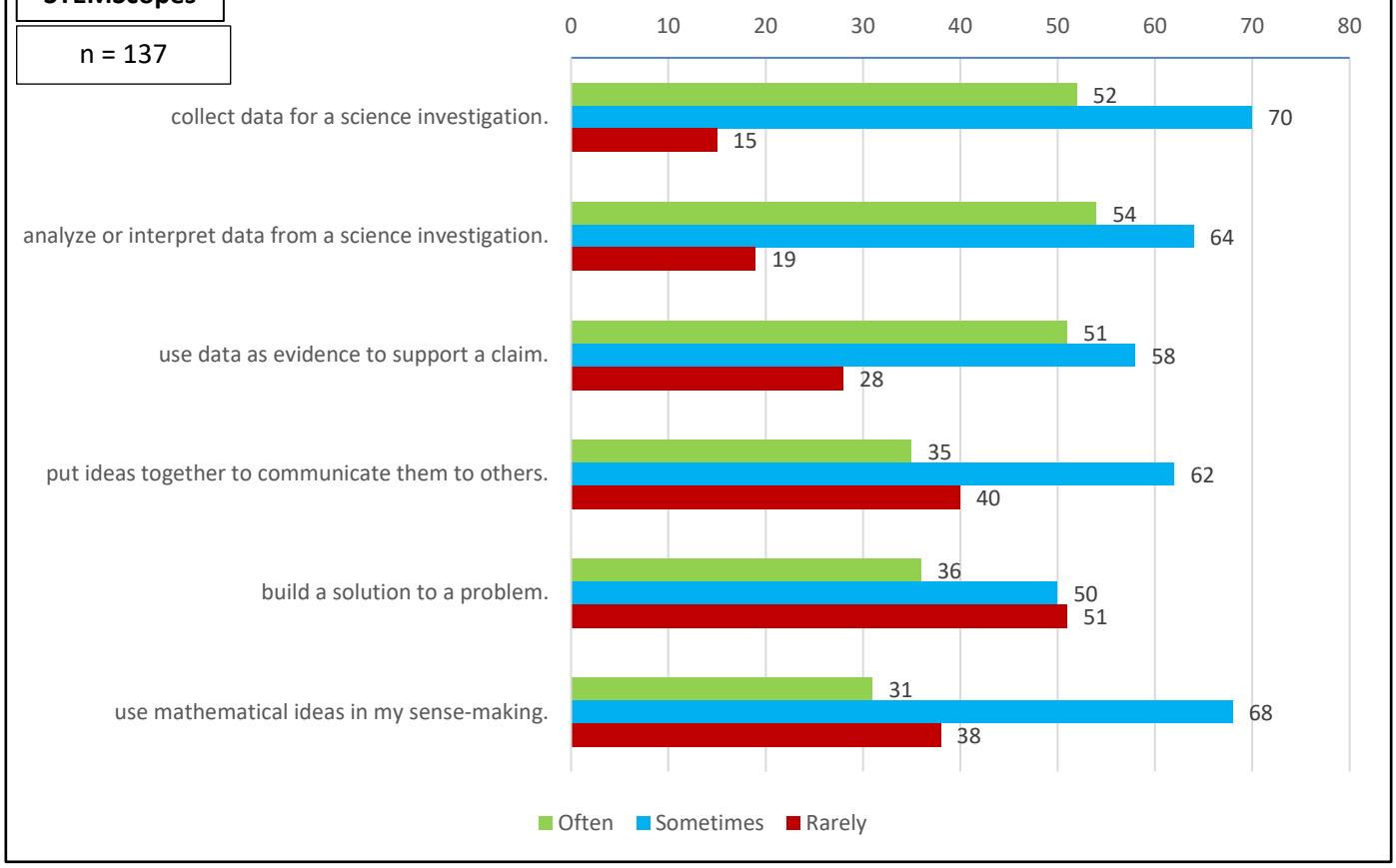
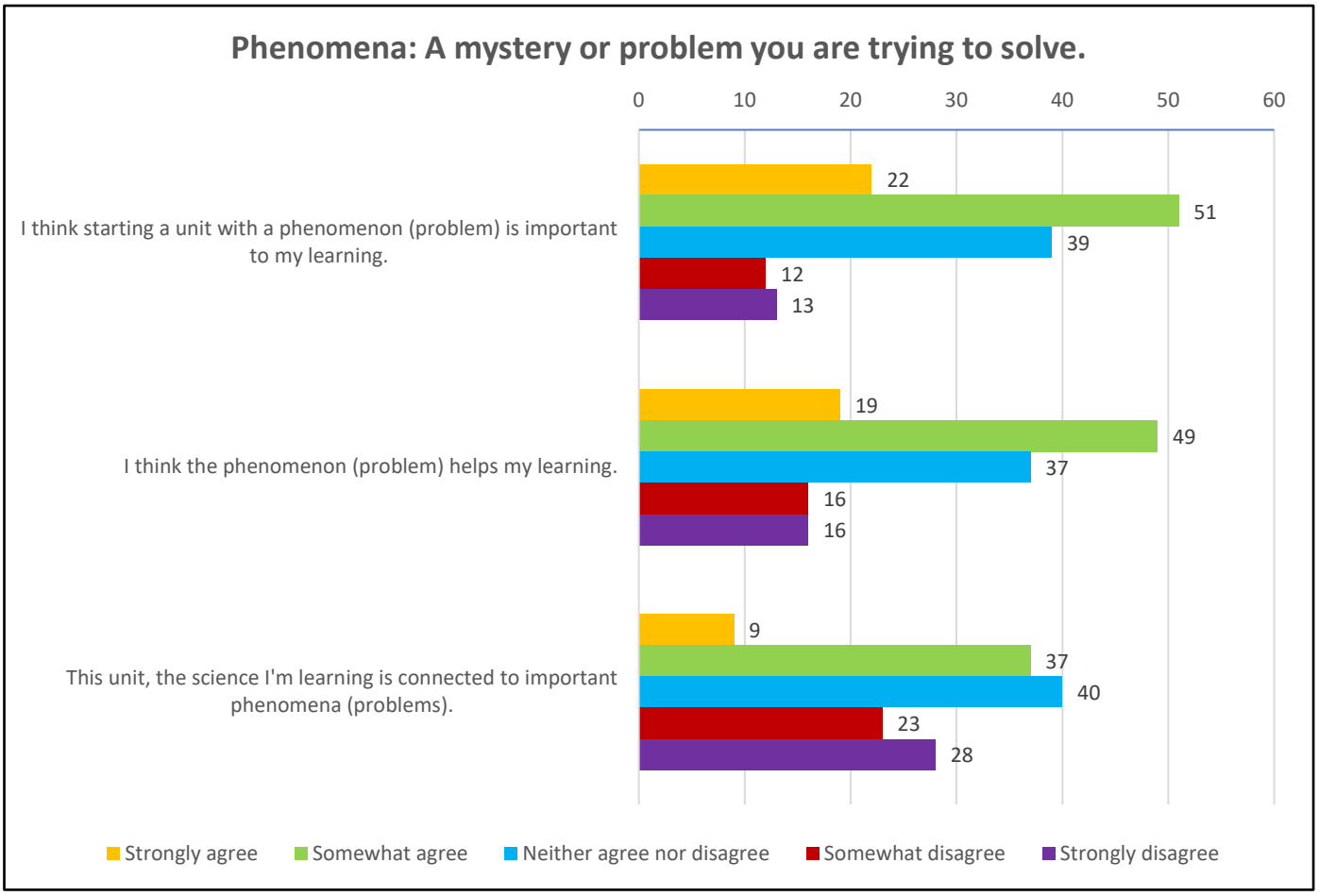
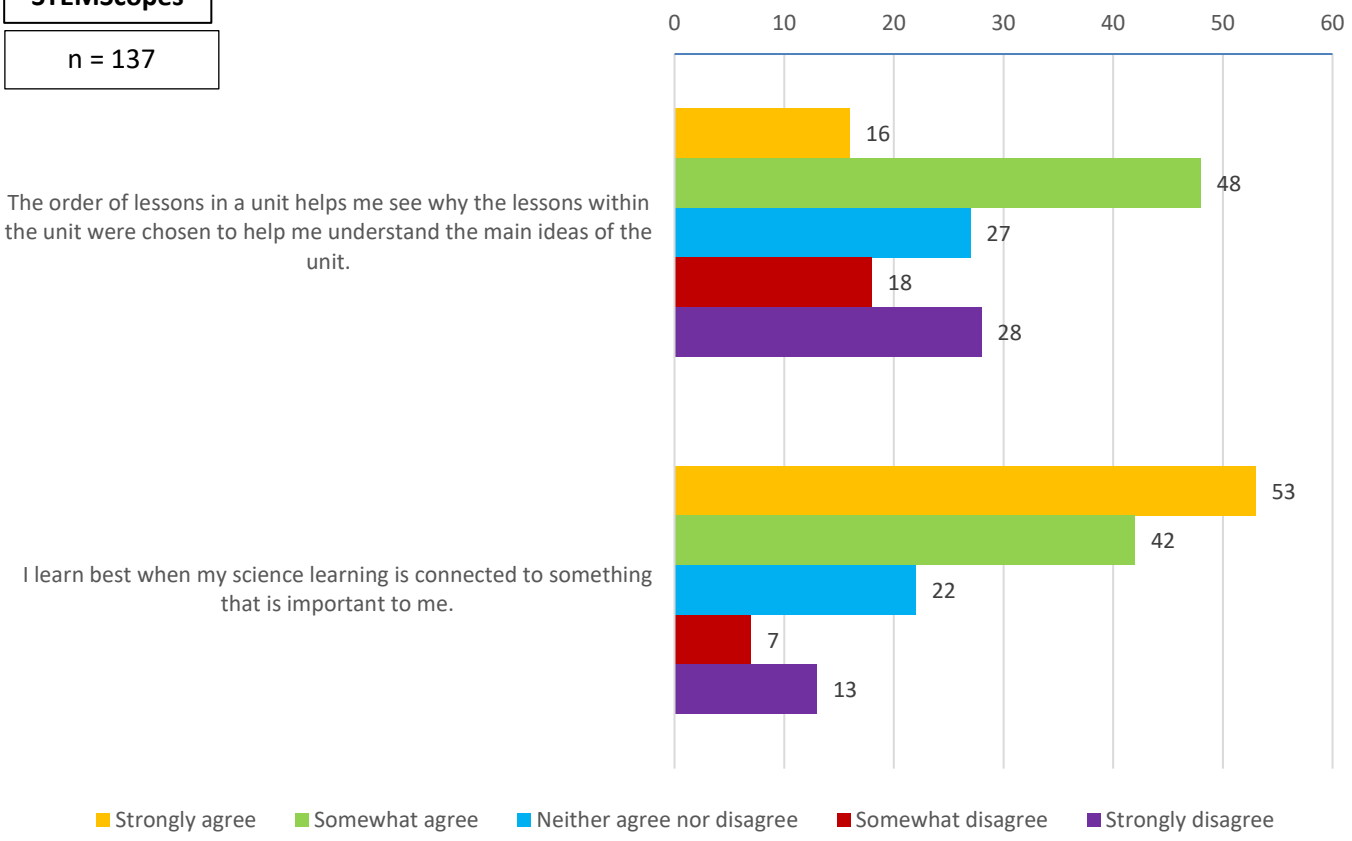




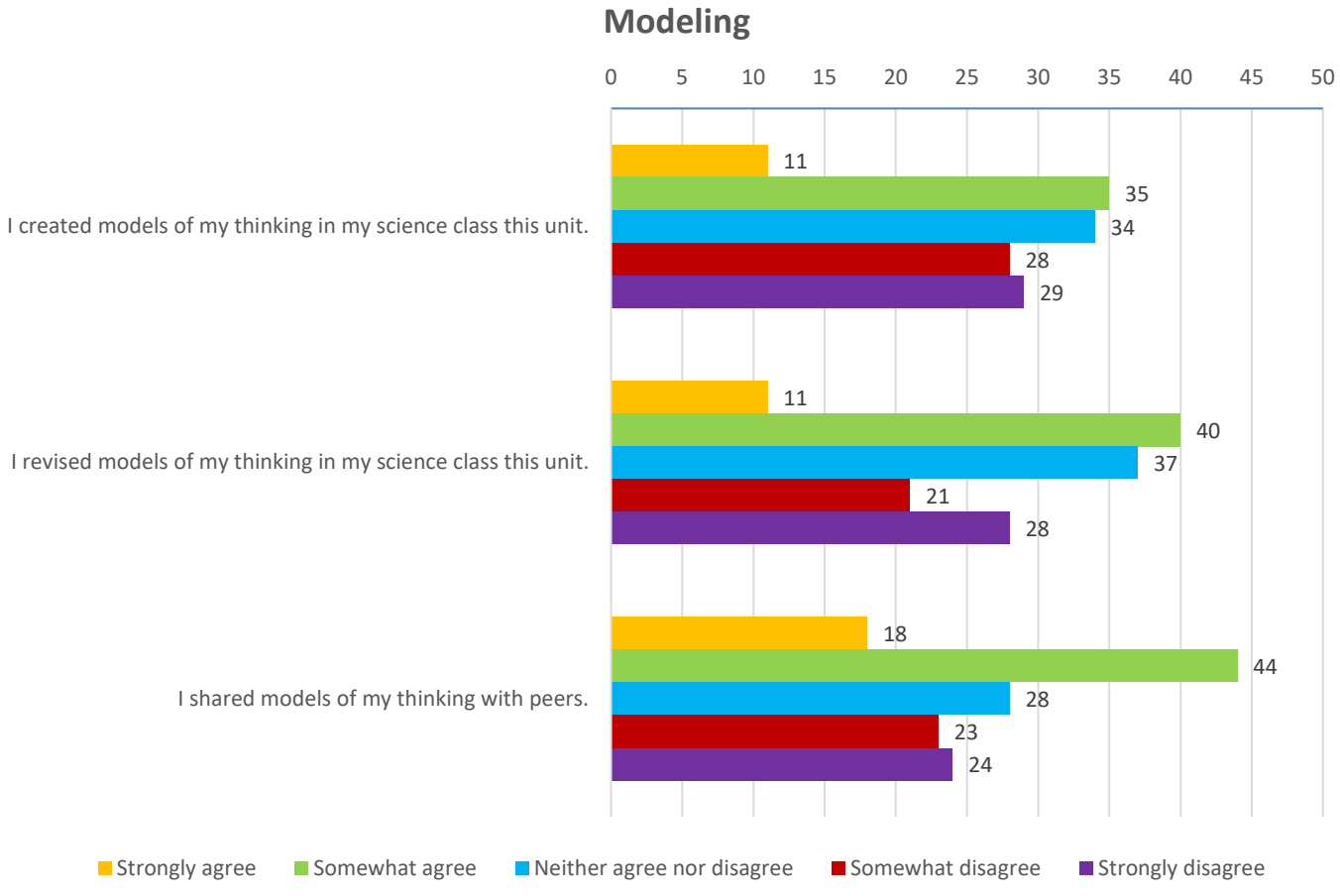
CHEM B
STEMScopes

n = 137

Storylining



Modeling



CHEM B
STEMScopes

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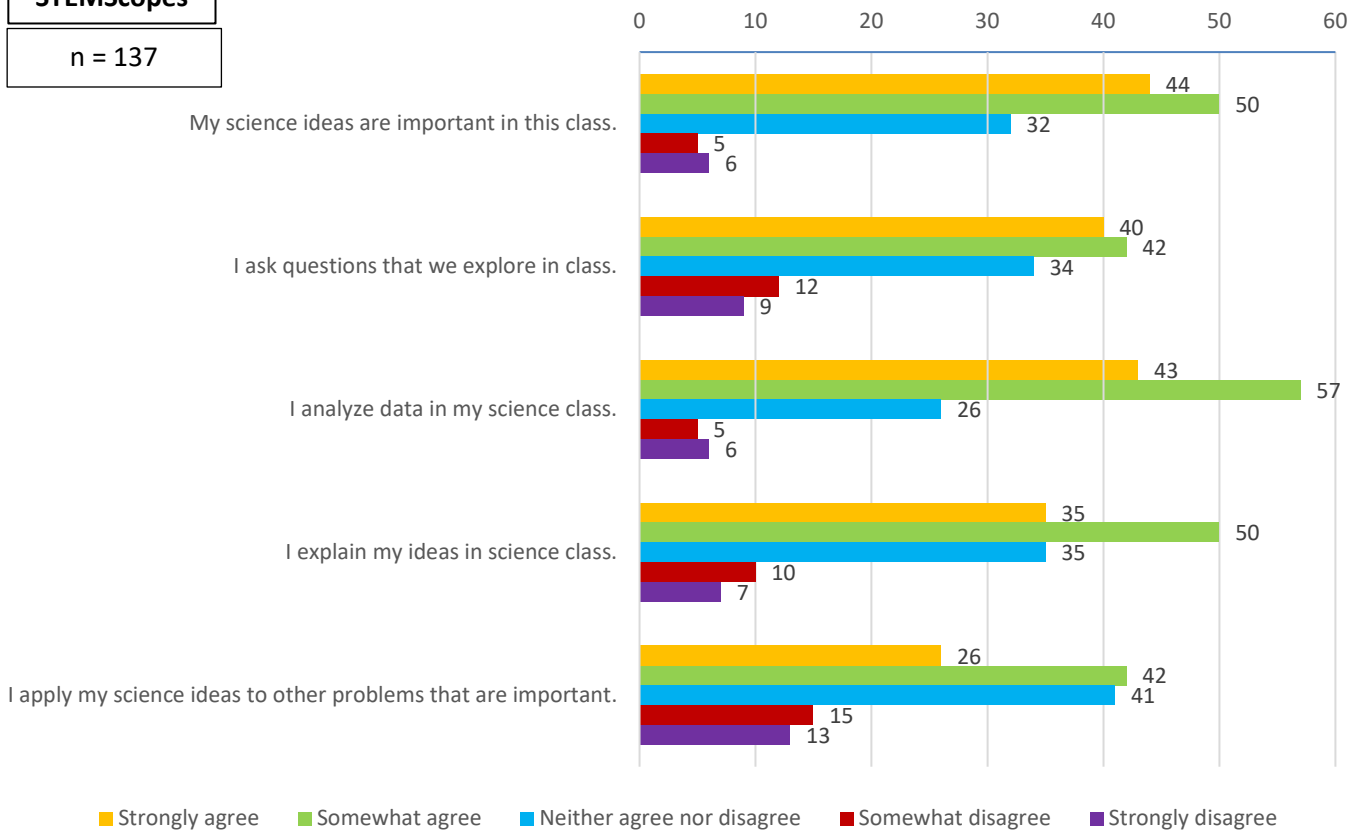
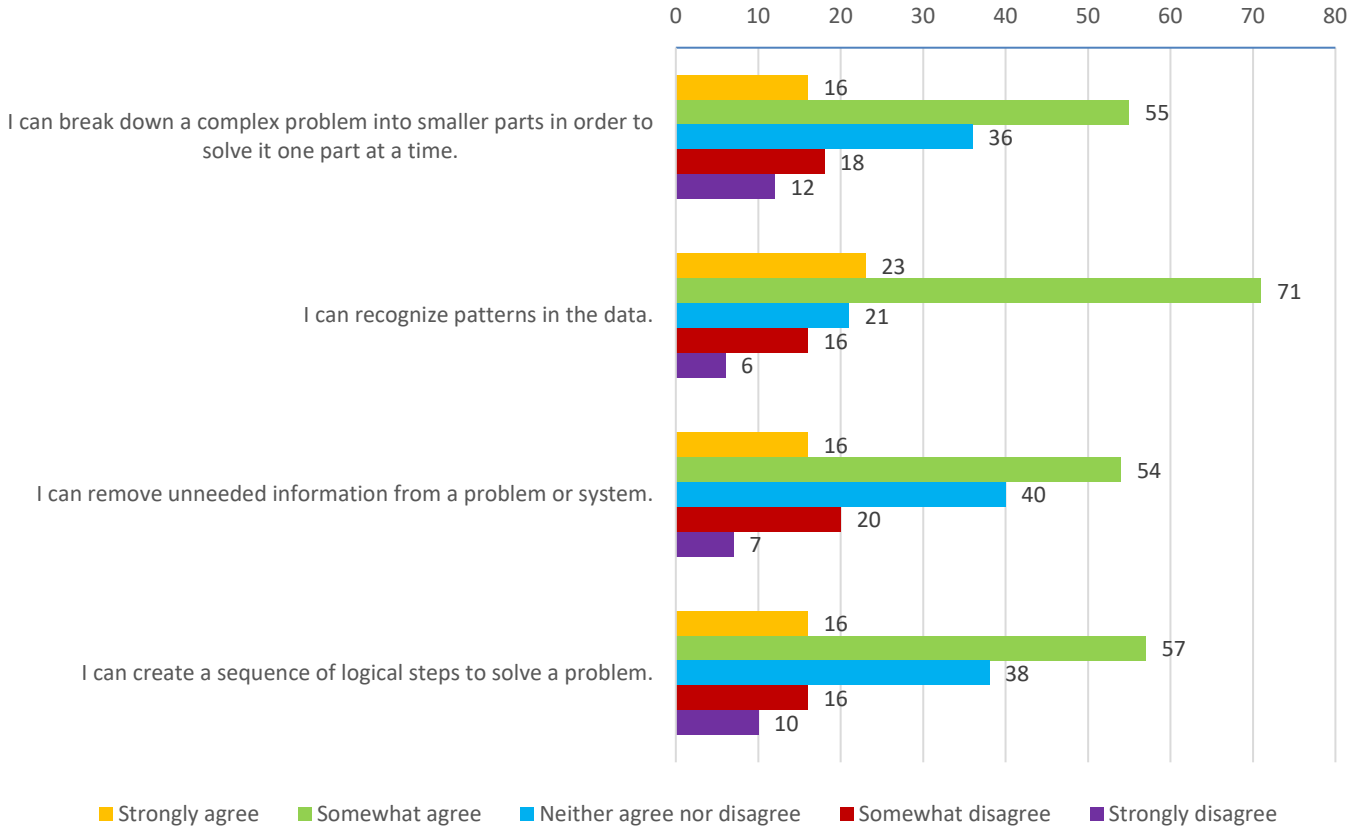
Science Ideas & Doing Science



Computational Thinking



CHEM B
STEMScopes

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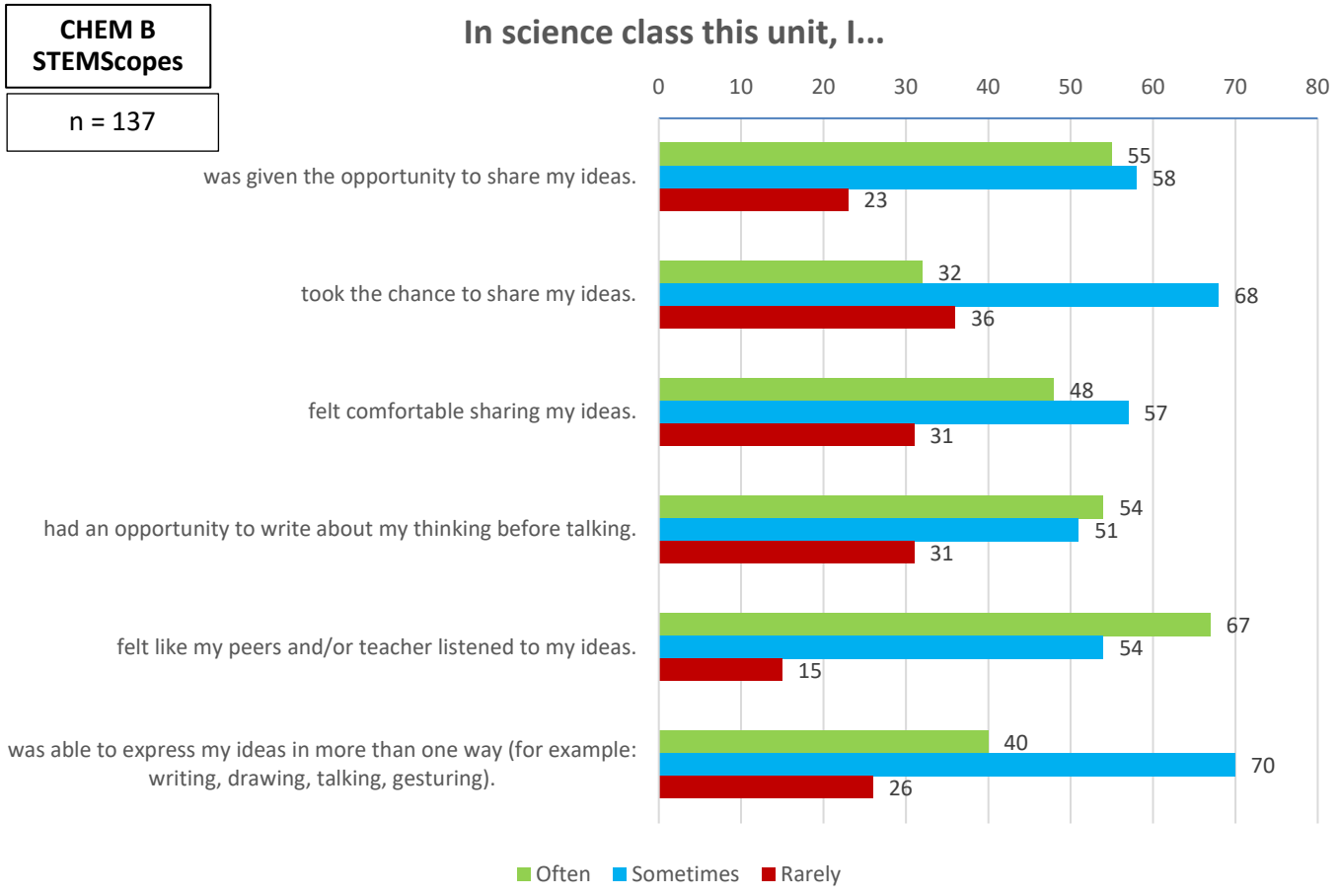

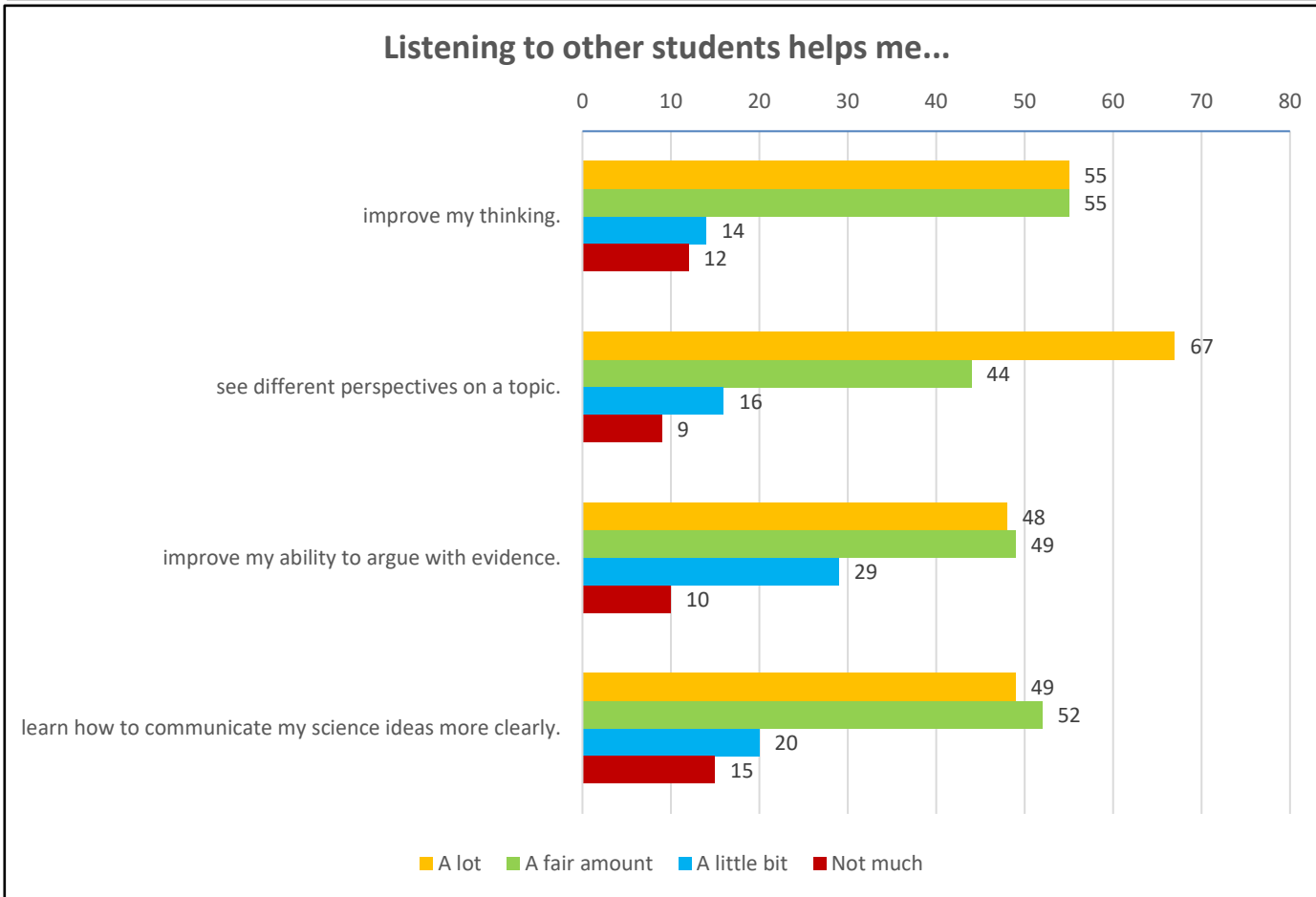

CHEM B STEMScopes

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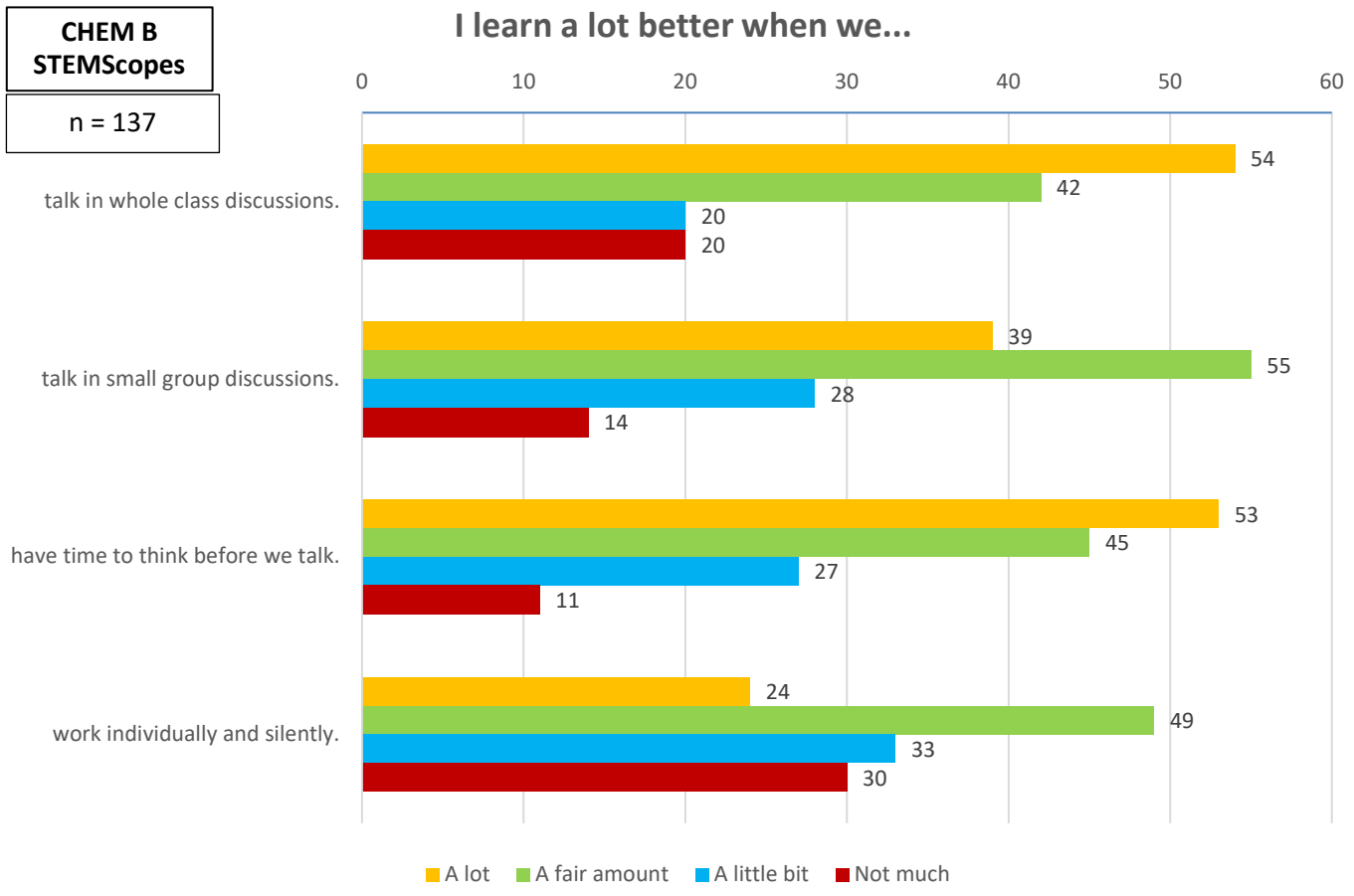

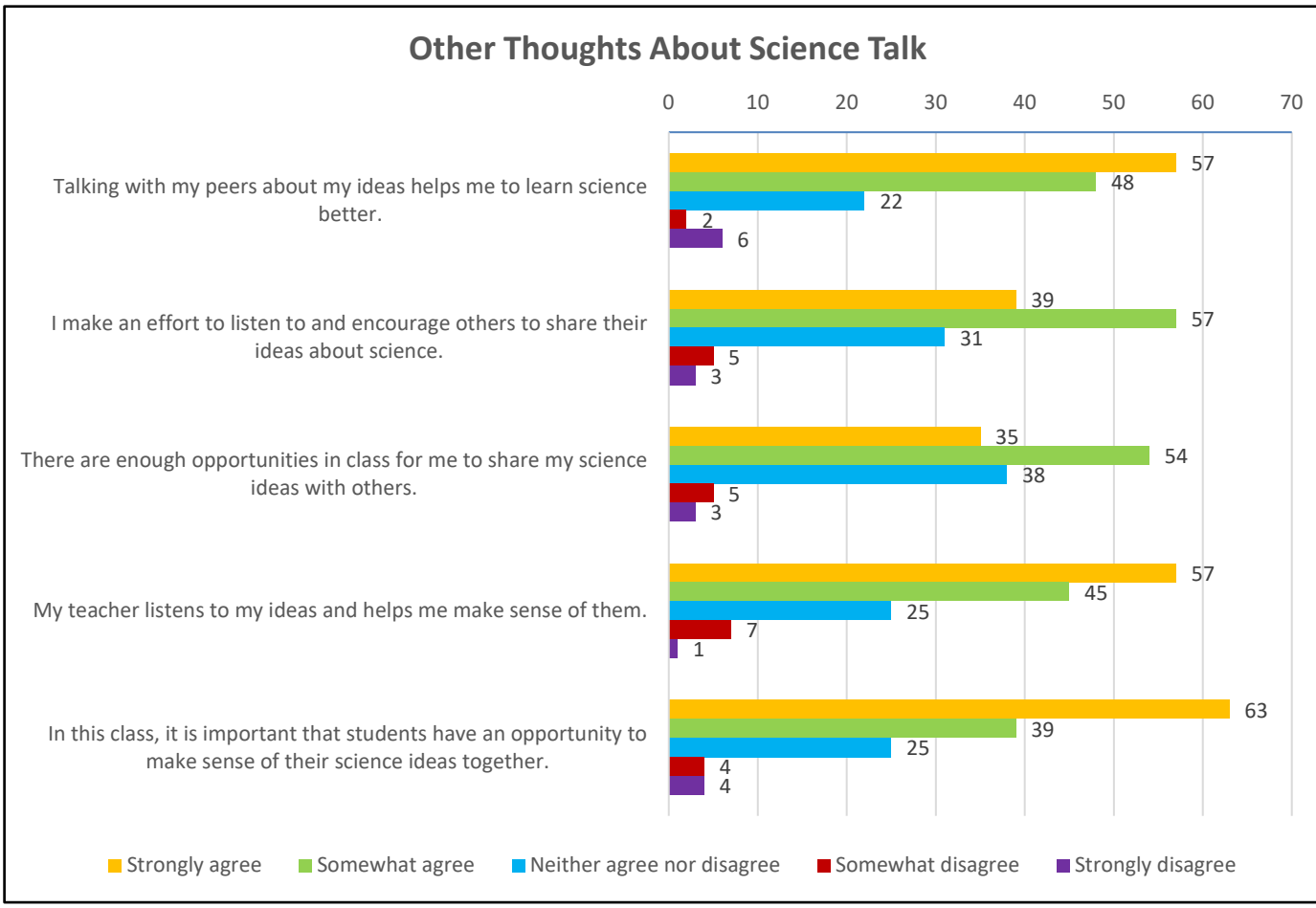

CHEM B
STEMScopes

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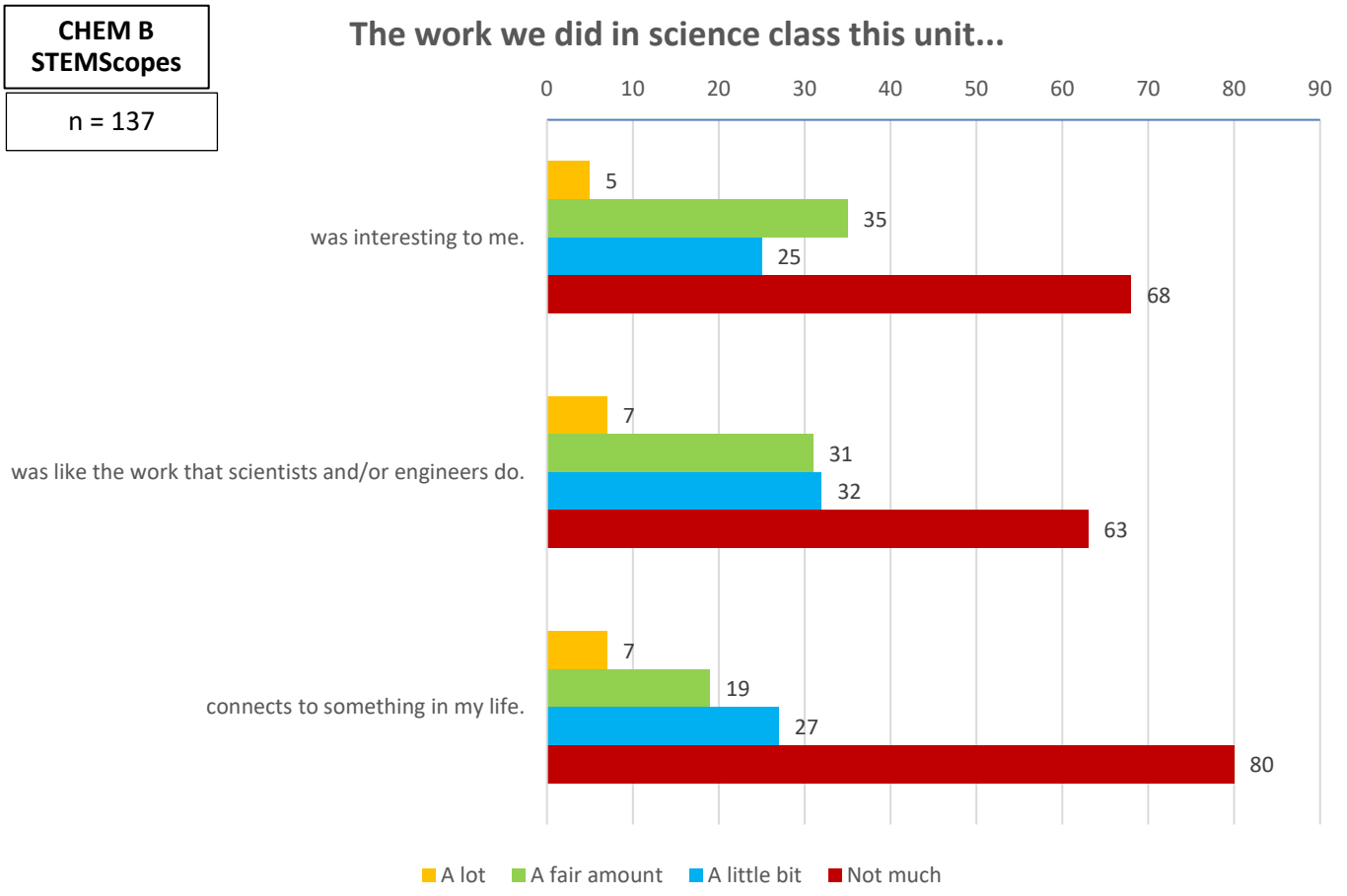

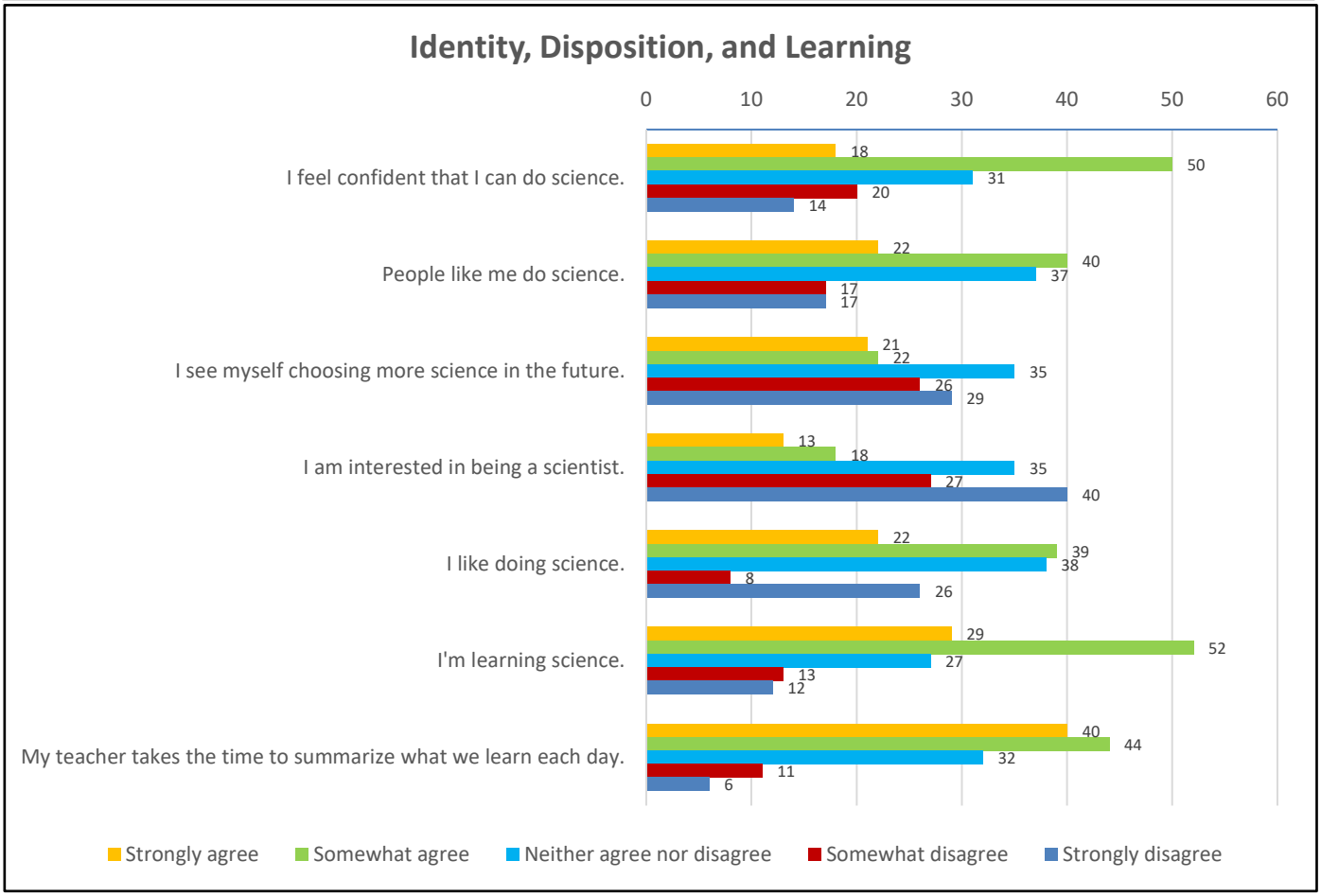

CHEM B STEMScopes

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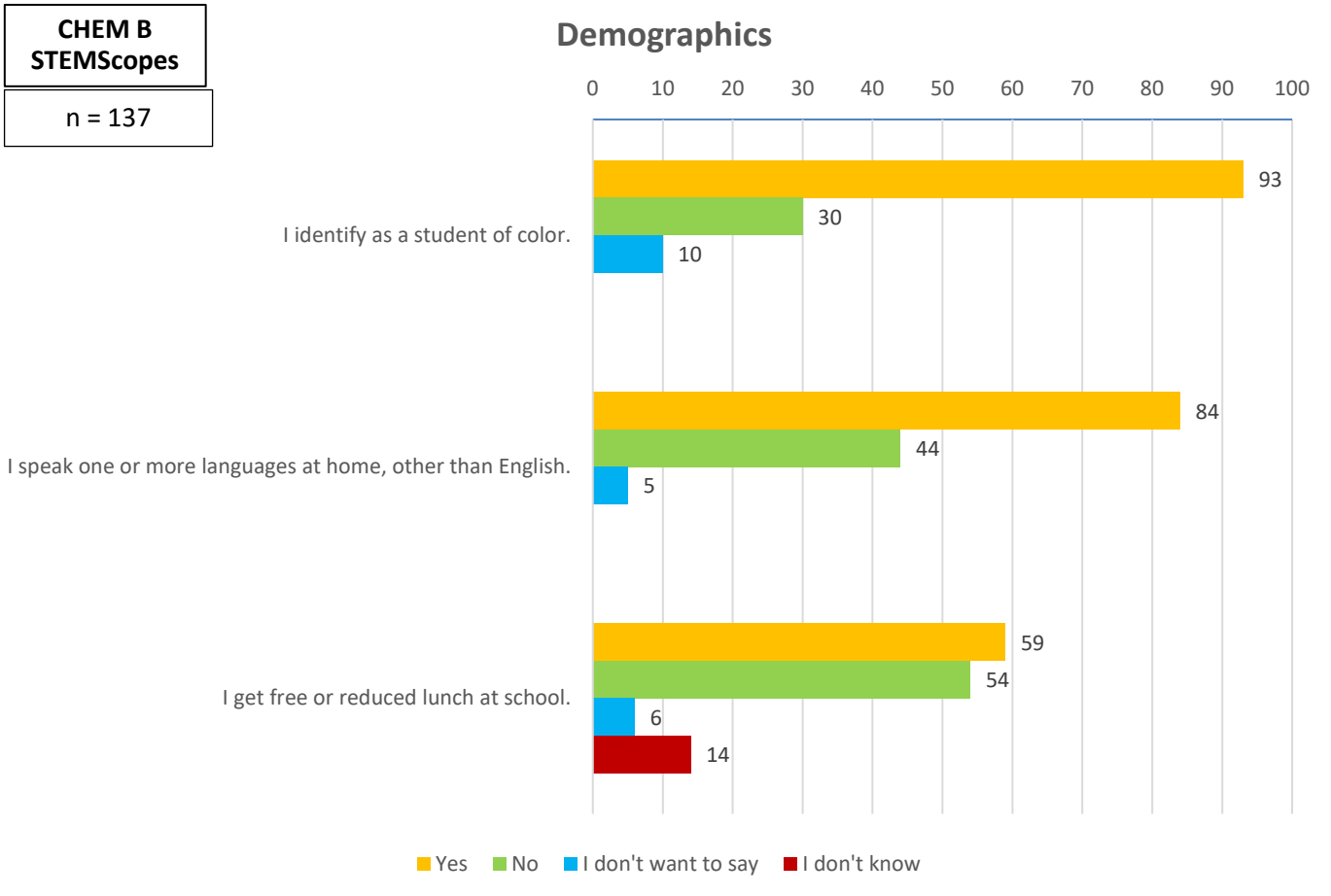
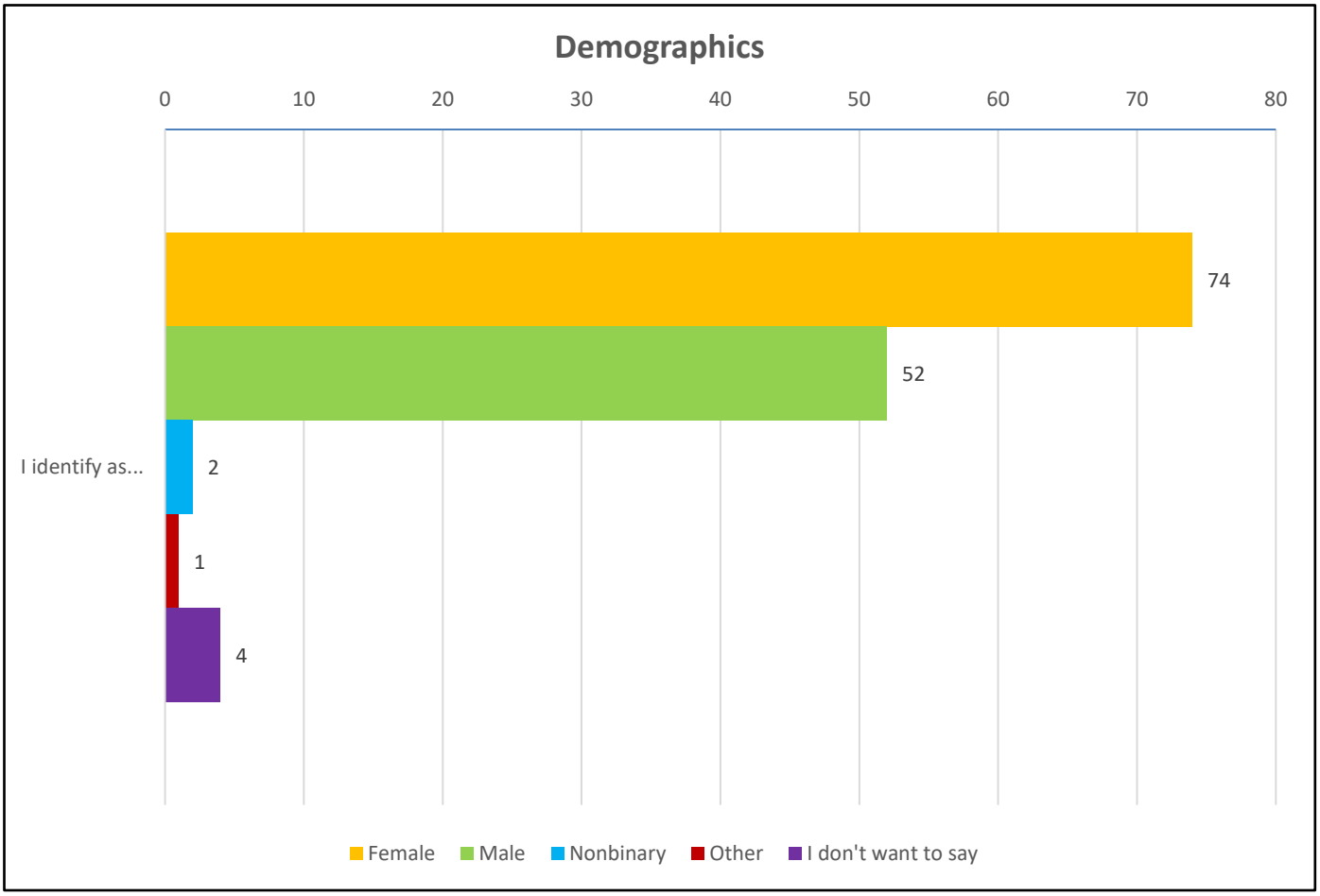




Attachment I.3A: Field Test Data
Student Growth for BIO A

Field Test teachers collected data from each program's pre-unit and post-unit assessments in order to measure student growth.

Methodology

Results were converted to a percentage, then an average was generated for both pre-unit (PRE) and post-unit (POST). Only data from students that took both the pre-unit and post-unit assessments was used in the calculation. Average growth was calculated using the following formula: (PRE – POST) / (100% – PRE)

Results

Program	# of Classrooms	Pre-Unit Average (%)	Post-Unit Average (%)	Average Student Growth (%)
Carbon TIME (BIO A)	5	47.0%	73.4%	**50.2%**

Attachment I.3B: Field Test Data
Student Growth for BIO B

Field Test teachers collected data from each program's pre-unit and post-unit assessments in order to measure student growth.

Methodology

Results were converted to a percentage, then an average was generated for both pre-unit (PRE) and post-unit (POST). Only data from students that took both the pre-unit and post-unit assessments was used in the calculation. Average growth was calculated using the following formula: (PRE – POST) / (100% – PRE)

Results

Program	# of Classrooms	Pre-Unit Average (%)	Post-Unit Average (%)	Average Student Growth (%)
Teacher-Developed Curriculum (BIO B)	3	38.8%	78.3%	**64.5%**

Attachment I.3C: Field Test Data
Student Growth for PHYS A and B

Field Test teachers collected data from each program's pre-unit and post-unit assessments in order to measure student growth.

Methodology

Results were converted to a percentage, then an average was generated for both pre-unit (PRE) and post-unit (POST). Only data from students that took both the pre-unit and post-unit assessments was used in the calculation. Average growth was calculated using the following formula: (PRE – POST) / (100% – PRE)

Results

Program	# of Classrooms	Pre-Unit Average (%)	Post-Unit Average (%)	Average Student Growth (%)
PEER (PHYS A and B)	4	17.1%	61.2%	**53.2%**

Attachment I.3D: Field Test Data
Student Growth for CHEM A

Field Test teachers collected data from each program's pre-unit and post-unit assessments in order to measure student growth.

Methodology

Results were converted to a percentage, then an average was generated for both pre-unit (PRE) and post-unit (POST). Only data from students that took both the pre-unit and post-unit assessments was used in the calculation. Average growth was calculated using the following formula: (PRE – POST) / (100% – PRE)

Results

Program	# of Classrooms	Pre-Unit Average (%)	Post-Unit Average (%)	Average Student Growth (%)
Teacher-Developed Curriculum (CHEM A)	4	25.5%	76.6%	**68.6%**
STEMScopes (CHEM A)	4	28.1%	48.3%	**28.1%**

Attachment I.3D: Field Test Data
Student Growth for CHEM B

Field Test teachers collected data from each program's pre-unit and post-unit assessments in order to measure student growth.

Methodology

Results were converted to a percentage, then an average was generated for both pre-unit (PRE) and post-unit (POST). Only data from students that took both the pre-unit and post-unit assessments was used in the calculation. Average growth was calculated using the following formula: (PRE – POST) / (100% – PRE)

Results

Program	# of Classrooms	Pre-Unit Average (%)	Post-Unit Average (%)	Average Student Growth (%)
STEMScopes (CHEM B)	2	22.3%	23.0%	**0.9%**

Attachment I.4

BIOLOGY A: CARBON TIME
SUMMARY OF EVIDENCE GATHERED DURING TEACHER OBSERVATION AND INTERVIEW
UNIT: Human Energy Systems

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3	Teacher 4	Teacher 5
SEP attended to within the unit	3	3	3	-	-
Phenomenon					
• Presence of	4	4	4	2	3
• Revisiting	3	3	3	3	3
• Engaging	3	3	4	3	2
Evidence Gathered					
• Multiple types	4	4	4	3	3
• Student engagement	4	4	4	3	2
Student Discourse for sense-making	4	4	4	4	2
Students tracking their progress (self-assessment)	4	4	3	3	-
Student Explanations	3	4	4	4	4
Usefulness of Materials	3	3	3	3	2

Comments to Note:

Teacher 1:

- Progression of this unit went well.
- Students apply their understanding of micro scale to macro scale to understanding how carbon is moved. Cause and effect is strong Crosscutting Concept.
- The scaffolds helped students feel like successful learners.

Teacher 2:

- Student engagement was high and the anticipated flow from curriculum was very natural. Students were literally asking questions about the next activity without knowing what the next activity was.
- The flow is going really well, students seemed interested and engaged with the work.

Teacher 3:

- Really impressed with how much the kids knew what they could do. They wrote a lot of how they connected their personal activities to carbon use. Many connected this to S&S. They see how the semester was very cohesive and to an understanding from cells to earth.
- They liked doing something they know makes a difference in their world. Because there is so much discussion that really matters. Everybody was engaged. I think it will connect to learning in other classes too. Kids finding connections to AP Human Geo. Environmental justice. Human Geo teachers reporting kids are talking about it.

Teacher 4:

- I would rate the explanations probably at an 8 or 9 out of 10. It is clear, direct, and (mostly) in student language. Connecting earths' systems produced the most lively conversations and noticeable revision of ideas.
- The phenomenon is overly simplistic and students feel they have answered it easily. My advanced students have found it redundant. I would prefer more engaging phenomenon (than Arctic Ice/Keeling Curve.) I would have students do a data comparison of the Arctic and Antarctic to extend their thinking about large scale patterns.

Teacher 5:

- They did engage in evidence-gathering to a certain extent, but it was a little repetitive. Evidence-gathering was mostly based in jigsaw on the NOAA site, which was down during government shut-down.
- Overall the unit has potential – the first jigsaw and PhET were really powerful and helped kids understand. More hands-on wet labs need to be developed. Heavy on PPT and paperwork. Discussions and PPTs help, but it's just not enough. Could use more action strategies.

Field Test Classroom Observation

Vendor: Carbon TIME
Unit: Human Energy Systems
Teacher #1

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
    a. Structuring from expert group to home group to build a group consensus and understanding.
    b. Applying this to a specific action they do every day. Synthesizing to explain.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
    a. Yes. Because the materials set up the jigsaw, scenarios, instructional goals.
3. Was there something that you would have liked to see that didn't happen?
    a. Yes. In those energy use scenarios wanted more levels of backwards thinking. One dimensional. Wish there was more dimensionality. Help kids see all of the pieces that go in to a single act.
4. What are your comments on the materials that you used today/ this week?
    a. Just that the progression in this unit went well. The students question flowed well with the way the storyline was laid out.

Overall:

5. What are your students understanding or not understanding?
    a. Apply their understanding of micro scale to macro scale. Understanding how carbon is moved. Cause and effect that we were exploring. Result of carbon increase.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
    a. They thought it was overly simple at first. But now they need to see the connection to the phenomena and need to apply it to the explanation. See it from a bigger perspective. More connection to the so what of the ice melting.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
    a. Yes. More so than some of the other units. Graphs in the beginning they saw patterns. Models needed more scaffolding. Purpose of the computer model.
8. Have student to student discussions focused on sense-making around evidence collected?
    a. Yes. Especially because this was partner work but every person needed to record their own idea. Making sense together.
9. How would you rate the explanations student generate using the tools from this unit?
    a. Haven't done the final yet. What was helpful was the 4 question scaffold. Some kids still struggle with taking these scaffold and creating a comprehensive idea.
    b. Growth from S&S to HES. All kids
10. Is there anything that we should know that I haven't asked you?
    a. Just that…the units are scaffolded in progression to make HES so important. Helps them feel like successful learners. See the connections CCC in particular.

Field Test Observations

Teacher #2
Vendor: Carbon TIME
Unit: Human Energy Systems

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   Learning Tracking tool went well, related to phenomena.
   Student engagement was high and the anticipated flow from curriculum was very natural. Students were literally asking questions about the next activity without knowing what the next activity was.
2. Was there something that you would have liked to see that didn't happen?
   More structure in the learning tracking tool, wish kids made their own calculations according to a menu rather than select a lifestyle they were closest to.
3. What are your comments on the materials that you used today/ this week?

The flow is going really well, students seemed interested and engaged with the work.

Overall:

4. What are your students understanding or not understanding?
   Students really didn't know how some of these lifestyle choices were related to carbon and making this connections between actions and the graphs we have been looking at is very new to them.
5. How have your students engaged with the phenomena? Has this phenomenon helped them to expand their thinking about this topic? It is posted on the wall with their ideas and questions, we revisit each time we do another entry of the learning tracking tool so they can see how we are building on ideas.
6. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   Evidence – large scale data (arctic sea ice, sea level, global temp, co2 increase) – made sense by showing relationships between the graphs. This happened in class through science discourse and tell the story how they are all related. There was a lot of discussion on whether sea ice melting caused sea level rising. Simulation on GH connected the content and reason why this is happening. Tiny World data and graphs helped students make sense of the balanced and unbalanced fluxes.
7. Have student to student discussions focused on discussing evidence to make substantiate their claims?
   Students discuss in small groups first, then share out in big group so all voiced are heard.
8. How would you rate the explanations student can generate using the tools from this unit?
   Keeling Curve Explanation – Having the large scale questions and criteria to answer questions helped guide students to full explanation. These resources were very helpful. The explanation did not have their own data but would be interesting if they referenced data from tiny world,
9. Is there anything that we should know that I haven't asked you?

None really

SECTION 4: Curriculum Lead's Reflections

In my observation there were several examples of connecting current learning to the phenomena and student discourse (both small and large group). It was evident that students were aware of the phenomena and it seemed common practice for students to be asked to make sense of their learning in the context of the phenomena. One area to note was the even flow of the lesson and how each part of the lesson flowed nice to the next part. For example, after the life style choice activity students discussed their experiences and asked questions. The questions they asked gave rise to the next part of the lesson. One student asked, I am not sure how food is related to carbon dioxide? The next lesson students became experts on how carbon is used in different human activities and explained the connection between food and carbon dioxide.

***Field Test* Classroom Observation**

Teacher: #3
Vendor: Carbon TIME
Unit: Human Energy Systems

SECTION 4: Post-Observation Notes

1. What did you try in HES that seemed successful? Why would you call it successful?
    a. Went through almost the entire unit including the optional, asking how is CO2 involved. Showing how human activities influence the CO2 and the consequences to the earth.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful unit?
    a. They used a lot of large-scale data sets with lesson plans to help students know how to use large scale data. Provided ways for students to deepen their explain of why and how and made it personal so they could see their own actions impact on those trends.
3. Was there something that you would have liked to see that didn't happen?
    a. More time! I wish there was a better opportunity at the end, to write a better explanation.
4. What are your comments on the materials that you used today/ this week?
    a. Really impressed with how much the kids knew what they could do. They wrote a lot of how they connected their personal activities to carbon use. Many connected this to S&S. See how the semester was very cohesive and to an understanding from cells to earth.

Overall:

5. What are your students understanding or not understanding?
    a. Very much understanding that more CO2 traps in the atmosphere. Needed to emphasize more that more plants does not remove CO2 alone. There was a reading in the activities that I need to bring that out more. I would like to work with that more. Could that into more of an engagement. Really understanding fossil fuel combustion on higher temps.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
    a. It was really different with the arctic sea ice because it seemed really simple. But the kids were able to really sink in. We were able to answer all of the unanswered questions by the end. Kids had heard enough about it, like polar bears, that they knew this was relevant in the news. Knew this was something changing in their lifetime.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
    a. Data sets. Kids were completely able to make sense of data in lesson 2. Some of the greenhouse effects simulations because that sim went beyond what CT worksheet required. Asking chem questions. Some wanted to know. Take APES! Continue to ask questions beyond this unit. They wanted to learn more. Pitch to bring diverse kids to APES.
8. Have student to student discussions focused on sense-making around evidence collected?
    a. Slowly getting better. Better in 4s than partners. Part of group work structure. Definitely spent time talking to each other. Lessons 2 and 4 expert groups supported kids making sense and then sharing that with their groups. Held them accountable to talking to each other. Good instructional move.
9. How would you rate the explanations student generate using the tools from this unit?
    a. Was hoping for deeper explanation but that is due to time crunch at end of semester. I think they could have done it had we had more time. Go back to the initial question and use the scaffold of the 4 questions. Wanted them to explain at atomic molecular scale. Room for growth in the lesson.
10. Is there anything that we should know that I haven't asked you?
    a. It was the first time through for me and I think it was very successful. They liked doing something they know makes a difference in their world. Because there is so much discussion that really matters. Everybody was engaged. I think it will connect to learning in other classes too. Kids finding connections to AP Human Geo. Environmental justice. As are the Human Geo teachers reporting kids are talking about it.

***Field Test* Classroom Observation**

Teacher #4
Vendor: Carbon TIME
Unit: Human Energy Systems

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   I was focused on sense-making around the patterns seen in the Keeling curve from an atomic/molecular level, writing explanations in science, and using a flux model to determine if a system is balanced or unbalanced. I would say students were 80-90% successful on sense-making, I don't have data yet for the written explanations, and 100% successful in modeling fluxes in earth systems. As I went around the room, students seemed to understand that contributing even "1" carbon atom from fossil fuels had an impact on the system. As I continued to teach the lesson throughout the day, it became clear that students easily applied the "3 question" model for organisms to the "4 question" model for large systems. Every student that I worked with was able to state the earth system was unbalanced according to the Keeling curve and why (it will be our warm-up the following week.)
2. Was there something that you would have liked to see that didn't happen?
   Side note: I would have liked to have had exit slips be part of the curriculum. Some students needed more time to actually do the entire model to get the pattern, while others caught on easily. I would like an extension exercise attached to this so that students who were done early were doing some predicting and modeling of their own to make sense. Some students need a better scaffold/instruction for the explanation tool to help them understand that the processes that contribute to the two patterns are not necessarily the same.
3. What are your comments on the materials that you used today/ this week?

Overall, the materials were highly successful and I found that the storyline was cohesive and made sense for all students. In some cases the powerpoints were redundant, and I would prefer to set those up myself in order to better differentiate for students. I would also differentiate in the materials and sense making. The whiteboarding activity for earth's systems was awesome, but in my case, everything is taking longer that what is specified, and I don't have enough work for my advanced students.

Overall:

4. What are your students understanding or not understanding?
   Understanding large scale movement of carbon, had a project from plants that helped. Just introduced fluxes and pools with CT PowerPoint – figuring out what they get about that. Some understand positive feedback loop (albedo) and some do not – but this is beyond CT. Some come in from plants forgetting what gases go in and out of plants.
5. How have your students engaged with the phenomena? Has this phenomenon helped them to expand their thinking about this topic?
   The phenomenon is overly simplistic and students feel they have answered it easily. My advanced students have found it redundant. I would prefer more engaging phenomenon (than Arctic Ice/Keeling Curve.) I would have students do a data comparison of the Arctic and Antarctic to extend their thinking about large scale patterns.
6. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   They have gathered textual evidence, phet simulations, graphs and data and videos (some are primary source videos), and finally the modeling for tiny pools. Students have clearly been able to make sense of the evidence they have gathered because of the multiple ways we use and talk about the data.
7. Have student to student discussions focused on discussing evidence to make substantiate their claims?
   Yes. In most cases we have discussed what we have evidence for (and what we don't have evidence for.) Because we are at the end of the first semester after using similar curriculum, students easily use data to justify their thinking.
8. How would you rate the explanations student can generate using the tools from this unit?
   I would rate the explanations probably at an 8 or 9 out of 10. It is clear, direct, and (mostly) in student language. Connecting earths' systems produced the most lively conversations and noticeable revision of ideas.
9. Is there anything that we should know that I haven't asked you?

Making slight changes to slides – i.e. arrival instructions
It's taking a long time to complete the Survey Monkey

The curriculum is solid. The pacing is solid (though redundant as written), and the tools are excellent. I would request more formative assessments connected to the lessons (beyond the summary tables.)

SECTION 4: Curriculum Lead's Reflections

The first part of the lesson was modified from Carbon TIME materials. The Warm Up activity and notes sheet were applicable, but not Carbon TIME. That said, the Tiny World Modeling activity was completed exactly as written.

Students were clearly familiar with the Carbon TIME format. They were able to follow the instructions on the Tiny World Modeling activity with some clarifications from the teacher. Students were seated at small groups of about 4 and worked with these peers on the activity. It was clear that the classroom had established discourse norms – students talked comfortably with one another and were focused on the task at hand. Some students helped others. They were focused on the data, and would return to the manipulative model if uncertain (evidence-based argumentation).

The teacher clarified the expectations for the final explanation and synthesized the key points from the lesson, engaging students in the final discussion to tease out big ideas.

The teacher had a favorable view of the curriculum. The teacher notes that the lessons are taking longer than estimated. She requests additional formative assessments i.e. exit tickets and extension activities for students who finish early.

Field Test Observations

Teacher #5
Vendor: Carbon TIME
Unit: Human Energy Systems

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?

The short debrief of each group in front of the whole class was successful. It allowed for everyone to get the basic information from all 4 groups even if a member did not teach their material well. I also liked the discussion questions.

2. Was there something that you would have liked to see that didn't happen?

I would have liked to have seen better buy in from everyone in the small groups. However, I think the students had burned out a bit on the jigsaw lessons.

3. What are your comments on the materials that you used today/ this week?

Overall the unit has potential – the first jigsaw and PhET were really powerful and helped kids understand. More hands-on wet labs need to be developed. Heavy on PPT and paperwork – could use some cleaning up. Needs to be modified for ELL and SPED students. Discussions and PPTs help, but it's just not enough – those students have really struggled through this. This curriculum also needs solutions so this is not a "doom and gloom" unit. Could use more action strategies. Graham and Sarah have been following along as well, and Graham preferred using the actual Carbon TIME site versus using SharePoint folder. Pretty good job in meeting NGSS standards.

Overall:

4. What are your students understanding or not understanding?

They understand "warming", but have a hard time behind the physics of the molecules – what makes something a greenhouse gas. This might be something to spiral on with Physics A. Gaps showed up with students who were not strong readers. Stronger students had multiple ways of getting information (reading, simulation, group discussion) but weaker students could maybe access one of those things.

5. How have your students engaged with the phenomena? Has this phenomenon helped them to expand their thinking about this topic?

They are engaged but students were starting to get burned out by the last jigsaw in terms of group responsibility.

6. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?

They did engage in evidence-gathering to a certain extent, but it was a little repetitive. Evidence-gathering was mostly based in jigsaw on the NOAA site, which was down during government shut-down. We ended up replicating by doing searches on YouTube.

7. Have student to student discussions focused on discussing evidence to make substantiate their claims?
8. How would you rate the explanations student can generate using the tools from this unit?

Majority of students were able to generate good explanations.

9. Is there anything that we should know that I haven't asked you?

SECTION 4: Curriculum Lead's Reflections

In Jigsaw – group didn't know what "Amtrak" was. (Cultural?)

"How much 'choice' does a person living in Ethiopia have about how she or he uses carbon every day? If a person from Ethiopia could play this game, what lifestyles do you think s/he would choose?" -- This question is really loaded. We actually have students from Ethiopia in our classes. Need to prep teachers on how to ask this

question in multicultural classroom so that students aren't making assumptions or generalizations about other students, nor are they putting these students on the spot to be representatives of their country.

When I talked to a group about WHY they chose the action strategies they did, interestingly they were thinking about "reaching a wider audience". I wonder if this would be a good opportunity to see if students could cite any evidence that one particular strategy would be more effective than another. What could be considered "evidence" in this case? Could this be formatted as a circle discussion?

BIOLOGY A: TEACHER DEVELOPED
SUMMARY OF EVIDENCE GATHERED DURING STUDENT INTERVIEW
UNIT: HUMAN ENERGY SYSTEMS

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3	Teacher 4	Teacher 5
Discourse for sense-making	3	3	3	3	3
Consensus building	3	4	3	3	-
Phenomenon present and helpful	3	3	3	2	2
Elicitation / Initial Model	3	3	3	2	2
Evidence helped understand the phenomenon	3	4	3	2	3
Way to track ideas through the unit	3	-	3	-	-
Assessments fair and helped know where you are	3	3	3	3	2
Does the unit help you learn science	3	3	3	3	3
Would you recommend these materials	3	3	3	2	3

Comments to Note:

- My favorite unit. I made connections. I see how the units linked together the units before. Usually everything is connected. Sometimes I don't see the point but when I look back it makes sense.
- Initial model and model revisions: Helps me see how my ideas change so I can write the final explanation. Feel proud how much I learned.
- *Yes because it helped me center on one idea, keeps my learning focused, we keeping coming back to the same idea so we know what is going on. We now can apply to different situations. In other classes I don't always know where we are going with the ideas but in science I do.*
- *Evidence – we did not gather our own evidence, but we reviewed many graphs and made connections to show relationships between them. We looked at keeling curve, sea level rise, global temp increase and arctic sea ice. We didn't really know what they had to do with our phenomena, but we had to figure out how they were all related.*
- *Often time we would ask questions that led to the next idea.*
- *Yes, it really brought all the previous units together and made sense or the other units – plants and animals. It was different to not collect our own data, but it was hard to collect our own data in this unit. We looked at lots of data that worked well, we analyzed other data.*
- *Write our ideas on a sticky note, questions on a sticky note. She is good at coming back to those ideas. Helps you think about how you changed your mind.*
- *Good to ask a big question, gives me a goal to think what I need to learn. When they are learning they have a reference to add ideas to. I like building to answer the big question.*
- *we're trying to figure out why CO2 is increasingly yearly, and we haven't quite got it yet*
  we always have an objective that is usually clear
- *Not my favorite, but I have learned – liked other units okay*
  I liked this one more
- *CS:* They felt that along the way it was a little hard to tell where everything was going, but it usually comes together as a coherent story in the end.
- *Have been looking at a lot of graphs to see CO2 increase, mainly graphs. We did a simulation. A lot of statistics.*
- *Simulations were helpful for visualizing what we were learning. But, at the beginning it felt slow-paced. The idea that CO2 traps heat was something that a lot of people know and could have been explained faster. Could use more readings. Simulations don't work for everyone. I liked how we were explaining what we learned instead of learning all together.*

Student Interview
Teacher 1
Vendor: CarbonTIME
Unit Name: Human Energy System

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
    a. *Yes. When we do our labs, we share responsibility. When everyone knows a little bit, piecing it together. Helps to clarify.*
    b. *Is having conversations with your peers something new to this unit or something you regularly do in science?*
        i. *All year.*
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
    a. *Sometime students break it down more. Teacher is busy. Peer helps me know.*
    b. *Teacher knows a lot more. They can't tell us everything. Sometimes we just guess, give me more resources. New ways to think of it.*
3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
    a. *Makes it easier to learn. Every time we go back to the question. Build our understanding. Gives us a goal to work towards*
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
    a. *I am ok guessing. We are all in the same boat. To see where we are at. We revisit our question. Ask if we can answer the questions now. Makes me feel proud. Teacher is honoring my ideas.*
5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
    a. *Plant changes color with BTB. Now we use this to figure out the big picture*
    b. *PhET simulation was confusing at fist. We went over it and answered the questions.*
    c. *Data sets CO2 concentration over time. Used that data to make a diagram. Helped me understand rise in CO2 effects everything.*
    d. *I asked them about what they would say to someone who doesn't believe in global climate change. All goes back to Carbon. I would use my notebook. How sea ices is melting. Temperature increasing.*
6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
    a. *My favorite unit. I made connections. I see how the units linked together the units before. Usually everything is connected. Sometimes I don't see the point but when I look back it makes sense.*
    b. *Idea journal is helpful in the last unit it was more helpful. It was in more depth.*
    c. *Initial model and model revisions: Helps me see how my ideas change so I can write the final explanation. Feel proud how much I learned.*
7. Were you able to ask your questions during the unit? To whom did you ask your questions?
    a. *Yes. Sometimes I am afraid to ask because I don't want to look dumb. But we can put our questions on sticky notes in our groups and then she answers them.*
    b. *I don't like asking questions in front of the whole class. I feel like someone is judging me. Our teacher doesn't make you feel dumb about the question but she does not give up on us until we can answer our own question.*
8. Did your teacher have students share their individual ideas before coming to class "consensus"?
9. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
10. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
11. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
12. Would you recommend that we use these materials for ALL students in ____ across the district.
    a. *It is really ~~fun~~ interesting, and I am learning.*
    b. *I like when I talk to my friends I can say something like, "I am eating polymers and changing them to monomers."*

Student Interview
Teacher 2
Vendor: Carbon TIME
Unit: Human Energy Systems

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yes, we do a lot of peer discussions, discuss what we see in the power points, different tables shared ideas on whiteboards and we got to see what others were thinking.
2. Is having conversations with your peers something new to this unit or something you regularly do in science?
   It seemed maybe we did more often in this unit. Overall, I feel this year in biology we do a lot more discussions around ideas than other years in science.
1. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?

Its better to hear from one or two people to get different perspectives, we help each other discover new ideas by hearing how other people think about things.

2. *Did the unit have a clear phenomenon (you might need to explain what you mean by a phenomena)? Yes, the arctic sea ice idea*
3. Does a phenomenon help you understand the science ideas by giving you a reason to study the science? *Yes because it helped me center on one idea, keeps my learning focused, we keeping coming back to the same idea so we know what is going on. We now can apply to different situations. In other classes I don't always know where we are going with the ideas but in science I do.*
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomena even before you began studying the topic?

Yes, we did

5. What kinds of evidence have you gathered in this unit? Did that evidence help you answer the unit question? Explain

Evidence – we did not gather our own evidence, but we reviewed many graphs and made connections to show relationships between them. We looked at keeling curve, sea level rise, global temp increase and arctic sea ice. We didn't really know what they had to do with our phenomena, but we had to figure out how they were all related.

6. Did the lessons link together to help you explain the phenomena? Do you think you can explain it to me? *Yes, (they explained it), it all seemed to flow together. We discovered stuff as we went and discovered how different systems worked together. It felt when we needed to learn more, the next lesson had something new to learn.*
7. Were you able to ask questions to get clarification during the unit? To whom did you ask your questions? *Yes, sometimes answered. Often time we would ask questions that led to the next idea. Often I had questions but it was always answered in the next lesson.*
8. Did your teacher have students share their different ideas before coming to class consensus?

We had lots of time to develop consensus as a group before we came to a group consensus. Different ideas were shared in a large group but then we came to consensus as a group.

9. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky? *When we come to class consensus she made sure everyone understood, when she stamps handouts she scans handouts to be sure it is done correctly. We did an explanation about the keeling curve.*
10. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?

Yes, it really brought all the previous units together and made sense or the other units – plants and animals. It was different to not collect our own data, but it was hard to collect our own data in this unit. We looked at lots of data that worked well, we analyzed other data.

Curriculum Specialist Impressions and Summary:

Overall I noticed students seemed to value the discourse and connections to the phenomena as part of their learning. The recognized that they had to work and make connections during the unit to be able to learn the content. They did not use the word storyline but they saw a clear storyline and appreciated the connections between lessons that helped them make sense of what was going on. There were many opportunities for students to collect evidence from graphs through the

analysis and interpretation of the graphs, even though the did not feel like they collected quantitative data themselves. It was clear that the teacher provided opportunities for them to make sense of their work through small and large group discussions and related each lesson back to the phenomena to support their learning. Students saw the small and large group discussions as opportunities to learn from each other and help each other the make connections in the science ideas they were learning.

Student Interview Protocol
Teacher 3
Vendor: Carbon TIME
Unit: Human Energy Systems

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
    a. *Share each other's ideas and help what others think. Different ideas help me think other ways and hear other perspectives.*
    b. *The more you talk your ideas, the more it helps me remember and get my ideas organized. Talk helps me remember it more.*
    c. *Is having conversations with your peers something new to this unit or something you regularly do in science?*
        i. *We often do this.*

2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
    a. *How does CO2 cause global warming. Gives us a big picture. Can be confusing every time I start a new unit. Building on top to solve the problem at the end.*
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
    a. *To give the teacher a general sense of where students are at the beginning.*
    b. *Good to ask a big question, gives me a goal to think what I need to learn. When they are learning they have a reference to add ideas to.*
    c. *I like building to answer the big question.*
5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
    a. *Computer modeling. Gives us an idea of how it happens*
    b. *Penny's to represent the CO2 that changes over time.*
    c. *Read articles. Helped me learn the ideas.*
6. Did the lessons link together to help you explain the phenomenon? **Do you think you can explain it to me?**
    a. *Yes. Helped me figure out the graphs.*
    b. *The lessons connect.*
    c. *We the direct and indirect affects of rising CO2 impacts the ecosystems. All relates together.*
7. Modeling: *Past units. Gives us one way to figure out what is going on. Helps remember it better. Different ways to represent ideas help me to learn.*
8. Were you able to ask your questions during the unit? To whom did you ask your questions?
    a. *Yes. We ask our teacher, she says, what do you think? She says ask each other. Helps me feel proud when I can answer.*
    b. *Thinking together is helpful.*
9. Did your teacher have students share their individual ideas before coming to class "consensus"?
    a. *She has us share each other's ideas. Helps us put our ideas. Look back to our initial ideas.*
    b. *Write our ideas on a sticky note, questions on a sticky note. She is good at coming back to those ideas. Helps you think about how you changed your mind.*
10. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky**? Summary Table**.
    a. *Final explanation. Walks around and listens,, sees if anyone is confusing.*
11. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
12. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    a. *Helps students learn.*
    b. *CT helps.*
    c. *Simulation are helpful*
    d. *Better than reading a book.*
    e. *Sometimes we go too fast.*
    f. *Materials provide the information to learn.*

Student Interview
Teacher 4
Vendor: Carbon TIME
Unit: Human Energy Systems

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yes, 2-3x per period
   We're trying to think things out
   Do a lot of work together
   a. Is having conversations with your peers something new to this unit or something you regularly do in science?
      regularly
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   Absolutely – science is not my strong suit, I can get it after hearing it from someone other than the teacher
   it's good to hear someone put it in different, build answers with other people
   like it – usually understand but want to hear and see if there is a better way to explain
3. Did the unit have a clear phenomenon (you might need to explain what you mean by a phenomena)? Does a phenomenon help you understand the science ideas by giving you a reason to study the science?
   we're trying to figure out why CO2 is increasingly yearly, and we haven't quite got it yet
   we always have an objective that is usually clear
   gives a reason, but maybe not a motive
   it does motivate me but I'm personally interested
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomena even before you began studying the topic?
   Yes – I hated it
   we did pre-assessment, we do for all our units
   I don't like it because I don't know, can make you frustrated, it's good to see your progress so I know why, feels like you aren't allowed to say I don't know, feels worse to be wrong
   I like it – I might have ideas that I had before and if incorrect I can figure out why I thought that and what I can think in the future, pull from previous knowledge, get you thinking
   if you have no idea it's hard
5. What kinds of evidence have you gathered in this unit? Did that evidence help you answer the unit question? Explain
   data – artic sea ice, land ice discussion, carbon levels in Mauna Loa, readings, sometimes labs (not *in this unit)*
   We get a lot of information and at the end you need to talk it all over and put it together
   Help you understand: yes – with a pause, we do learn everything but as we go through it I don't have a question in my mind until we get to the end
   we have this question so I start thinking about how would it relate and I start formulating ideas
6. Did the lessons link together to help you explain the phenomena? Do you think you can explain it to me?
   In the end, there was an order, but not connected until the end, a little fuzzy along the way
7. Were you able to ask questions to get clarification during the unit? To whom did you ask your questions?
   Yes – teacher, peers
8. Did your teacher have students share their different ideas before coming to class consensus?
   Yes – asks what we think, do we agree, figure out
   I don't like but that's personal
9. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
   She comes in and checks in, might ask why we're doing it, make sure not on wrong path and steer, go over misconceptions which is helpful, some have different idea
10. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    Not my favorite, but I have learned – liked other units okay
    I liked this one more

Organization – liked it, but a few readings had weird sentences that were confusing

Curriculum Specialist Impressions and Summary:
Teacher identified this group of 3 students as a diverse lab team. One student seems to really like science and the material. One doesn't really like science, the other seemed in between. We had to have this conversation in the back of the classroom so it wasn't a great setting to record, but all 3 students contributed ideas.

The students' opinions were mixed, and reflected their experience on learning with the Carbon TIME materials all year. They all agreed that they like talking to each other and working in small groups with the teacher available to redirect, synthesis, etc. They felt that the phenomenon gives a reason, but not necessarily a motivation to learn something. They felt that along the way it was a little hard to tell where everything was going, but it usually comes together as a coherent story in the end. They had mixed feelings about eliciting ideas because it's hard to be asked things that you don't know, but they agreed that they understand why they do it and that it can be useful to realize what you already know.

They were also mixed on the Human Energy Systems unit in particular, with some liking it more and some less than other Carbon TIME units. They noted that there were a few typos and confusion portions in some readings that they worked through.

Student Interview
Teacher 5
Vendor: Carbon TIME
Unit: Human Energy Systems

Questions

1. What have you been learning about?

Mostly we've been learning about CO2 and the atmosphere, and how humans affect the earth. We're learning that the increase in CO2 corresponds with an increase in temperature. We're learning about greenhouse gases and fossil fuels, and why the greenhouse effect happens.

2. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.

Yes, we do jigsaws and talk to our groups and share ideas and answer questions. We talk in table partners, like if I miss any information.

3. Is having conversations with your peers something new to this unit or something you regularly do in science?

I've done this in other classes but not specifically this one. The jigsaw is kind of new – we haven't gone [to the back of the room] and communicate to each other. This unit had more groupwork than previous units.

4. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?

Yes – if someone else doesn't know, you can explain to someone else and by explaining it to someone else you solidify the knowledge yourself. We always do writing activities at the very end, like "rewrite the packet in your own words". This is the only class that I do this for and it actually helps because when I have to rewrite it at the end I have to look over everything and it makes more sense.

5. Did the unit have a clear phenomenon (you might need to explain what you mean by a phenomena)? Does a phenomenon help you understand the science ideas by giving you a reason to study the science? (Had to reword this as a "theme")

Life – we had to learn what was in our food, then we learned what happened in plants and then how it all affects the CO2 in the air. It all ties together. With this unit we learned more about how we as humans get our energy in different ways and it impacts the environment – temperatures are rising, which causes land ice to melt, which causes sea levels to rise and we learned why that happens.

6. At the beginning of the unit, did your teacher ask you your ideas about the phenomena even before you began studying the topic?

Yes, we did post-its and placed on a chart on the whiteboard; We also had a worksheet (initial ideas) that asked us why sea levels rise.

7. What kinds of evidence have you gathered in this unit? Did that evidence help you answer the unit question? Explain.

Have been looking at a lot of graphs to see CO2 increase, mainly graphs. We did a simulation. A lot of statistics.

8. Did the lessons link together to help you explain the phenomena? Do you think you can explain it to me?
9. Were you able to ask questions to get clarification during the unit? To whom did you ask your questions?

We would ask each other or the teacher.

10. Did your teacher have students share their different ideas before coming to class consensus?
11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?

We do study guides, and ask what we need help on, and the whole class will work on the study guide together. With the jigsaws we write our ideas down and [teacher] will look over them and ask to go over them if you don't understand.

12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?

Simulations were helpful for visualizing what we were learning. But, at the beginning it felt slow-paced. The idea that CO2 traps heat was something that a lot of people know and could have been explained faster. Could use more readings. Simulations don't work for everyone. I liked how we were explaining what we learned instead of learning all together.

Curriculum Specialist Impressions and Summary: All 3 students are stronger students, in 4th period. This group was not selected by the teacher – he put out a blanket call for students to participate but it was too short-notice to arrange ahead of time, so we waited to see who would show up to eat lunch in his classroom.

Students did not really come to agreement on a single phenomenon that tied the unit together. They knew it was broadly about global warming but they brought up different aspects of the phenomenon such as human action/impact and the physical properties of the greenhouse effect.

Attachment I.4

BIOLOGY B: TEACHER DEVELOPED
SUMMARY OF EVIDENCE GATHERED DURING TEACHER OBSERVATION AND INTERVIEW
UNIT: Development

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3
SEP attended to within the unit	4	4	4
Phenomenon			
• Presence of	3	4	3
• Revisiting	3	4	3
• Engaging	3	4	3
Evidence Gathered			
• Multiple types	3	4	3
• Student engagement	3	4	3
Student Discourse for sense-making	3	4	3
Students tracking their progress (self-assessment)	3	4	3
Student Explanations	3	-	3
Usefulness of Materials	3	4	3

Comments to Note:

Teacher 1:

- Schoology page for basic information, easy to download information.
- A lot of "aha" moments. Any activity that does that is a success.

Teacher 2:

- Fits really well within the sequence of learning. Logical next steps. Opportunity to do critical thinking.
- Learning Tracking Tool connects them back to the phenom. Helps them hang their ideas, anchoring their learning and a place to fit all of the pieces together.
- Gives students the opportunity to work with different types of evidence. The work that scientists do in an authentic way. Lots of opportunity for discourse.

Teacher 3:

- Schoology materials are helpful – teacher examples are helpful, planning guide, storyline, optional readings are useful for advanced students, like the Word files
- Would be nice to have a way to address unanswered questions about human development

Teacher #1
Vendor: Teacher-Developed Materials Bio B
Unit: Genetics - Development

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   Hands-on activity – students were engaged and from my conversations they were getting the concepts. That's great because of the snow days and I was worried about that with the time between pieces of information. A lot of "aha" moments. Any activity that does that is a success.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
   Yes – use the Schoology page for basics, easy to download information. Don't generally do the elicitations – using that time right now for learning tracking tool because of time crunch.
   Idea Journal as an arrival activity helps cement what we did the previous day and connect to new learning so they see flow.
3. Was there something that you would have liked to see that didn't happen?
   Always want 2nd period to be more on task, but they got quite a bit done today. I've had to let go of them being all activities all the time. I don't let them draw us away from big tasks, but they benefit from some relaxed conversations to build relationships.
   Would have modified the questions with the reading – there are too many. Instructions suggest using reading strategy – will use for differentiation
4. What are your comments on the materials that you used today/ this week?
   Like the cell diff activity – they start not knowing what to do, but when they read they get it. Easy to follow, understand, interesting, understand that all our cells have the same DNA but not all used, will build in gene expression.

Overall:

5. What are your students understanding or not understanding?
   Understanding: Starting to be able to answer phenomenon. All cells have the same DNA (starting to get)
   Not: Struggle with partial answers. Need to look more at idea journals, get frustrated until they know more. Not great at following instructions and utilizing resources yet, but improving (maternity leave)
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
   Never taught this without a phenomenon, so not sure. Not engaging as much as they could. Do keep bringing everything back, not sure if they are yet. Will do more Idea Journals and that really helps.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   Planaria lab – not made sense of it yet, coming back next week. Need more content to explain.
8. Have student to student discussions focused on sense-making around evidence collected?
   Hasn't happened yet. Not really talked much about EBA yet.
9. How would you rate the explanations student generate using the tools from this unit?
   Not really there yet.
10. Is there anything that we should know that I haven't asked you?
    Need more ideas on how to differentiate up on some early activities – have some bored students who don't like things like cutting out DNA and get frustrated. Feel more confident differentiating down.
    Mitosis – need a mini-PowerPoint and video. Just to get everyone on the same page. It helped a lot. Could have been better, but snow days made it hard.
    Consistency in language – Idea Journal/Learning Tracking Tool
    How you show the DNA and the gene – be consistent

SECTION 4: Curriculum Lead's Reflections

The teacher likes the phenomenon and teaching with storylines. She LOVES the Learning Tracking Tool. She loves hands-on activities, and says that her students enjoy these. She also was impressed with how many students were having "aha" moments in the lesson. She feels a bit off-track because of the snow days, and noted that they still need to do further analysis of the planaria and to explain the phenomenon.

The Cell Differentiation Activity was completed as written. The teacher was familiar with the activity and offered a few suggestions to help the students be successful, but otherwise asked students to read through the instructions and complete the activity as described. Students were successful in following these instructions. Observation of student work and hearing snippets of their conversations indicated that students were able to work collaboratively to figure out the activity. The teacher asked back pocket questions such as, "What are the differences in the DNA between your muscle and your bone cells?" that prompted students to explain to her that all cells have the same DNA, but they use different genes. Students are beginning to understand this idea, and the teacher felt their understanding would grow in the remaining part of the unit and in Gene Regulation.

The DNA and Cell Differentiation Reading and Questions were assigned as written. Students will finish these for homework.

The teacher is using the Learning Tracking Tool, but calls it an Idea Journal for consistency across the year. Due to time, she often uses these as entry tasks. Some of the entries didn't perfectly match the suggested Revisit Initial Ideas lessons, but students were connecting their ideas to the phenomenon. The phenomenon was referred to several times, and the classroom had a K-W-L style driving questions board.

The teacher made some edits to mitosis materials due to snow days creating confusion with the activities. She used some PowerPoint slides with pictures of the stages and a video to help review. Otherwise she is trying to use the materials as-is. The students are completing a Take Charge activity related to sustainability (for the RHS Sustainability Fair) and are reading some chapters in an ancillary materials textbook – the teacher has continued these activities for consistency with the rest of the department.

The teacher referred to ongoing work on the CCC: Structure and Function.

Practices: The students asked questions on their Learning Tracking Tools. Their questions on the Driving Questions board were referred to. Students used a model to understand cell differentiation. In the Cell Differentiation Activity students made sense of the information about genes to determine which would be used in each cell type. They also communicated this information to each other.

Field Test Observations

Teacher #2
Vendor: Teacher Developed Bio B
Unit: Development

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
    a. LTT as entry task. Questions they had for next steps, were actually on the driving question board.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
    a. Yes. Add pedagogy
    b. Background, directions, student worksheet provided. Schoology has goals and context. Teacher instructional moves.
3. Was there something that you would have liked to see that didn't happen?
    a. Small thing…Define gene and chromosomes. Make assumptions kids are familiar.
4. What are your comments on the materials that you used today/ this week?
    a. Fits really well within the sequence of learning. Logical next steps. Opportunity to do critical thinking.

Overall:

5. What are your students understanding or not understanding?
    a. Understand cell division, DNA replication. Early in the unit. Having questions about Stem cells, they are eager to know and see they are missing a piece.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
    a. Yes. LTT connects them back to the phenom. Helps them hang their ideas, anchoring their learning and a place to fit all of the pieces together.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
    a. Used images of cells dividing, planaria observation=growth, genes on chromosomes.
8. Have student to student discussions focused on sense-making around evidence collected?
    a. Yes. Especially for the cell division. Sense making about the order of mitosis.
9. How would you rate the explanations student generate using the tools from this unit?
    a. Not yet
10. Is there anything that we should know that I haven't asked you?
    a. Gives students the opportunity to work with different types of evidence. The work that scientists do in an authentic way. Lots of opportunity for discourse.

***Field Test* Classroom Observation**

Teacher #3
Vendor: Teacher-Developed Bio B
Unit: Genetics - Development

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   The Warm Up was an "aha" moment for some, but less than 1% have it. More will have it when repeated tomorrow.
   Helping students understand the basic level that some turn on or off, but don't yet get gene to protein – first time seeing it
   Which genes would be turned on for which cells in an introductory way
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
   Not intrinsic within the lesson for modifying down, i.e. vocab of expressed/repressed
   Schoology materials are helpful – teacher examples are helpful, planning guide, storyline, optional readings are useful for advanced students, like the Word files
   Better built than some CT
3. Was there something that you would have liked to see that didn't happen?
   Would like more Exit Tickets
4. What are your comments on the materials that you used today/ this week?
   LTT – like these, already using
   Activities build on each other well, enough variation, but consistent
   Teacher materials are good
   PD is inherent part of curriculum – if I didn't know things were coming, would be hard to know how to include

Overall:

5. What are your students understanding or not understanding?
   Understanding – in order to heal or grow cells need to divide, to do that they need second set of DNA (don't know when), understand that different cells do different jobs, want to know when in the forming of organism cells get their jobs
   Not understanding – events of cell cycle (likely don't understand cells from CT)
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
   They have been engaged in planaria, less with baby, think the explanations will be good
   Ask questions
   Calmer unit, more opportunity for discussion than in CT – actually built into curriculum
   Want an opportunity for students to argue about their ideas regarding evidence, would like to come to consensus
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   Planaria – drop their tails and grow heads
   Mostly qualitative, did some quantitative with calculations and graphing
   Other is all through models – card sort, pipecleaners (students don't always trust that as evidence), video, reading
8. Have student to student discussions focused on sense-making around evidence collected?
   Think explanation will be the best
   Graphed before midwinter break, assigned EBA and had to remember when they returned (would have been better without snow days and break)
   Mitosis modeling – good opportunity
9. How would you rate the explanations student generate using the tools from this unit?
   From Cell Diff activity they can explain cell division, about 40% can say they have different gene expression, about 10-20% can do gapless explanation right now, will increase tomorrow.
   Would be nice to have a way to address unanswered questions about human development
10. Is there anything that we should know that I haven't asked you?
    DNA replication modeling

SECTION 4: Curriculum Lead's Reflections

Teacher has made some modifications including adding a formative assessment after mitosis, making a notes sheet for the DNA PowerPoint, shortening the questions that follow the Cell Differentiation reading to just 4 since there were too many, completing the concept map for the Cell Differentiation question separately on whiteboard, Warm Ups, etc. She wants a modeling activity for DNA replication.

The Cell Differentiation activity was completed as written. The activity went smoothly and students were able to follow the directions and explain the differences between the cells. The Warm Up (written by the teacher) indicated that students didn't understand the details of how DNA replicates, but they did explain during the lesson that cells need to copy their DNA when they divide. The optional Stem Cells Reading was an extension for students who finished early or wanted a challenge. The DNA and Cell Division Reading Questions (optional) were assigned as homework. Students were going to do Learning Tracking Tool, but the class was ahead of other periods and had already completed the entries.

The teacher referred to student-generated questions, the unit phenomenon, and the experimental phenomenon (planaria). It was clear that students were comfortable asking questions about the unit.

BIOLOGY B: TEACHER DEVELOPED
SUMMARY OF EVIDENCE GATHERED DURING STUDENT INTERVIEW
UNIT: DEVELOPMENT

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3
Discourse for sense-making	3	3	3
Consensus building	2	3	2
Phenomenon present and helpful	3	3	3
Elicitation / Initial Model	3	3	2
Evidence helped understand the phenomenon	3	3	2
Way to track ideas through the unit	2	3	3
Assessments fair and helped know where you are	2	3	3
Does the unit help you learn science	2	3	3
Would you recommend these materials	3	4	2

Comments to Note:

- CS**:** Overall the students felt that the unit felt the same as what they already do. They hadn't noticed that anything was different. They think that the overall style of having a phenomenon and answering the question along the way works fine. They could recite the phenomenon verbatim and were very clear on what they would be asked to explain. One commented that the phenomena aren't so much puzzling, as they have a "simplistic" current understanding and gain a deeper understanding. They said that they regularly connect back to the phenomenon through students' questions collected on a K-W-L board and through the Idea Journal.
- *Yes. At the beginning I don't know anything, but I like to see where my knowledge is at and how it has changed. Feel good about my learning. That feeling that I learn something new and feel good about it. Makes me feel smarter.*
- *We do revisit our model. Started with a prediction, we were confused. But then we explained it more. Showed more images. We add on. Before we add on we learn a couple of things.*
- *I think it was interesting. I liked the planaria growing its head. Head grew a tale.*
- *Makes sense to have baby question first, then planaria (was a little confusing to set up planaria first) Planaria and baby growing are a little different since you stop feeding*
- *CS:* Overall the feedback was positive. Students overall like learning with phenomena and storylines, and they felt that their teacher does this already. They have mixed feelings about expressing their initial ideas because it's hard to focus on things they don't know yet, but they understood why they were doing them. They really like being able to ask questions about something puzzling: "I like the idea of building a unit off of students' questions."

Student Interview Protocol
Teacher 1
Vendor: Teacher Developed
Unit Name: Genetics - Development

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yes – time to practice by ourselves and see hoe much you know, then talk with group members, then bounce ideas off each other
   Today – practice test, when done can talk to see what was missing
   Asked a question, answer on own, then discuss, then class discussion
2. Is having conversations with your peers something new to this unit or something you regularly do in science?
   Familiar routine
3. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   Yes – sometimes they understand it in a different way that's easier to understand. Sometimes the teacher says it, but the peer says it in a different way
   Sometimes someone may have studied on their own and they know a lot
   Different levels of understand
4. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   A lot of time the phenomenon isn't super puzzling, but our current understanding is simplistic, get a more detailed understanding
   Can identify phenomenon
   Discussions – she'll ask how it relates to the question, like how cellular division connects
5. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   Yes – initial model, K-W-L post-it notes
6. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   Planaria Lab – how it grows after its cut
   Energy and matter processes – like biosynthesis and cellular respiration, mitosis, DNA replication, cell differentiation
   Planaria Lab was interesting, but didn't seem super helpful to explaining phenomenon
   Most helpful is Ms. Coulthard explaining it or reading it
   It's a chance to see it, then teacher is telling us what is really happening
7. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   Yes – DNA replicates, cell does mitosis, cell differentiation, happens over and over again until organs and limbs are made
   Stem cells and cell division
   Planaria are doing same thing – I wonder what differences there are
8. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   Yes we did, somewhat helpful/didn't use it that much, usually my own ideas aren't right, it's helpful to write down the process over and over, but I already think there is enough repetition. It's useful, but everything connects
9. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
   A couple of times – not sure if it was helpful, but it's interesting, it's good to see how much we have progressed, not sure if it was useful
10. Were you able to ask your questions during the unit? To whom did you ask your questions?

Yes – peers or teacher

11. Did your teacher have students share their individual ideas before coming to class "consensus"?
    Yes -described above
12. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?

Yes – assignments that she looks at
Assignments are fair, a mix of both – some general and some deeper thinking
Not sure how much detail

13. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    Yes – very similar to other units
    A little more discussion
14. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    Yes
    Scientists figured it out at some point
    Kind of like scientists, but teacher already knows
    Harder to discover on own
    A little different in middle school
    Teacher explains
15. Would you recommend that we use these materials for ALL students in ____ across the district.
    Yes, seems good. Similar to what we do already.

1. Do you think this is interesting? Why or why not?
2. Explain to me what you're learning in science.
3. How is this science different from the other science you've done?

Curriculum Specialist Impressions and Summary:
4 students chosen by Ms. Coulthard that represent the range of students in her class. Two students were more talkative than the other two. Our time was limited because we had to meet during Rider TIME (20 minute study hall) and there were loud announcements at the beginning.

Overall the students felt that the unit felt the same as what they already do. They hadn't noticed that anything was different. They think that the overall style of having a phenomenon and answering the question along the way works fine. They could recite the phenomenon verbatim and were very clear on what they would be asked to explain. One commented that the phenomena aren't so much puzzling, as they have a "simplistic" current understanding and gain a deeper understanding. They said that they regularly connect back to the phenomenon through students' questions collected on a K-W-L board and through the Idea Journal. They weren't sure that the Idea Journal was useful, but they understood why their teacher asked them to do Idea Journal entries to summarize their growing understanding. The students were more enthusiastic about the value of talking with their peers to understand ideas. They said that peers can explain things in a different way than the teacher. The cited a familiar routine of individual think time, small group discussion, and whole class discussion.

Student Interview
Teacher 2
Vendor: Teacher Developed
Unit Name: Development

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
    a. *Yes. We work together in groups. We had this paper, where each partner worked on it. After we learned a lot of things about it. Initial model with peers that we revisited.*
    b. *Tracking tool, we do what we can by ourself, she gives us feedback, sometime we talk to our peers about it. We ask each other questions.*
2. Is having conversations with your peers something new to this unit or something you regularly do in science?
    a. *Kinda more comfortable. Talking to the teacher can be intimidating. Peers is a lot easier and I feel more confident.*
    b. *I like it because you can show you thinking and other people give you feedback. Table group talk helps me understand it more.*
    c. *Sometimes I get confused and my group helps summarize and get more ideas*
    d. *Helpful to hear ideas I never thought about.*
    e. *We were discussing cell division and my peer helped explain the steps. Sometimes I can learn from my peers.*
    f. *Sometimes people are confused and we worked it out. We had to put it in more details.*
3. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
    a. *See above.*
4. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
    a. *How can a single cell turn in to a multicellular.*
    b. *Planaria too. This is when we figure out cell division. We learned that the planaria can differentiate. DNA*
5. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
    a. *Yes. I don't know anything, but I like to see where my knowledge is at and how it has changed. Feel good about my learning.*
    b. *That feeling that I learn something new and feel good about it. Makes me feel smarter.*
6. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
    a. *When we cut the planaria it was very engaging. We did some physical things. We learned that over time it regenerated through cell division. We observed and watched the growth. It connects that all organisms divide.*
    b. *Card sorting. Pictures of cells, what is expressed. We sorted what we thought cell divisions worked and by doing that we communicated to our group and saw what we thought. Ms Craig put the actual order on the board. Showed how two cells can be made from one cell.*
    c. *DNA model. Helped us understand DNA replication. Helped us visual the actual process*
    d. *Expressed and not expressed matching. Each cell has a different job. Cell differentiation.*
        i. *Learn the vocab after the concept.*
7. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
    a. *See above*

8. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
    a. *It helps organize your thoughts and explanations. Helps me keep track.*
    b. *Shows you where you are at in the lesson. And you get to ask questions*
    c. *She gives us feedback. Helps me track my progress so I can get help along the way.*
9. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
    a. *We do revisit our model. Started with a prediction, we were confused. But then we explained it more. Showed more images.*
    b. *Helps us study.*
    c. *We add on. Before we add on we learn a couple of things.*
10. Were you able to ask your questions during the unit? To whom did you ask your questions?
    a. *Teacher and my friends, ask my table mates. I know my friends and they can help me. They can help me quicker. They can describe it easily.*
    b. *When I am the explainer, I can learn and makes me feel good.*
11. Did your teacher have students share their individual ideas before coming to class "consensus"?
    a. *Helps if you didn't understand, the other groups explain.*
    b. *Visual learning shows more and I understand more it makes more sense.*
    c. *Picture helps me explain.*
    d. *Sometimes readings are complicated so I use the picture to process my thoughts.*
12. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    a. *Learning tracking tool*
    b. *Group post it notes with questions*
    c. *Driving Question board is helpful.*
        i. *At the end of the unit my questing are not always answered.*
    d. *Assessments are fair. I feel that I was exposed to those ideas.*
13. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    a. *Learning how organisms develop*
    b. *Well organized.*
    c. *Similar to the animal and plants unit. Helpful as a learner because I want the best for my learning. Helps to go back to what we did in the beginning.*
14. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    a. *I think it was interesting. I liked the planaria growing its head. Head grew a tale.*
15. Would you recommend that we use these materials for ALL students in ____ across the district.
    a. *All 4 say yes!*

Student Interview Protocol
Teacher 3
Vendor: Teacher Developed
Unit Name: Genetics - Development

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yeah, it's more been entire class discussion, but sometimes. It's more about the group – some groups talk more or less.
1. Is having conversations with your peers something new to this unit or something you regularly do in science?
   Regularly – with this unit I can't tell if it's good because it's a new thing or because our teacher is good.
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   Yes – Earlier in class I asked about what certain things meant and which proteins were being used. I ask questions a lot and that helps. Peers are physically closer. The thinking about it can be more straightforward because we're both learning it. More casual.
3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   How one cell turns into a baby
   My middle school had similar approach. It's been slightly less clear how it connects – in the background.
   Planaria threw us off – not sure how those come into play
   It is a good example, for me not really helpful – I understand why, but for me personally I think it would be helpful if it was clearer, I like it because it brings up so many questions – initial ideas, that's really complex that totally doesn't make sense, "I like the idea of building a unit off of students' questions."
   I like the overarching question because it's going back to what we all know, but we go deeper into that in this class and I feel like that's a good direction.
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   Yes – see above.
5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   Evidence – planaria growth, mitosis activity, DNA replication model
   Yes, will help – cell division, more questions about how planaria's bodies work
   Makes sense to have baby question first, then planaria (was a little confusing to set up planaria first)
   Planaria and baby growing are a little different since you stop feeding
6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   I thought we were in a different unit now, but snow days contribute
   LTT helps, I personally don't use it
7. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   See above
8. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
   Yes – No, I hated doing that and we haven't gone back. An exercise in pain and misery because we don't know yet, prefer asking question
9. Were you able to ask your questions during the unit? To whom did you ask your questions?
   Yes – lots of questions
   Entire class got to write on sticky notes
   To teacher
10. Did your teacher have students share their individual ideas before coming to class "consensus"?
    Haven't done it yet, but do it with whiteboards
    Discussion
    Not sure for this unit
11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?

Warm Ups – good questions

12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    Yes – learning new ideas, maybe a few too many at once
    Fast paced – not in-depth, frustrating for students who want more
    It's helpful to ask teacher questions
    There's a lot to get through
    Organization – fine, a bit fast, more time
    Compare to other units – Appreciate no computer tests, some like, organization is the same
13. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    Yes! Excited for genetics!
    I think the broader concepts yes, but activities no
    Steps are similar but process is different, which makes sense
14. Would you recommend that we use these materials for ALL students in ____ across the district.
    Yes, think it's good
    I hated MS Science
    Not knowing what the alternatives are

    I think it would have been interesting to have an essential question in climate change – would have liked to do more on environmental justice, etc. Need phenomenon.

Curriculum Specialist Impressions and Summary:
Not the most diverse group – mostly high-performing students, but teacher identified them as reflective.

Overall the feedback was positive. Students overall like learning with phenomena and storylines, and they felt that their teacher does this already. They have mixed feelings about expressing their initial ideas because it's hard to focus on things they don't know yet, but they understood why they were doing them. They really like being able to ask questions about something puzzling: "I like the idea of building a unit off of students' questions." They enjoy working together in small groups, Students felt that the unit felt fast-paced and some wanted more depth on topics that they found interesting.

Attachment I.4
CHEMISTRY A: TEACHER DEVELOPED
SUMMARY OF EVIDENCE GATHERED DURING TEACHER OBSERVATION AND INTERVIEW
UNIT: PERIODIC TABLE

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3	Teacher 4
SEP attended to within the unit	-	3	3	3
Phenomenon				
• Presence of	4	4	4	4
• Revisiting	3	4	3	3
• Engaging	3	4	3	4
Evidence Gathered				
• Multiple types	4	4	4	4
• Student engagement	3	4	3	3
Student Discourse for sense-making	3	3	3	4
Students tracking their progress (self-assessment)	-	2	-	3
Student Explanations	3	-	2	-
Usefulness of Materials	3	3	3	3

Comments to Note:

Teacher 1:

- Students have opportunity to discuss & make sense, built in, they're asked to apply understanding as part of the sense making. There's a variety of different engagements, sims, tactile, wet lab-ish.

Teacher 2:

- How each lesson is connected together and how they bridge. The order makes sense. Makes sense at each point to developing the story. Activities are broken down really well, with goals and makes sense.
- A lot of the evidence is around the use and rules of the model. Charge, mass and stability. Use it to model what the particles look like. Use scientific evidence when they look at historical models. Videos

Teacher 3:

- Felt successful to take cards away and resort on second. Could see patterns more clearly the second day. Every kid participated. I was shocked. They really have to talk and argue.
- This is really a lot more fun to teach than I thought it was going to be. I just don't love chemistry. Yea. I like the flow so far. The lessons seem to build on one another without being repetitive. I think that's what I like the most.

Teacher 4:

- Student talk and engagement was very high. Getting the main theme that nuclei can change went really well (with some prompting). Successful because it generated a lot of questions from students and some kids having an AHA moment of understanding.
- The game went well, the candy lab was really helpful in understanding the complicated mathematical thinking about average atomic mass (isotopes). The game was really appropriate for them because they love playing games and everyone was involved and had a turn. At the point they were starting to run the game out at their table it was time for the analysis questions, perfect timing.

***Field Test* Classroom Observation**

Teacher #1
Vendor: Chem A Teacher Developed
Unit: Mole

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful? Try makes me feel like I've never done it before, routine, timing flexible.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson? Yes
3. Was there something that you would have liked to see that didn't happen? More voices
4. What are your comments on the materials that you used today/ this week? Defining elements, hard to use the discourse strategies suggested, didn't see the connection. Felt clunky & forced.

Overall:

5. What are your students understanding or not understanding? Understand basics of an atom; phen, don't understand why to do things this way, this connection. Why take this long path, why not learn concept & move on.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic? What connections about PT help explain how penny turns from Cu to Au.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered? See ST note, yes last column is making sense. They came up w/ things I hadn't thought of.
8. Have student to student discussions focused on sense-making around evidence collected? Always
9. How would you rate the explanations student generate using the tools from this unit? Good, definitely.
10. Is there anything that we should know that I haven't asked you? Students have opportunity to discuss & make sense, built in, they're asked to apply understanding as part of the sense making. There's a variety of different things, sim. Tactile, wet lab-ish. In only three lessons.

Field Test Classroom Observation

Teacher: #2
Vendor: Teacher Developed
Unit: Periodic Table

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
    a. How each lesson is connected together and how they bridge. The order makes sense. Makes sense at each point to developing the story.
    b. Activities are broken down really well, with goals and makes sense. Quizzed them on each part.
    c. Nuclear quest board game, bridges and helps them answer the model. Hands on activity. Tech included
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
    a. Yes. Scaffolded really well. Have them reference prior assignments to answer the question.
3. Was there something that you would have liked to see that didn't happen?
    a. Don't like the summary table. Too focused on phenomenon. Needs to focus more on summarizing. No periodic table suggested. Have more accommodated versions would be helpful (lines, language)
    b. Good extra links for videos.
    c. Framed the PHeT. We are using the model.
4. What are your comments on the materials that you used today/ this week?
    a. Like the schoology. Has what I need. One thing I would change is cutesy names.

Overall:

5. What are your students understanding or not understanding?
    a. Firm understanding of how to use the simple atomic model and periodic table. Still struggling with the vocab. I need to help them confirm the vocab.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
    a. Not far enough in the unit again. The summary table tries but there are not enough tools. The last activity where they revisit will be helpful.
    b. Change to the solid sphere idea
    c. Kids LOVED the penny activity
    d. Initial ideas in this unit are really hard! Better at them because of PEER!
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
    a. A lot of the evidence is around the use and rules of the model. Charge, mass and stability. Use it to model what the particles look like. Use scientific evidence when they look at historical models. Videos.
8. Have student to student discussions focused on sense-making around evidence collected?
    a. Snow days has made it hard. Idea coaching is in there.
9. How would you rate the explanations student generate using the tools from this unit?
    a. Get back to me on this.
10. Is there anything that we should know that I haven't asked you?
    a. Not that I can think of.

***Field Test* Classroom Observation**

Teacher: #3
Vendor: Teacher Developed
Unit: Periodic Table

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   S had the manipulative right in front of them. Felt successful to take cards away and resort on second. Could see patterns more clearly the second day. Every kid participated. I was shocked. They really have to talk and argue.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
   Mostly. I uncovered how best to guide them towards better organization. The suggestions weren't in the teacher materials but there were ways to move them towards the patterns without telling them.
3. Was there something that you would have liked to see that didn't happen?
   They reached their objective. They had not idea what the pegs were. Could have used some scene setting. These are the elements that were in Medeleevs time and here's what was known about them. What if the picture was not central and the properties were central on the card?
4. What are your comments on the materials that you used today/ this week?
   They are great.
   Copying and cutting what a big fat pain in the butt. And expensive for color.

Overall:

5. What are your students understanding or not understanding?
   Understanding- the periodic table is organized to tell us properties of different elements
   Not- the things that give it the properties is the valence electrons. And to combine and take apart protons takes tremendous energy. Theoretically, nuclear quest (next lesson) will teach them that.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
   Yes, definitely. I'm a little worried that the final explanation is that it is an alloy that there will be some rebellion. They'll be sad and frustrated that the final explanation relies on something they can not explain. They won't know about brass.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   What counts as evidence… they made sense of the phet simulation, the periodic table organization (every group got the cards organized). Yes they make sense of it. A lot of kids have said they like the chemistry way more than the physics. They like having bigger ideas to work with.
8. Have student to student discussions focused on sense-making around evidence collected?
   Well yes, during the phet sim, like why did the charge go up. What happened?!
9. How would you rate the explanations student generate using the tools from this unit?
   I don't know yet. They are already saying… they start to notice that the atomic mass of copper and zn is NOT the atomic mass of gold. That is definitely where we need to be going.
10. Is there anything that we should know that I haven't asked you?
    This is really a lot more fun to teach than I thought it was going to be. I just don't love chemistry. Yea. I like the flow so far. The lessons seem to build on one another without being repetitive. I think that's what I like the most.

    I'm still struggling on how to differentiate up and down.

SECTION 4: Curriculum Lead's Reflections

Curriculum provides teacher support to teach the majority of her students but does not provide significant differentiate support up and down.

Lesson engaged students to talk and participate. The level of difficulty was appropriate for these students.

Lessons link together and are not repetitive.

***Field Test* Classroom Observation**

Teacher: #4
Vendor: Teacher Developed Materials
Unit: Periodic Table

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   Student talk and engagement was very high. Getting the main theme that nuclei can change went really well (with some prompting). Successful because it generated a lot of questions from students and some kids having an AHA moment of understanding.
2. Was there something that you would have liked to see that didn't happen?
   I expected them to translate their work to the phenomena but needed more scaffolding that I expected.
3. What are your comments on the materials that you used today/ this week?
   The game went well, the candy lab was really helpful in understanding the complicated mathematical thinking about average atomic mass (isotopes). The game was really appropriate for them because they love playing games and everyone was involved and had a turn. At the point they were starting to run the game out at their table it was time for the analysis questions, perfect timing.

Overall:

4. What are your students understanding or not understanding? Understand that elements can change due to their nuceli changing, they are not understanding how it relates back to their question about the penny (their phenomena).
5. How have your students engaged with the phenomena? Has this phenomenon helped them to expand their thinking about this topic? They have been challenged by it. They reflect and revisit by using the LTT. They add evidence from their experiences to the phenomenon.
6. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   Evidence – patterns on periodic table, what defines and element, simulation what makes up an element
   They have been pretty good about using evidence to attempt to explain phenomenon but not good about explaining it fully because they are not there yet.
7. Have student to student discussions focused on discussing evidence to substantiate their claims?
   Student talk about evidence when they reflect on their experiences in the LTT
8. How would you rate the explanations student can generate using the tools from this unit? All the right pieces are there but they need more support to create a step by step explanations, the idea coaching is going well but they need more discussions to build consensus.

9. Is there anything that we should know that I haven't asked you?

No, this is the first unit so its many tools are new to students, it has taken more time.

SECTION 4: Curriculum Lead's Reflections

Overall engagement and participation from students were high while they discussed their learning tracking tool and played the nuclear reaction game. During the whole group discussions there was a mix of student-student interactions AND student-teacher interactions. In discussions and check-in with the groups there were a lot of probing questions to think deeper about the work they are doing and how it relates to the phenomena. The students appeared comfortable with the learning tracking tool to track data and were filling it out with their lab tables. Also it was noticeable that there was a safe and positive vibe to the learning environment, students were held to high expectations for their time together and was accountable for their work. The instructional materials seemed to play a role in the engagement, discussions of evidence through learning tracking tool and the specific instructions to the game they played.

CHEMISTRY A: TEACHER DEVELOPED
SUMMARY OF EVIDENCE GATHERED DURING STUDENT INTERVIEW
UNIT: PERIODIC TABLE

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3	Teacher 4
Discourse for sense-making	3	3	3	3
Consensus building	3	3	3	3
Phenomenon present and helpful	3	3	3	3
Elicitation / Initial Model	3	3	3	3
Evidence helped understand the phenomenon	3	3	3	3
Way to track ideas through the unit	3	3	3	3
Assessments fair and helped know where you are	3	3	3	3
Does the unit help you learn science	3	3	3	3
Would you recommend these materials	3	3	3	3

Comments to Note:

- *Yes, a lot of grp work, a lot of talk, in tables. If we don't know, we can ask. During labs, everyone in table is critical to success in lab & safety; if you don't participate, work doesn't get done. Curriculum depends on communication between students.*
- *With me, I don't learn as fast as others, so others help me understand the ideas and they respect my ideas and are patient with me.*
- *Sometimes kids ask me questions that I didn't think of. It helps me think of things I did not think about before.*
- *She kind of helped us but we kinda figured it out ourselves it was fun and interesting. It is mostly group based. We like that in that class.*
- CS: Students showed great trust in their teacher and the progression of the unit. They understood that they were in the middle of a learning cycle and would reach full understanding at the end.
- *Yes, it is a good way because right now I don't know how it all works together but I feel like I am making progress. It is helpful to have something to make sense about, so I can make my own connection. Everyone struggles a bit together to figure something out so it is nice to know you are not alone.*
- *I like the tracking tool because I really understand the main points of the lesson and know what is coming next.*
- CS: It was interesting at one point a student really went into how she doesn't really understand what is going on right now, but it was okay not to know because she was learning it and figuring it out.

Student Interview
Teacher 1
Vendor: Teacher Developed
Unit Name: Periodic Table

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain. *Yes, a lot of grp work, a lot of talk, in tables. If we don't know, we can ask. During labs, everyone in table is critical to success in lab & safety; if you don't participate, work doesn't get done. Is it the unit or teacher? Little bit of both. Curriculum depends on communication btwen students. A lot of steps in labs , easy to understand.*
2. Is having conversations with your peers something new to this unit or something you regularly do in science? *Regularly do*.
3. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not? *Definitely, 100% one-2 know everything. But coming up w/ ideas from others. Interesting to see how others see things work, of why things happen. Talking in your groups help me form ideas.*
4. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas? *Yes, turning penny color change, how did it happen. Started talking about what they thought was happening.*
5. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic? *Yes, did lab w/ initial ideas charts. No previous knowledge of PT, just guessing.*
6. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? *Explain reactivity of specific elements, how they compare to ea other, figuring out how PT works, how it's organized. How EPN mixed together to make atoms. All this help start us, brings us closer. Didn't know 3 were similar until now.*
7. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me? *Yes, when penny changing we looked at 3 diff element for similarities, all malleable,*
8. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so? *ST helpful, can look back to it, esp at end, can understand what we're doing. You can get disorganized, nice to have one page with the big ideas.*
9. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful? *Yes, and initial ideas. Cool to do initial and see how wrong you are. So much more detail to my answer. Use to see our thinking. Good way to get an idea out there and look at it.*
10. Were you able to ask your questions during the unit? To whom did you ask your questions? *Yes, to everyone. Specific assignment: teacher; what we think, at table then it turns into a big conversation.*
11. Did your teacher have students share their individual ideas before coming to class "consensus"? *Yes, that's what we do w/ summary chart. White board grp idea for collaborative discussion.*
12. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky? *Yes, white boards, present to class, make sure everyone agrees. Reviewed the PENM. Simple questions but open ended.*
13. Did this unit help you learn science ideas? *Yes* Did you like the way it was organized? *Straight forward so far.* How is it different/the same as other units you have done? *Not too diff, does add a bit more; read and talk about ea others ideas, easier to come up w/ ideas. Hard to know, it's a whole diff subject.*
14. Do you think this unit is interesting? *Yes* Do you think this is the kind of work that scientists do? Explain. *Yes; candy lab geared to kids but ideas are serious*.
15. Would you recommend that we use these materials for ALL students in ____ across the district. *Yes*. Did it actually change elements? *Similar but completely diff, learning the basics so we can fully understand what's happening!*

Student Interview Protocol
Teacher 2
Unit Name: The Atom by _____ Vendor
School:
Date:
Time:
Students First Names: Thomas, Nahal, Francis, Kyra
Preparation for Interview *Before you start, explain to the students that we are in an instructional materials adoption and an important part of learning about these materials is to see how they work for students. Share with the students that you are grateful to them that they will help you to learn more about how this unit looks for students. Tell them that their comments are not used to evaluate their teacher or them as students. The data is simply to help us know about the materials. Ask if they have any questions. Tell them you would like to record their answers, so you make sure you don't miss anything. Ask if that is OK?*
As an interviewer, it may be useful to ask clarifying and follow-up questions to the student that are unscripted in order to fully investigate their thinking. Examples of good questions are "what do you mean by that?" "Could you summarize that answer for me again?"

Choose a setting with little distraction.

Sample Questions (feel free to modify as the students begin to talk)

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
    a. *YES. Actually yesterday we were doing a really fun game. We had to figure out the meaning and what to do with them*
    b. *1.5 Isotopes, what we did 2 things before the board game, that was fun, we had to find the number o neutrons. A different standard for AMU. So we had to work out the math problem with this. That made it interesting*
2. Is having conversations with your peers something new to this unit or something you regularly do in science?
    a. *Regally to this Every time we do a model we need to talk. We create group model and consensus conversations we work as group and then as a class. Everybody has their own model and then we lay them out to create a final model.*
3. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
    a. *Yes, when I am confused I like someone's else ideas. I have initial ideas but I like to hear others ideas and hear how it works with the model*
    b. *When you are talking in a group. YOU might be missing something and someone else might be able to add*
    c. *With me, I don't learn as fast as others, so others help me understand the ideas and they respect my ideas and are patient with me.*
4. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
    a. *Penny into gold.*
    b. *We start to think about how the penny turns to gold. But then we learn step by step to see what is happening.*
    c. *For the past unit, the phenomena*
    d. *Something to build and work toward as you do each section to keep adding things to figure out what is going on.*
5. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?

    a. *We always give our initial ideas*
    b. *Sometime that is frustrating because I don't know and it is a guess. I see why we do this.*
    c. *Initial ideas help me start working what is in my mind.*
    d. *We revisit those ideas. Around mid way we relate to what we did originally.*
    e. *We change our model.*
    f. *In this unit we are using a model not making our own*
6. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
    a. *Very beginning the learning tracking tool. That was super helpful*
    b. *Planning the game/simulation over and over. Need to get 100% before moving on. So helpful.*
    c. *Simulation. The more protons the element would change. Electrons show some kind of charge going on.*
    d. *We made our own definitions. Better than googling it.*
    e. *Make the definition for isotope, showing stable and unstable.*
    f. *SPED student: You can see and go back when you are confused. Tools that I can use throughout the semester.*
7. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
    a. *Yes because each time it adds something differently in a different way and apply it to the phenomenon*
    b. *SPED: Sometimes the words are confusing. The summary table helps a lot . Helps you go back.*
8. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
    a. *This time the summary table is too structured. I liked it was more open.*
    b. *SPED: I like the ones with sentence starters, that is the one he gives me.*
9. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
    a. *Yes drawing and symbols and rules are included. Yes it is helpful, so far*
10. Were you able to ask your questions during the unit? To whom did you ask your questions?
    a. *We ask each other. The teacher asks a question right back, I have to figure it out.*
    b. *SPED: this new unit is very confusing. The teacher asking question back. Sometimes I ask my peers but it is still confusing. Sometimes I come in for tutoring. Maybe we could have other students help with tutoring.*
        i. *Honors students can get extra points to help tutor.*
    c. *Sometimes kids ask me questions that I didn't think of. It helps me think of things I did not think about before.*
11. Did your teacher have students share their individual ideas before coming to class "consensus"?
    a. *We draw a model, each group, group model. Put it in the middle of the classroom, the whole class would see the one that makes the most sense*
    b. *Other times we pick sides on claims and try to convince each other about our claim*
        i. *3 parts, evidence, reasoning and model*
    c. *Sometimes we don't come to consensus but rather conclusions.*
    d. *You have to say if you agree or disagree and why.*
    e. *We can go back and change our model.*
12. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    a. *Yes. Sometimes he makes up exit ticket on the spot.*
    b. *He asks questions during the class when he walks around. He makes sure everyone is on task and getting the information we are supposed to.*

c. *If you don't pass the test you keep taking it until you pass. You have to take the mastery quiz every day until you pass. This is very fair.*
d. *We can come in after school to get help. Students also need to take the initiative to come*
e. *He goes over the questions but doesn't give you the answers.*

13. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    a. *Last semester, I was so confused with the magnetism. New rules every day. This unit the rules have stuck.*
    b. *Pretty organized from the model we are doing. All of the rules are laid out for us. We are basically trying to understand.*
    c. *SPED: Sometimes the words are hard. Sometimes it is too much. Heavy with vocab. We learn really fast. Hard to ask questions in front of everyone. Vocab paper.*
    d. *Sometimes he makes broken down version and I don't need it. They are doing something different.*
14. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    a. *Yes it is interesting.*
    b. *Yes scientists do this on a larger scale. More in depth. We are just learning the rules and just going through it. They know how to use the periodic table.*
    c. *Why don't people like you come for other subjects. I have a lot to say especially in history.*
    d. *Share ideas, consensus, initial model (they have to start with something) collect evidence.*
15. Would you recommend that we use these materials for ALL students in ____ across the district.
    a. *Stamps are too many points. 30% of our grade. Sometimes kids copy and don't do the work.*
    b. *Grading on the final test only would be scary. Because we need something to balance it out. All the work I did should count for something.*
    c. *3 yes. SPED no (too hard). Easier to follow so everyone can work together.*

Student Interview Protocol
Teacher 3
Vendor: Teacher Developed
Unit Name: The Atom

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yes, a lot. You have to work together more.
   We discuss with groups after everything we do and we talk to the whole class about it. We do labs and card sort. Making the periodic table but you don't know what it looks like.
   a. Is having conversations with your peers something new to this unit or something you regularly do in science?
      Normally. Well in her class. Not last year. It was all computer stuff (8th grade Denny)

2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   Yes, sometimes. You don't know and you guess, but sometimes you don't work together. Share with your partners but you don't come up with it together. It depends who is in your group.
   Yes, I don't dislike hearing ideas. It helps and you can build upon your ideas. It helps you find a new idea or reassure an idea you already had.

3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   Yes, how did a penny turn gold. I'm still so confused.
   Yes, how molecules change. Protons and such.

4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   Yes, no one knew wat to say. Maybe a chemical reaction between the zinc. We still don't really know. But we are getting there.
5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   We know what protons neutrons and electrons are. We know where metals are, we know what determines the placement on the periodic table.
   we will be able to piece things together.

6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   Yes. At first we build and atom and what goes into atoms. Then what elements are on the periodic table. Penny is made of copper. There's silver and gold which are other elements. Now we know what makes an element an elements. They are all different elements. But we don't know how copper turned into different elements.
7. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   Yes, yes after each lesson. We can write what ever for a test. And you write the things you learn at the end of a lesson so you don't have to remember all the way back.
8. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
   Yes, recently after the card sort. We still couldn't figure out what happen but we know they are all in the same row so that probably has something to do with it.
9. Were you able to ask your questions during the unit? To whom did you ask your questions?
   Teacher, and Indy. Friends.
10. Did your teacher have students share their individual ideas before coming to class "consensus"?
    Yes, always.
11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    Yes, in group work. Check that we are understanding by talking and checking worksheets. Give you hints.

12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    Yes, yes, less tests, same because group work and organizing charts.
13. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    Yes. Yes. Watched this video about an old scientist guy and what makes and element and element. And the place on the periodic table. we figured out Ge on the periodic table. we were right.

14. Would you recommend that we use these materials for ALL students in ____ across the district.

Yes, it is easier for us. Ms. X is a really good teacher. Even without Ms. X it's a fun unit. It is explanatory. Even the card sort. She didn't really tell us. She kind of helped us but we kinda figured it out ourselves it was fun and interesting. It is mostly group based. We like that in that class.

Curriculum Specialist Impressions and Summary:
Students showed great trust in their teacher and the progression of the unit. They understood that they were in the middle of a learning cycle and would reach full understanding at the end.

They expressed their enjoyment of the lessons and a willingness to 'figure it out' rather than being told.

Student Interview
Teacher 4
Vendor: Teacher Developed
Unit: Periodic Table

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   We do a lot of small group work, allows us to talk to each other and if we encounter a problem we can check in with each other. We like that we have time to explain to a partner and share ideas.
2. Is having conversations with your peers something new to this unit or something you regularly do in science?
   This year in science we talk more that previous science class, we do a lot of explaining to each other, in previous science classes we did a lab and the teacher told us what to know. We now explain to each other rather than the teacher explaining to us, we go over a lot of the materials together make sure we really understand the materials
1. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   It is helpful because we do a lot of check ins with our table and sometimes we don't know or understand but usually someone at the table knows and understands what is going on, we can have more of a conversation to understands what is happening rather than the teacher tell us. Then when we have big group we have an idea what is going on and can make sense of what is going on way better.
2. Did the unit have a clear phenomenon (you might need to explain what you mean by a phenomena)? Yes, can we turn copper penny to gold?
3. Does a phenomenon help you *understand* the science ideas by giving you a reason to study the science? *Yes, it is a good way because right now I don't know how it all works together but I feel like I am making progress. It is helpful to have something to make sense about, so I can make my own connection. Everyone struggles a bit together to figure something out so it is nice to know you are not alone.*
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomena even before you began studying the topic?

Yes, but we didn't know anything.

5. What kinds of evidence have you gathered in this unit? Did that evidence help you answer the unit question? Explain

Evidence – we have done labs and games to determine what was happening and how it relates back to the phenomena. The game was helpful to collect evidence on what happens to atoms over time, simulation helped us build an atom in a very visual way, calculate average atomic mass using candy.

6. Did the lessons link together to help you explain the phenomena? Do you think you can explain it to me? *Yes, they flowed well and we have been reflecting along the way*.
7. Were you able to ask questions to get clarification during the unit? To whom did you ask your questions? *Yes, if the questions relates to the unit she will support us. Sometimes questions are not relevant, and she tells us that we will learn later.*
8. Did your teacher have students share their different ideas before coming to class consensus?

We talk as small groups and sometimes we share all our ideas as a class to hear if we have similar ideas, more at the end of the unit as we have more common ideas.

9. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky? *She moves around the room and asks questions to each group. Assessment questions were hard.*
10. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?

I like the tracking tool because I really understand the main points of the lesson and know what is coming next. Lots of individual group work, less whole class work in this unit. Lots of check ins from teacher is helpful, entry tickets are helpful to know what I need to know or will need to know.

The teacher can really make the difference in my understanding if they make more time to check in with us and let us talk together.

Curriculum Specialist Impressions and Summary:

Overall, I noticed students seemed to value the discourse and the opportunity to figure out how something works together, rather than the teacher gives them the answer. The smaller conversations at the table to discuss ideas were just as important to them as the large group discussions. It was interesting at one point a student really went into how she doesn't really understand what is going on right now, but it was okay not to know because she was learning it and figuring it out. This was an incredible statement and mindset for a 7th grade student. The classroom seemed very safe to be in a learning mode and not have all the right answers. Of course, there is a time for the right answers but during the learning stage it was okay to struggle a bit. The teacher mentioned that they were at the end of the unit, but students seemed to think there was a lot more info they needed to learn, they were on the verge of their final pieces of their learning tracking tool. They appreciated the tool to identify where they have been and what else they needed to know to answer the questions.

CHEMISTRY A: STEMScopes
SUMMARY OF EVIDENCE GATHERED DURING TEACHER OBSERVATION AND INTERVIEW
UNIT: PERIODIC TABLE

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3	Teacher 4
SEP attended to within the unit	2	3	3	2
Phenomenon				
• Presence of	1	1	2	1
• Revisiting	1	1	1	1
• Engaging	1	1	1	1
Evidence Gathered				
• Multiple types	3	2	2	2
• Student engagement	2	2	1	1
Student Discourse for sense-making	2	3	1	2
Students tracking their progress (self-assessment)	-	-	-	-
Student Explanations	2	2	1	1
Usefulness of Materials	1	1	1	2

Comments to Note:

Teacher 1:

- There's so much teachers need to say that is not in the curriculum. In let's organize, it tells teachers to point out electron cloud, valence electrons, groups, periods…. Really hard to plan lessons because it is hard for me to support the students just from me saying it, they are not going to get it.
- Group work and dialogue is really important. Dialogue without any visuals is really challenging. The video is the only place for me to use and explain. What looks like a short video is just a lot of teaching.
- It is designed for a teacher with strong chemistry background. The bonding lesson, I had to ask colleagues what will bond. If we purchase, we need it to work for general science teachers. I need more support than "tell kids with will make metallic bonds.' It goes into really basic accommodations (wait time and how to cut up and package cards)

Teacher 2:

- No discussion of ions vs atoms, no description of what they should be looking for when building an atom, no discussion of why neutrons were necessary. Questions were factual recall. Did not push curiosity or concept building.
- From the outset, a lot of the materials had massive assumptions that kids had a lot more prior knowledge. This was not made obvious from the SS materials. No indication of prior knowledge that was needed. Confusion carried through the unit.
- The overall structure of the website is difficult for both teachers and students. Options for giving students access to resources is very limited. Grading on the website is absolutely infuriating.

Teacher 3:

- There are no formative assessments. They questions are vague and confusing, the PPT doesn't align with the video and written instructions.
- This is not ready to be put in front of kids. It is a grab bag of activities, there's no storyline even the pacing guide. Formative assessment = "ask students to explain what they learned" Pacing guide is very general and follows the 5 Es but under (example) Explain, gives teacher no guidance to which of the Explain activities to use. Assumes a lot of prior knowledge. Shiny objects! On the surface, it looks complete. But the system is hard to navigate. Students had a hard time navigating and requires 1 to 1 tech.

Teacher 4:

- I would not use this as presented again. The questions were wildly difficult, and the students never come back to some of the new concepts in any future follow up activities. I am going to have to reteach a lot of this stuff in the next unit.
- Honestly, my students are all over the place in terms of their understanding. There is such little meaningful assessment both for me or for them, so it can be hard to tell, but so far I know that I will have to reteach some of this next unit.
- I honestly don't believe this curriculum was public ready. It is missing so much that it is shocking. The content leaves a lot for me to fill in (when instructed to) which isn't really the point of a premade curriculum. There are only a few activities for the whole unit and each has been problematic. I love the interface though.

***Field Test* Classroom Observation**

Teacher: #1
Vendor: STEMScopes
Unit: Periodic table and element structure

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   Helpful to have point of reference. Gives them an organized way to organize their notes. Previously we would give an existing periodic table. this blank one allows for drawing orbitals and highlighting metals etc. and vocab words
   The video we could see similarities in the video and the card sort we did.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
   No, somewhat out of my element. Graphic organizer has an answer key is not aligned to the things kids need to know for the lesson. Had metals and non metals but not groups which needed to be clarified. It labeled groups differently in the video and in the explore activity. 1-18 vs a/b set up. Needed pause points in the video where to do the
   As a packaged curriculum I want to know when the graphic organizer is appropriate.
   The video has inaccuracies. There are elements considered metals and metalloids.
   Video was in the robot voice. Much less accessible, kids make fun of the voice. And it makes a jokes about science is boring. Card sort is dependent on color and we don't have the money for color copies.
   The baseline concepts: abbreviations, how to read a periodic table. seems designed for students that have baseline understanding.
3. Was there something that you would have liked to see that didn't happen?
   There are 3 online questions. There was trickiness with the logistics of computers.
   3rd question of drawing a magnesium atom, they could figure out the logistics of drawing.
   Letting the students see a real periodic table. they don't know about magnesium, they have to see it to draw it. We have not given them a periodic table.
4. What are your comments on the materials that you used today/ this week?
   It took a lot longer for the 10 minute video for the card sort and explaining. There's so much teachers need to say that is not in the curriculum. In let's organize, it tells teachers to point out electron cloud, valence electrons, groups, periods…. Really hard to plan lessons because it is hard for me to support the students just from me saying it, they are not going to get it.
   Group work and dialogue is really important. Dialogue without any visuals is really challenging. The video is the only place for me to use and explain. What looks like a short video is just a lot of teaching.
   I'm a biology major, but I'm generalizing for 9th grade. It is designed for a teacher with strong chemistry background. The bonding lesson, I had to ask colleagues what will bond. If we purchase, we need it to work for general science teachers. I need more support than "tell kids with will make metallic bonds.' It goes into really basic accommodations (wait time and how to cut up and package cards)

Overall:

5. What are your students understanding or not understanding?
   Not as well as I would like. Better than I expected from giving them so little. Some things, I might want to try again, card sort with atoms and valence electrons, they could tell what to put together. It would be stronger if they knew about the structure of the atom. They don't know what the abbreviations. You don't tell them what bonds are!
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
   Throwing a metal in water and seeing it explode. I found it later.
   Video starts with 'sci is boring' and guys throw stuff in water and explosion. Then a couple of seconds of what an atom looks like. No personal connection, kids are supposed to answer 'how elements are different from each other?'
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   Patterns of atomic radii, not done that yet.
   Evidence on cards is number of orbitals, electrons, protons. They aren't collecting it they are just sorting to make a periodic table and see bond making. At the end they understand that different elements have different electrons in different spots.

They are noticing patterns. They derive the octet rule. Sizes of atoms change where the electrons are and numbers of electrons. I would not like so many card sorts. Needs more scaffolding for sense making.

8. Have student to student discussions focused on sense-making around evidence collected?
   Computer does not support discussion. Questions are low level and stop early in the lesson. So much more that is not asked of students. Does not allow for collaboration.
   Discussion during card sort. But lacking discussion in other lessons. not explaining where the electrons are moving to make a bond. I teach them the charge and group rather than groups talking to learning. Some ambitious students might talk with other students.
9. How would you rate the explanations student generate using the tools from this unit?
   Super basic. Wording lends it to that, yes/no questions. A depth of understand is missing. They don't know what elements are so they can talk in depth about bonds even thought they know the octet rule. They can make meaning out of the patterns if they don't know H is hydrogen.
10. Is there anything that we should know that I haven't asked you?

This is their first chemistry unit. They aren't seeing a shift in practice. They have no grounds to change. Students tend to live in grounds of failure so this does not change that. We are looking for something that allows for them to be super successful. My students are just not going to be very critical of things. They just haven't been in a situation where things come together. Not a criticism of physics curriculum. They don't know how much they should know. Tocchi's class can see a bit more of a shift.

Amal didn't speak in the interview but he was really saying that he hated the video.

SECTION 4: Curriculum Lead's Reflections

Video is inappropriate for students.

Curriculum does not allow more many opportunities to practice foundational skills in chemistry. Curriculum seems to jump quickly to many different concepts.

***Field Test* Classroom Observation**

Teacher: #2
Vendor: STEMScopes
Unit: Periodic Table

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
    a. Heavy teacher lecture day at the beginning to summarize complex ideas from the earlier week. IRE day. Concepts they were expected to get from the previous activity required me to hit a vast amount of facts and concepts. Quickly walk through in a teacher driven way. Time pressure and I think the concepts were too difficult for the kids, they needed this time but I don't like this method. SS said "explain to your kids". I used information from STEMScopes to summarize.
    b. Prescribed to do this without resources.

2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
    See above.
    Second half where kids built an atom. The resource the students were given implied a significant amount of prior knowledge that only 5% of the kids had before the unit. Continued the confusion. Did not bridge the gap for the lack of knowledge.

3. Was there something that you would have liked to see that didn't happen?
    a. Little more guidance and connection to the previous activity. No discussion of ions vs atoms, no description of what they should be looking for when building an atom, no discussion of why neutrons were necessary. Questions were factual recall. Did not push curiosity or concept building.

4. What are your comments on the materials that you used today/ this week?
    a. See above.
    b. From the outset, a lot of the materials had massive assumptions that kids had a lot more prior knowledge. This was not made obvious from the SS materials. No indication of prior knowledge that was needed. Confusion carried through the unit.
    c. It seems that the activities are OK in terms of getting student engaged and organizing things but when you get the explain part there are tons of resources but no breakdown of where and when to use them. Choose your own adventure and not worked in to the series of lessons.
    d. Some differentiation strategies at the bottom but not very integratable.

Overall:

5. What are your students understanding or not understanding?
    a. Understanding of sub atomic particles, their location, ions, how to use the periodic table, some similarities between elements in the same groups.
    b. Not: Having trouble tracking all of these nuances. Nothing on isotopes, but expected to know.

6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
    a. Supposedly a phenomenon, a bundle phenomenon. This scope will not give them the evidence to write a gapless explanation.
    b. The cartoon video was AWEFUL> wasn't sure what I could do it.
    c. Phenomenon was not at all compelling. Cool to watch but could be explained with the reaction without really experience all of the foundational science.

7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
    a. Just scratched the surface on different bonding types. Concept of how Na did in H2O is not apparent.

b. Evidence is weak.
c. One remaining lesson on periodic trends. This will not help them explain the phenomenon.

8. Have student to student discussions focused on sense-making around evidence collected?
   A lot of card sorting and paring that are group activities. These allow then to discuss why they are putting things together based on patterns. Their reasons for changing those pairings, they are able to do. But ultimately, it is me explaining why the pairings work or don't work. A lot of me "I am a teacher and I know all of this and less of me as a facilitator of learning."

9. How would you rate the explanations student generate using the tools from this unit?
   a. They are still very weak. Cannot put things in a complete sentence. Early vocab allows them to hide behind vocab, not deep learning. Superficial explanations. One word answers. When I press they cannot deliver.

10. Is there anything that we should know that I haven't asked you?
    a. The overall structure of the website is difficult for both teachers and students. Options for giving students access to resources is very limited.
    b. Grading on the website is absolutely infuriating. No easy way to do it. Not intuitive. Increased grading time exponentially. I don't know what kids get back even when I look at their screen. Confusion on how to formatively assess.
    c. Being able to give the direct access is important and valuable. But the way I would assign and access were very clunky. Particularly, the click drag function did not work, made it confusing. Assigning resource was in the format as send as an assignment rather than giving it to them as a resource. So it disappears from the folder because they "turned it in". No way of seeing it or recovering it.
    d. We already have an online learning platform. They now need to learn a totally separate online learning system mid-way. A lot of button clicking and getting lost. Not a way to quickly access the resources. Videos restricted even at home.
    e. I have definitely tried to use every single digital assignment either as an assignment or enrichment so they could experience it at its fullest.
    f. One of the activities, trying to put atoms together in terms of their valence, wants us to put together any two metals together. Creates a misconception. Determination of reactivity series is confusing.

***Field Test* Classroom Observation**

Teacher: #3
Vendor: STEM Scopes
Unit: Periodic table and element structure

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   Students persisted well. They kept trying new things. They goal was for them to puzzle through and reason it. They tried different methods. In terms of practice and patterns I saw them using those and that is a good thing.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
   No, I would want to approach each type of bonding separately. The real goal was to infer the octet rule. That somewhat fits but bonding does not fit in the units and the bundle of the Pes. 3 types of bonding at once is problematic. PPT does not follow sequence in video and in written instructions
3. Was there something that you would have liked to see that didn't happen?
   I did make it happen. I would have like instructions that had them just looking for octet rule pairs. Really, in another day for types of bonds. Start with rule then to the instructions.
4. What are your comments on the materials that you used today/ this week?
   Unclear that they should have a periodic table or not. All questions should be on website but I can't do that. There are no formative assessments. They questions are vague and confusing, the PPT doesn't align with the video and written instructions.]
   This is the 3rd card sort

Overall:

5. What are your students understanding or not understanding?
   No opportunities to formatively assess so I don't know.
   Super repetitive on parts of an atom but I've only told them.
   Understand that valence electrons and shells increase across the table. these impact the behavior or elements. But no context.
   Not understand bonding.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
   Phenomenon is sodium in water. Mildly engaging in the moment, haven't returned. Not expand thinking.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   No evidence. We talk about valence electron trends but nothing to connect to phenome or making sense. All memorization.
8. Have student to student discussions focused on sense-making around evidence collected?
   No. sort of in this activity from my yeses and nos. but that feels limited.
9. How would you rate the explanations student generate using the tools from this unit?
   The tool is a periodic table graphic organizer- but I just tell them what to write.
   Before, During, After Instruction Tool.
   Explanations will be… there is no explanation asked of them. The phenomenon is not revisited.
10. Is there anything that we should know that I haven't asked you?
    This is not ready to be put in front of kids. It is a grab bag of activities, there's no storyline even the pacing guide.
    Formative assessment = "ask students to explain what they learned"
    Pacing guide is very general and follows the 5 Es but under (example) Explain, gives teacher no guidance to which of the Explain activities to use.
    No sure if I can incorporate Elaborate earlier.
    Assumes a lot of prior knowledge.
    Shiny objects! On the surface, it looks complete. But the system is hard to navigate. Students had a hard time navigating and requires 1 to 1 tech.
    Could be used to build a unit as a resource but scaffolding and a storyline would need to be build.
    Bonding seems out of place.

SECTION 4: Curriculum Lead's Reflections

This curriculum seems to force the Teacher to be the keeper of the secrets, especially in the lets bond lesson.

Seems that the chunks in this unit are too large, assuming prior knowledge in some places and covering many different topics quickly.

Teacher guidance seems lacking.

Field Test **Classroom Observation**

Teacher: #4
Vendor: STEMScopes
Unit: Periodic Table and Element Structure

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?

   The students were mostly successful in terms of attempting/getting through a largely self-directed exercise. A lot of the kids dove right back in and started working through the second half of the questions/the graph tool.

2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?

   No, the students constantly needed me for technical help with the graph tool, help with questions, and help with instructions. These kids don't normally have any issues following instructions.

3. Was there something that you would have liked to see that didn't happen?

   The students struggled to tie what they were learning to what they previously learned in a meaningful way. There wasn't a lot of opportunity for that. The activity introduced new and rather difficult ideas without much support.

4. What are your comments on the materials that you used today/ this week?

   I would not use this as presented again. The questions were wildly difficult, and the students never come back to some of the new concepts in any future follow up activities. I am going to have to reteach a lot of this stuff in the next unit.

   Also… The instructions don't match the graphing tool! I had to help a lot of kids get past the steps that weren't labeled the same as in their instructions.

Overall:

5. What are your students understanding or not understanding?

   Honestly, my students are all over the place in terms of their understanding. There is such little meaningful assessment both for me or for them, so it can be hard to tell, but so far I know that I will have to reteach some of this next unit.

6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?

   The phenomenon isn't super robust, so there isn't really much to come back to. Once you learn the basics of nucleus/electron cloud the phenomenon makes perfect sense already.

7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?

   The way atoms interact, the trends in atomic structure, trends in atomic radii and electronegativity. For a few of these the only evidence ultimately is me just telling them yes or no though, so it isn't really strong evidence.

8. Have student to student discussions focused on sense-making around evidence collected?

   Yeah, but the explanations for some of the phenomena (like the trend in atomic radii and electronegativity) are never actually explained and it would be too hard for students to get there via discussion.

9. How would you rate the explanations student generate using the tools from this unit?

   Poor. There isn't enough prompting them with meaningful questions in many of the activities.

10. Is there anything that we should know that I haven't asked you?

    I honestly don't believe this curriculum was public ready. It is missing so much that it is shocking. The content leaves a lot for me to fill in (when instructed to) which isn't really the point of a premade curriculum. There are only a few activities for the whole unit and each has been problematic. I love the interface though.

SECTION 4: Curriculum Lead's Reflections

Summary: The "interactive" graph was interesting, but not incredibly engaging. It also covered information that had not yet been introduced, in what the teacher and I assumed was an attempt at having the students "discover" the information, but it was not an appropriate strategy for this subject matter, especially for this grade range. As pointed out by the teacher before the class period, some of the questions are baffling in their complexity and context – some of them are unanswerable considering the students' current level of understanding. 30 minutes into the class, it was difficult for students to remain focused on the task, as many had to wait for the teacher to make his rounds to either assist or verify their answers. This was not a reflection on the teacher, but of the wildly-varying complexity of the questions, the limits of the ability of the activity to engage the students, and the one-dimensionality of the lesson.

CHEMISTRY A: STEMScopes
SUMMARY OF EVIDENCE GATHERED DURING STUDENT INTERVIEW
UNIT: PERIODIC TABLE

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3	Teacher 4
Discourse for sense-making	2	2	2	2
Consensus building	2	2	-	1
Phenomenon present and helpful	2	1	1	1
Elicitation / Initial Model	2	1	1	1
Evidence helped understand the phenomenon	3	1	1	2
Way to track ideas through the unit	2	0	0	0
Assessments fair and helped know where you are	3	1	1	1
Does the unit help you learn science	3	1	1	2
Would you recommend these materials	2	0	0	1

Comments to Note:

- *Making elements, protons neutrons electrons. How the periodic table is and how we use it. Sometimes we look at cards and you put in order by color. It help you learn the how you put the elements on the periodic table. And how it goes down 1234*
- *CS:* Students didn't seem to identify a phenomenon rather they identified that they were learning about atoms.
- They were interested in the topic.
- *I don't think there is a puzzle. Making an atom maybe. I don't think sodium in the water is not puzzling. Create smoke. In units before, they were pretty clear. This unit not so much. I like when there is a phenom, you try to figure it out as you go along. We learn about a lot of things along the way. Sneaking in a bunch of information that we might need to know.*
- *With the previous unit test, I had a chance to figure it out. This one was totally confusing. I didn't even want to try to figure it out. Factual recall. Some of the longer answers were convoluted.*
- *Would you recommend. NO! How we have been learning is lacking something. Asking questions without giving information. We should be doing more. Limited to the computer*
- *Last semester was different units on waves, charge, and that was very clear. There was always a central question we were asking. This semester just seems vague*
- *But then everything came from 2 videos that made it more confusing. They were badly filmed and acted. Poorly executed. They put out a lot of info at once and you couldn't follow it. I was lost at the end. Weird metaphors. It was trying to be too hip and too cool. You don't have to wear a backwards hat to give me the info.*
- *The setup is very confusing and not organized but the topic is interesting. It seems like they rushed to put it together.*
- CS: Students expressed confusion when it came to the organization of this curriculum. They sounded disempowered by this curriculum.
- *Some of the questions, we don't even know what it's asking. We have to ask the teacher what it's asking – and sometimes, it's tricky because it's actually asking us a question and we don't know the answer, we have to actually guess it and then it's something new we're supposed to know. I don't know if that makes sense. But it seems to be trying to trick us into figuring it out, but sometimes we don't know what it all means before the question.*

Student Interview
Teacher 1
Vendor: STEMScopes
Unit Name: Periodic table and element structure

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yes, kinda. Just depends on the activity. Yes, by some assignments.
   a. Is having conversations with your peers something new to this unit or something you regularly do in science?
      Yes, you get new ideas. Asking question of your group.
      Yes we learn new stuff by talking.
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?

3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?

   Yes, sometimes. There's something I never hear of. For me yes, it's better to learn with the question.
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?

5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain

   Yes, sometimes, similarities between atoms. The video states how the periodic table is organized and how it works. Yes, the phenomena is learning about atoms.

6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   Yes, you get some parts. After a while it pieces together.
   Making elements, protons neutrons electrons. How the periodic table is and how we use it. Sometimes we look at cards and you put in order by color. It help you learn the how you put the elements on the periodic table. And how it goes down 1234

7. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   Yes, yes, summarizes and compares what we know. And collects evidence from the lesson. We get vocabulary words.
8. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
   No, we wrote it. Today we went back. A lot changed! Yes. Give you the real understanding.
9. Were you able to ask your questions during the unit? To whom did you ask your questions?
   Partners and Teachers. Group members.
10. Did your teacher have students share their individual ideas before coming to class "consensus"?
    Yes.
11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    Yes, comes to our group. Asks us questions. Fair but sometimes tricky. If we think about it.
12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    Yes, yes, there's articles to relevant. Some talk about how the earth is made. Similar.
13. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    Yes somewhat. I have already learned some of it. No. at some point. They are looking into deeper things.
14. Would you recommend that we use these materials for ALL students in ____ across the district.
    I would, just depends on how they learn.
    When you are just starting to learn, it is harder on you, but you'll be answer it next year.

Curriculum Specialist Impressions and Summary:
Students didn't seem to identify a phenomenon rather they identified that they were learning about atoms.
They were interested in the topic.

Student Interview
Teacher 2
Vendor STEMScopes
Unit Name: Periodic Table

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
    a. *Not that I know of. The topics are more he teaches us but we don't need to talk about it.*
    b. *Other units we talked more.*
2. Is having conversations with your peers something new to this unit or something you regularly do in science?
    a. *Yes. We regularly do*
3. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
    a. *Yes, because everybody has different ideas. You don't do it by yourself, other ideas help me think. Collaboration helps with the understanding.*
    b. *Most of the time some are dominated by someone who knows. I try to get everyone flowing. I ask, what do you think about this? I group our comments together.*
    c. *Ask other people*
    d. *One teacher and 33 kids. So there are people in our table group who know about this. Someone adds on, put everyone's ideas in. Sometime we are good at figuring it out together.*
    e. *There was a group quiz, a teammate helped me with the vocab, helped trigger words.*
    f. *Usually, sometimes kids are distracted, and I help them catch up. I will turn to our teacher.*
    g. *Group discussions are important but this unit does not lend itself to it.*
4. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
    a. *I think we are still in the intro. Not there yet.*
    b. *I don't think there is a puzzle. Making an atom maybe.*
5. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
    a. *He would give us worksheets and videos. Some men there sodium in the lake.*
    b. *Helpful to start this way. I can look back and find that I know this now.*
    c. *I don't think sodium in the water is not puzzling. Create smoke.*
    d. *In units before, they were pretty clear. This unit not so much.*
    e. *I like when there is a phenom, you try to figure it out as you go along. We learn about a lot of things along the way. Sneaking in a bunch of information that we might need to know.*
6. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
    a. *PHET today*
    b. *Just been told on what is in an atom, how to make it neutral.*
    c. *Mainly learned about the build of an atom.*
    d. *Made a model with beans.*
    e. *Looked at elements*
    f. *Haven't learned anything that would help me explain the sodium in the water.*
    g. *In the past we keep thinking back to the phenom.*
7. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
    a. *See Above*
8. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
    a. *Not this unit.*
    b. *Helpful for a test.*
    c. *I don't' find them helpful. I would write my ideas during a project. Write my questions and observations. Summary table is done' at the end. Boxes constrict me.*
    d. *I feel it limits me to certain ways to take notes. I want to talk about other things that are on my note sheet*
    e. *Some kids need this structure.*
    f. *I don't use it on the test. Writing it down helps me remember.*

9. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
    a. *Had a bunch of cards that we organized in a way we learn best*
    b. *Beans to sort to make an atom.*
    c. *Hard to do this without a phenomenon.*
10. Were you able to ask your questions during the unit? To whom did you ask your questions?
    a. *Most people confused during the class so I ask the teacher. He tells us to ask our partners.*
    b. *Look for someone who is paying attention.*
    c. *If I know someone who is understanding the work, I go to them first before the teacher.*
11. Did your teacher have students share their individual ideas before coming to class "consensus"?
    a. *Sometimes the teacher will ask the question, raise hands from different groups.*
    b. *Helpful to hear ideas from other groups. Confirming my ideas. Hear similar ideas = correct or something to think about.*
    c. *When we share out, another way to look at it. Hear other people*
    d. *We come to consensus. Put ideas together from other tables.*
12. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    a. *Not assessment per se.*
    b. *With the previous unit test, I had a chance to figure it out. This one was totally confusing. I didn't even want to try to figure it out. Factual recall.*
    c. *Tuned in our homework on the scope. Homework wasn't challenging. Questions were not about our knowledge more about the experience.*
    d. *NO test yet.*
    e. *Pre test questions were really confusing. Help me see what I need to know by the end. Starting to understand. I thought some questions were confusing when they asked the question.*
    f. *Some of the longer answers were convoluted.*
13. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    a. *Yes I am learning science. It is helping us understand what atoms are made of. It will be helpful. Right now we are just learning the basics. But will learn more as we go along*
    b. *It is pretty straight forward. I want it to be connected to something real very soon.*
    c. *Usually we have more paper assignments. Not new to use a computer, but I want to write more.*
14. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    a. *Scientist do more problem solving and more labs and more models.*
    b. *Don't like when I already know the answer. I was expecting more.*
15. Would you recommend that we use these materials for ALL students in ____ across the district.
    a. *NO! How we have been learning is lacking something. Asking questions without giving information. CLE should be doing more. Limited to the computer. Don't see the project based learning.*
    b. *More project based last semester. We were able to see the mistakes and fix them. I want more challenge and more complex.*
    c. *Give me an example from another time: Boren, drilling in to rocks. Building something, working together, talk about with a group. DYI project, vandegraph.*
    d. *I like the sims in this class because we use them for things we can't see.*
16. Does this make good use of the computers?
    a. *Yes. We are using it almost every time we come here. Assignments and homework on the scope.*
    b. *I don't like all assignments on a computer. I like being able to write. Working on the computers not the best.*
    c. *Simulations help a lot. Don't like writing on the computers. It is confusing. I cant' remember to do everything on the computer.*
    d. *Rather work with paper. I like to draw what I am thinking. Visuals I take are important*
    e. *Sims and videos are helpful.*
    f. *Best use of computers is checking grades.*
17. *Even though we answered yes about working together. On certain projects it should be only you! I want to test only on what I know. Puzzle by myself as a learner.*
18. *Go back to the way we were learning. Start with a problem that we figure out.*
19. *STEMScopes the website is scattered.*

Student Interview
Teacher 3
Vendor: STEMScopes
Unit Name: Periodic table and element structure

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   It does, because when we did the flashcards and placements of elements, we had a big group discussion to help understand how things work.
   But then also, the group work is an excuse to let one person talk and do the work. One person figures it our and we just agree with them
   I think it is less in depth than what we did in physics
   When you in a group, sometimes you need more help.
   a. Is having conversations with your peers something new to this unit or something you regularly do in science?
      Seems a little newer. Talk to your partner is always something we do, but now it is more you and your group with figure this out with each other. The teacher doesn't explain in the end. More group work and discussion.
      There was more interaction with peers to figure out the answer before this.
      We used to do labs and it was fun. But simulation is less hands on so not as labs.
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   Talking helps and bouncing off ideas helps. Drawing pictures helps to explain yourself more. I like when you have and idea written and you compare to each other. Then you listen to peers and combine ideas to one bigger ideas.
3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   It is a little fuzzy. There's a few things each time. The simulation is all types of things
   Last semester was different units on waves, charge, and that was very clear. There was always a central question we were asking. This semester just seems vague. We are figuring out elements and their structure. It is a chart of different questions. It would be easier if we chopped it up into more questions. It feels less organized.

4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   We did the test on the computer. There were start questions and pretest.
   She did ask our background knowledge and what we want to know. It came back flooding back from 6th grade.
   Yes but I feel like she took our questions into consideration.
   If I don't like this unit, it is not her fault. I think the unit is too vague. Her teaching is not too vague. She wants to help us. She keeps it vague at the beginning so you can narrow your ideas and sharpen it.
5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   To learn about structure of atoms, we used beans for protons, neutrons and electrons. But then everything came from 2 videos that made it more confusing. They were badly filmed and acted. Poorly executed. They put out a lot of info at once and you couldn't follow it. I was lost at the end. Weird metaphors. It was trying to be too hip and too cool. You don't have to wear a backwards hat to give me the info.

6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   Not particularly. They are generally the same topic.
   I think of it like a movie with a lot of subplots. Its like where does this go. There are different ideas that don't connect into one fluent story. A very dissatisfying story. It hasn't come together well. Wait we went from structure to naming.
   I be they all could connect but it is pretty fuzzy. I am not deepening my understanding.
7. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   That's what I was complaining about. We have different tiny worksheets and we loose them. It was helpful to have it all on one paper to go back to. It was straightforward.
   There were vocab sheets that went nowhere. It hasn't been brought up again. Are all these papers going to help my understanding. Can I just look at one page and see it all connect to each other? Without the summary chart there is not good organization.
8. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
   No, it added more questions. I take a question and answer it with another question. Not helpful. It feels confusing and distracting. It is a never-ending cycle. It is not helping answering burning question.
9. Were you able to ask your questions during the unit? To whom did you ask your questions?
   Yes, our teacher. Sometimes she has the answer but if it were with other teachers, without a chemistry background, she wouldn't know. She had a moment where she didn't know if they could bond. Later she had to say why they could bond for a different reason. It kind of lost me.
10. Did your teacher have students share their individual ideas before coming to class "consensus"?

11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    She walks and asks you. Its not as a group, more for individuals that need help.
    Its usually to review a previous lessons. it was not like the check point in a summary chart
    Now you have to ask her instead of her asking you. More pressure on the student.
12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
13. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    Yes, I like element structure. We started it in 6th grade and coming back is interesting to see how things bond. I like chemistry in general but not the set up in the unit.
    It is interesting to revisit stuff to learn it.
    I do like it but at the same time I don't there's a lot of confusing.
    The lesson plan can be confusing.
14. Would you recommend that we use these materials for ALL students in ____ across the district.
    No
    Ye- no
    I understand that every student has a different way of learning. for that I have to say no. for that I'd have to say no because this is only helpful to one type of student that takes information and learn it
    You shouldn't have to deliberately ask. And when you do ask it makes you feel not smart.
    We don't know what other teachers are like but maybe other teacher…
    Absolutely not. The set up is very confusing and not organized but the topic is interesting. It seems like they rushed to put it together.

Curriculum Specialist Impressions and Summary:

Students expressed confusion when it came to the organization of this curriculum. They sounded disempowered by this curriculum.
They find chemistry inherently interesting but don’t like the never cycle of just not knowing.

Student Interview
Teacher 4
Unit Name: Periodic Table and Element Structure
Vendor: STEMScopes

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Oh, yes. Most of class is like that.

   It's helpful, because I don't really understand what we're doing sometimes, and it helps to be able to talk to other people about it.

   It's helpful to talk to others that are going through the same learning process as you are, instead of someone who already knows it – I mean, sometimes that's helpful too, because obviously they are giving you new information – but it's helpful to process that information with people that are learning it too. Your classmates.

2. Is having conversations with your peers something new to this unit or something you regularly do in science?
   No, we have always done this with our teacher.

3. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   Well, if it's work time, then we're always talking to our table mates anyway and we're learning together. We can ask each other questions to try to figure things out. And if none of us knows, then we'll ask our teacher.

4. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   I don't think so…

   There was a sodium and water thing that he showed us. But I don't think that really counts.

   No. There wasn't anything.

   [Have you guys had a puzzling phenomenon in your science work before? Did it help your learning?]

   [All] Yes.

   Earth Science last year. Being able to go back to something like that at the end of the unit helps you remember it.

   It depends on the unit. Also, it depends on whether you learn better that way or not.

   I think it provides an example about what you're learning.

   It helps me apply what we're learning. Which makes it meaningful.

   Sometimes, we're just learning random stuff, and we don't know why we're learning about stuff. It helps to know why it's important to learn about it.

   [Do you think it's important to learn about the Periodic Table?]

   Yes. Why…?

   I just feel like all science is important. It's dumb to go through life ignorant about life, like some people do. Like some famous figures – no names, you know!

Honestly, I don't know why it's important. College?

I think like, later on in life, it depends on what you want to do with your life. It's always good to know the basics. Like, if you don't want to do science later on in life, it's still important to know the basics about how the world works. It's good to know that, because most people don't know what they want to be until later in life.

5. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   [No phenomenon for the unit.]
6. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   Well, we're really just getting started with the unit – the base stuff. We're learning about the periodic table, like what the numbers mean.

   How to draw or represent each element. That's what we've been learning.
7. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   [No phenomenon for the unit.]
8. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   We write down our findings and our work in our notebooks.

   Yeah, I keep all my work in my notebook. So I can go back during a quiz and look over the work.

   We can't use it on tests, but just on quizzes.

   We don't actually use a summary table, though.
9. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
   Yes, we have learned how to draw the elements. It does help us learn.

   It helps through muscle memory.

   It helps you visualize it, it's not just some theoretical thing, you can actually see it then.

   Last year, we did a lot of reading articles and annotating them – that didn't help quite as much as drawing and visualizing the stuff.

   It was also boring!
10. Were you able to ask your questions during the unit? To whom did you ask your questions?
    [See previous responses]
11. Did your teacher have students share their individual ideas before coming to class "consensus"?
12. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    Well, I think a lot of the questions in the class work make sense, but the test questions are very hard.

    They're definitely fair, but they're just using different situations, it's using what we've learned, so we can use what we've learned. I just wish we did more of that during class work so that we would practice.

    Some of the questions, we don't even know what it's asking. We have to ask the teacher what it's asking – and sometimes, it's tricky because it's actually asking us a question and we don't know the answer, we have to actually guess it and then it's something new we're supposed to know. I don't

know if that makes sense. But it seems to be trying to trick us into figuring it out, but sometimes we don't know what it all means before the question.

13. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
Last year, we were learning Amplify, and we used the computers a lot. Some of it was not helpful – it got very repetitive. Like, even the tests would ask the same questions five times. I feel like there wasn't any thinking outside the box – it was very much about learning it a certain way.

14. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
It's definitely less boring than just reading!

    I still think it's interesting to learn, though, because then once you understand it, it can help you later on in everyday life apply it to other things and then it's useful.

    I think this is the stuff that scientists need to know, it's the basics. To be able to do the harder stuff, they need to know this stuff, so I guess it's what scientists would have done before.

15. Would you recommend that we use these materials for ALL students in ____ across the district.
Well, it's pretty fun I guess.

    I think it's really good for teaching in extreme depth – about the basics I guess.

    I agree, but, it's sort of hard to tell because we aren't very far yet.

    It's done a good job of teaching me the basics so far.

    It's OK I guess. I don't know what to compare it to.

    That's a good point, we don't really know if it's good or not!

    I think it's pretty good. I think I need a little more time to process everything, but it did a good job of teaching us how many protons are in an atom, and things like that.

    [What have you done on the computers so far?]

    I think most of the stuff is online models. It would be cool if we could get more hands-on models. There are some simulations, but not that much so far. We had more in physics, I wish we had more for chemistry.

Attachment I.4

PHYSICS A: PEER
SUMMARY OF EVIDENCE GATHERED DURING TEACHER OBSERVATION AND INTERVIEW
UNIT: MAGNETISM

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3	Teacher 4
SEP attended to within the unit	3	3	3	3
Phenomenon				
• Presence of	3	3	3	3
• Revisiting	3	3	3	3
• Engaging	2	2	3	3
Evidence Gathered				
• Multiple types	4	3	3	3
• Student engagement	4	3	3	3
Student Discourse for sense-making	3	2	3	3
Students tracking their progress (self-assessment)	4	2	3	3
Student Explanations	4	3	2	3
Usefulness of Materials	4	3	4	3

Comments to Note:

Teacher 1:

- PEER curric is really successful if students communicate
- Yes students can make sense. They apply evidence to a model. Meant to be frustrating until they get to M3. Materials give enough background to help. Assessment bank helps me check for understanding.
- Their explanations are exceptional. Kids who are engaging in this make sense based on evidence with a visual representation. Even kids less engaged have explanations that make sense.
- From the IA: "This curriculum is the best ever. Kids who never understood before are thriving! Our kids felt joy that they understood this unit. I even understand and am learning. This is a move for brown kids in south Seattle. I have kids who can't read, are still thriving! Kids who skipped every day are coming and learning. Kids who have success in science is making them believe they can be a learner."

Teacher 2:

- Overall like PEER, model based, hands on.
- PEER gets up to the pt of explaining what's happening then stops, more about domains/molecules moving creating charges, creating mag fields.
- Very hands on, Readings introduce new concept sometimes briefly & on assessment but no evidence collected. Mag unit in particular, too repetitive, could have moved faster & covered more materials.

Teacher 3:

- The teacher manual has lots of notes on what student might think and how their thinking might change and what to extent I might expect progress.
- Teacher felt supported by the curricular materials.
- PEER meets students at the proper level, pushing them in small chunked lessons. Not too fast and not telling them.
- SPED students struggled to change models

Teacher 4:

- Absolutely engaged in the phenomenon! We talked about Grill Master Shelly every day in class. She became part of the class. I really like that phenomenon. They were really aware of what we were doing because of it.
- Students were conducting experiments and collecting data to support their learning. The questions in PEER help them make sense of the data as they collect it and how it connects back to their explanations.
- They were using an established model to draw and then describe their results and were using these results as evidence to support explanations (claims). They were, in summary, engaged in several of the practices at once, and I found this lesson to be truly three-dimensional (just to name one example: covering at least two DCIs in HS.PS relating to magnetism and force; CCCs of patterns and energy and matter; and SEPs

***Field Test* Classroom Observation**

Teacher #1
Vendor: PEER
Unit : Magnetism

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
    a. Having them share out their observations. I did not confirm or deny. I just repeated.
    b. PEER curric is really successful if students communicate. Table groups are organized by level so I could spend more time with the tables who needed me more.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
    a. YES> The teachers guide is VERY good. Telling me what to look for.
3. Was there something that you would have liked to see that didn't happen?
    a. Only down side is the amount of time.
4. What are your comments on the materials that you used today/ this week?
    a. I wish they were more specific on how to prepare the materials. Need suggested on what to get.

Overall:

5. What are your students understanding or not understanding?
    a. Understanding the standards," magnets can change an object" can model the domains. Explain the properties. Exceptionally good at modeling and argue from evidence.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
    a. The phenomenon was not very strong. Kids don't have a foundation of thermal energy. Kids can't relate.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
    a. Yes students can make sense. They apply evidence to a model. Meant to be frustrating until they get to M3. Materials give enough background to help. Assessment bank helps me check for understanding.
    b. Permanent magnet! This needed to be defined.
8. Have student to student discussions focused on sense-making around evidence collected?
    a. I think so! I worry about off topic, but they are good distracted. Kids use the time to figure it out!
    b. I am leaving a sticky note to say what I will ask when I come back.
9. How would you rate the explanations student generate using the tools from this unit?
    a. Their explanations are exceptional. Kids who are engaging in this make sense based on evidence with a visual representation. Even kids less engaged have explanations that make sense.
10. Is there anything that we should know that I haven't asked you?
    a. Adopt this curriculum!

SECTION 4: Curriculum Lead's Reflections

"This curriculum is the best ever. Kids who never understood before are thriving! Our kids felt joy they understood this unit. I even understand and am learning. This is a move for brown kids in south Seattle. I have kids who can't read, are still thriving! Kids who skipped every day are coming and learning. Kids who have success in science is making them believe they can be a learner." Ashlee' Thomas, Academic Interventionist

***Field Test* Classroom Observation**

Teacher #2
Vendor : PEER
Unit : Magnetism

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Having students keep track of activities & summarize main ideas to help all of them understand the intention of the lessons. Why would you call it successful? Found that most doing the activities in PEER but not all getting the ideas, not doing well on assessments. Understanding why intention of lesson. This summary helps them get to the pt, what they're supposed to learn. Know PEER builds on consensus building, try to get students to arrive at what they should be learning.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson? Yes, concern is if someone didn't have a strong background, it may not be providing enough background information. Give same level of information that students get but need more for teachers.
3. Was there something that you would have liked to see that didn't happen? Like to see more participation by more students. Tends to be a few students, discussion dominated by a few students. Make it more to build from table before sharing out, to get more participation, more a classroom pedagogy. Students not engaging w/ readings provided. Intention is to get main ideas, HCC have those ideas already, not engaging for them.
4. What are your comments on the materials that you used today/ this week? See above about reading. Overall like PEER, model based, hands on. Today was a review day, these things are not present. Earlier good activities, visualizing domains moving w/ filings. Getting to idea of domain instead of charges moving to end of the nail.

Overall:

5. What are your students understanding or not understanding? In this unit: most all started w/ mag same as static charge. By end not the case, domain is more accurate model, curr did this. Demag harder, didn't work that well, didn't see amt of change by pounding on the nail, reduced mag but not eliminated. Would like to see take it further. PEER gets up to the pt of explaining what's happening then stops, more about domains/molecules moving creating charges, creating mag fields.
6. Based on student interview, they felt phen disconnected. Did mag nails & floating in dish to see pointing N. felt they learned N attracted to mag field. Assumed that was clear it was a compass model. Yes, compasses not very good.
7. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic? Kids this age don't care about phen of BBQ grills losing damage based on temp. felt it was disconnected. Waves unit, phen radio images, didn't make a whole not of connection bwtn it and sound. This is an area for improvements
8. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered? A lot of mag nails, more than they needed. Used for observing mag properties of the earth. Cutting of nails to see both halves have N/S poles. Iron filing analogy strong pc of evidence. Collected demag evidence of nail, key idea but not strong evidence/not clear enough evidence.
9. Have student to student discussions focused on sense-making around evidence collected? Yes, for most part. Often hear bringing up evidence they did in class as part of evidence of what's happening and why.
10. How would you rate the explanations student generate using the tools from this unit? Overall, do well with this. Scale 1-10, 8 draw a lot on what they observe in class. Evidence collecting is reasonable to get to ideas they're getting to.
11. Is there anything that we should know that I haven't asked you? Do feel it's a good curr. Very hands on, Amplify almost no hand on, doing rather than reading but doesn't go far enough into the sci of the ideas they're learning. Readings introduce new concept sometimes briefly & on assessment but no evidence collected. Mag unit in particular, too repetitive, could have moved faster & covered more materials.

***Field Test* Classroom Observation**

Teacher #3
Vendor: PEER
Unit: Magnetism

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   I found that cutting the nail and having students observe that they behave like 2 small nails rather than 2 halves of a large nail broke their initial model. That is what science is; collecting evidence and revising models. There was lots of emotion from kids that were engaged. They were mystified.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
   Definitely. The teacher manual has lots of notes on what student might think and how their thinking might change and what to extent I might expect progress.
3. Was there something that you would have liked to see that didn't happen?
   Yes, my students were stumped and had a hard time creating a new model to match their observations. As a consequence, they went back to their previous model. About 1/3 of kids went back instead of revising their model to match their observations.
4. What are your comments on the materials that you used today/ this week?
   They are great. Well thought out and edited. There are bite sized chunks for most student to know what to do.

Overall:

5. What are your students understanding or not understanding?
   2/3 of students understand that science is the process of gathering observations, analyzing data, constructing models and creating explanations that match.
   Students understand that magnetism and charge are different phenomena. You have to describe them differently
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
   Definitely. To explain the crockpot phenomenon, [students] needed to read Scientist Ideas (SI) Reading and this prompted a conversation about previous SI readings can be evidence. Science builds on previous science work.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   See that magnets are different than nails. Nails can be turned into magnets. A piece of a magnet behaves like a whole magnet. Not have made sense of it all.
8. Have student to student discussions focused on sense-making around evidence collected?
   Yes. However, it is very difficult to keep students engaged in the thinking processes when I move from group to group. They lack confidence and endurance for such activities. And will immediately go to other thoughts and activities as soon as I move on to engage the next group.
9. How would you rate the explanations student generate using the tools from this unit?
   I would say about 1/2 of the kids were able to explain magnetism as was expected (given what was noted in the teacher materials). About ¼ of the students were very close to being able to explain, and about ¼ clung doggedly to their old notions and did not improve their understanding or explanations at all.
10. Is there anything that we should know that I haven't asked you?
    Sped kids did not improve their understanding at all. Many wrote exactly the same thing on the pre-test, every drawing during the lessons, and in the post test. One concern I have for model building this way is that all students draw their flawed models many many times, making it stick very well in their brains. When confronted with new evidence, if they couldn't come up with a better explanation, they just ignored the new evidence and kept their old models.

SECTION 4: Curriculum Lead's Reflections

Teacher felt supported by the curricular materials.
PEER meets students at the proper level, pushing them in small chunked lessons. Not too fast and not telling them.
SPED students struggled to change models

Field Test **Classroom Observation**

Teacher: #4
Vendor: PEER
Unit: Magnetism (PHYS A)

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?

   I do, yes. They were supposed to see that the iron filings line up inside the test tube. Kind of the domains in the nail – pretty much all of them were able to identify that.

2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?

   Yes, everything was right in the book.

3. Was there something that you would have liked to see that didn't happen?

   Well, they talked a lot about how physical things affect the magnetism. A lot of the students are familiar with the heat making things less magnetic, so it would have been nice to have that addressed a little more clearly.

4. What are your comments on the materials that you used today/ this week?

   I did have one student during the day who had an accident with the hammer today. And it was one of my more focused students, too – she was following the instructions and being careful.

Overall:

5. What are your students understanding or not understanding?

   They came away with a good understanding of the content within the unit.

6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?

   Absolutely! We talked about Grill Master Shelly every day in class. She became part of the class. I really like that phenomenon. They were really aware of what we were doing because of it.

7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?

   Students were conducting experiments and collecting data to support their learning. The questions in PEER help them make sense of the data as they collect it and how it connects back to their explanations.

8. Have student to student discussions focused on sense-making around evidence collected?

   Yes, there are regular points for students to make predictions together and then to do sense making around their data.

9. How would you rate the explanations students generate using the tools from this unit?

   Students were able to generate very thoughtful, complete explanations, supported strongly by the evidence they collected during the unit.

10. Is there anything that we should know that I haven't asked you?

SECTION 4: Curriculum Lead's Reflections

Summary: Students were very engaged and attentive in the activity, and from my questions to them, they found the topic interesting, engaging, and important to understand. The experiments they were conducting were simple, yet often resulted in results that surprised them. They were using an established model to draw and then describe their results and were using these results as evidence to support explanations (claims). They were, in summary, engaged in several of the practices at once, and I found this lesson to be truly three-dimensional (just to name one example: covering at least two DCIs in HS.PS relating to magnetism and force; CCCs of patterns and energy and matter; and SEPs a checked above (quite a few)). While this was a continuation of work started yesterday, it was clear the way these three experiments were designed, it gave the teacher the ability to use her time to circulate the classroom to support or use back-pocket questions. Students were also expected to compare their results with another group and discuss any discrepancies, which when asked, students thought was critical to their learning.

This was a great example of a "hands-on, minds-on" activity that did not rely on any "wow" factors – most students were working on an experiment that involved a small magnet, a small compass, a nail, and a straw: not exactly the most visually stimulating of activities. Yet, to a group, they were engaged, collaborating, and recording their data in their notebooks, proof that not every activity needs to involve fire or explosions to keep students engaged.

PHYSICS A: PEER
SUMMARY OF EVIDENCE GATHERED DURING STUDENT INTERVIEW
UNIT: MAGNETISM

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3	Teacher 4
Discourse for sense-making	3	3	3	3
Consensus building	3	3	3	3
Phenomenon present and helpful	3	2	3	3
Elicitation / Initial Model	3	2	3	3
Evidence helped understand the phenomenon	3	2	3	3
Way to track ideas through the unit	3	2	-	3
Assessments fair and helped know where you are	3	3	3	3
Does the unit help you learn science	3	2	3	3
Would you recommend these materials	3	2	3	3

Comments to Note:

- *I think figuring it out helps it stick in your head if you figure out.*
- *I feel smarter as I learn. Helps me relate to my real life, put it in to a situation that is real so I can understand way better. I think it helps…at first it is confusing…I don't have any evidence yet. Important for the teacher to listen, and not tell us the answer but guide us to the answers.*
- *Every time we revised our model, we looked at each other's. Helped me see the flaw. Sometimes I see something I didn't think about it and it helps me understand better. More clear.*
- *The phenomenon gave us purpose. In the beginning, we were like, why did that happen. Instead of just learning. Some units didn't have a thing that made us want to learn.*
- During the interview, one student prompted another to join the conversation. Demonstrating the science practice of discourse!
- Students referred to each other as experts on evidence rather than the teacher as the keeper of knowledge.
- *I think it's definitely helpful to talk to each other, because you get to think on your own first, then when you talk to people and then – oh, that makes a lot of sense, and maybe I change my model and incorporate some other ideas. But everyone gets to think to themselves first. I think there's a lot more debate. It's gets you to actually look at other perspectives a little more. Like how someone else can see that.*
- *I think to think it out rather than draw it, but it it is helpful to have an actual drawing of what is going on, because it's a good reference tool and it's good to have when explaining it to others.*
- *but I find that the scientific ideas reading at the ends are really helpful as it helps to qualify what we're thinking. I wish we had that at the end of every experiment. Or, that we would actually come to full consensus – not just as a class, but with what is actually accepted – at the end of every experiment.*
- *Part of the reason I like science, and this one especially, is because we have that kind of structure to it. Where you're not just going off of a textbook, you're learning through experiments and investigations. It's a lot more fun, we learn a lot more, and we learn it for longer.*
- *I don't think it's perfect, I think it needs a little improvement, like what we've been talking about, but I think it's a breath of fresh air in teaching styles. And I think it has a lot of potential.*

Student Interview
Teacher 1
For Magnetism Unit
Vendor: PEER

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
    a. Is having conversations with your peers something new to this unit or something you regularly do in science?
        i. *Not before in science*
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
    a. *Easier to have other people's ideas and to have the book to help you.*
    b. *Kinda like a recipe, it helps guide you to figure out the experiment.*
    c. *It is helpful to my learning. I am coming up with my own answers and figuring it out myself. I like to hear other people's ideas. I can help show my friends how to do it.*
    d. *I think it helps. It is more enjoyable. It becomes boring when you work alone.*
    e. *I think figuring it out helps it stick in your head if you figure out.*
3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
    a. *About a magnet on a crock pot that stopped working. They gave us this problem. We made some initial ideas on it. Then we started to learn about magnets and then figuring out why. Not about that specific problem. They could have a more interesting one. Like the charge one.*
    b. Is it helpful to link your learning to something that relates to you? *Sometimes science is too much about symbols and away the real world.*
    c. Does science offer you something important in your life? Talk about real things in your life. *Math is just about number but not real life. Not sure if I need to know it, it is nice to know why it is happening. It is actually fun to know it.*
    d. *Will you ever apply this learning to your life? Yea, charge. In certain jobs maybe.*
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
    a. *Yes we did this. Beneficial to myself, I feel smarter as I learn. Helps me relate to my real life, put it in to a situation that is real so I can understand way better. I think it helps…at first it is confusing…I don't have any evidence yet. See how our past ideas were there. Helps our teacher. Important for the teacher to listen, and not tell us the answer but guide us to the answers.*
5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
    a. *Nail magnetized, boat in water, points to north. Helped me know what is in the magnet. Help us know why the N and S on the big magnet*
    b. *Attract and repel ideas.*
    c. What did these help add to the model?
        i. *We had a model of the nail. Why parts attract or repel. Help us see that the symbols cause. My model changed. Every experiment, helps add to the model. Revision our model. Keep on testing the model til we get it correct*
        ii. *When you have an idea and want to write it down, this helps me visualize my ideas*
        iii. *Really helps, when I put it on paper I see the flaws and want to revise*
        iv. *Teachers help when they come around and ask how the model applies.*
        v. *Better prepare to take the test at the end.*
        vi. *Help me know the properties. Helps me remember those properties.*
    d. Scientists idea: Scientist test and revision
6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
    a. *At first it didn't. But as we started figuring out the evidence it made sense.*
    b. *Write in a summary table. Helps me understand the key points. Seems tedious. Helps me see how they link together and study for the test*

7. Were you able to ask your questions during the unit? To whom did you ask your questions?
    a. *Yes. Ask my peers first and then the teacher.*
8. Did your teacher have students share their individual ideas before coming to class "consensus"?
    a. *Every time we revised our model, we looked at each other's. Helped me see the flaw. Sometimes I see something I didn't think about it and it helps me understand better. More clear.*
9. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    a. *Quizzes. Look at our model. Always asking questions.*
    b. *Good check points to make sure I am understanding before we go on.*
    c. *Sometimes there are questions that reference earlier experiments that helps me see why that happened.*
10. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    a. *I like the way it is organized. Sometimes it takes a while, when I already learned it. Sometime difficult to work with peers but it helps.*
    b. *Teacher doesn't let us move on before everyone is on board.*
    c. *At the end of the chapter, the scientist ideas are sometimes repetitive. Can help. Give you the answers. It is really easy because the questions are in the text. Test your knowledge and help me think about what I need to learn. Sometimes they are harder than the test.*
11. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    a. *Yes I really think these are useful to my learning. Hands on. I figure it out myself. Helpful because science in MS was boring. Do the thinking. Not just watching it happen. MS they gave us everything. Now we really dig in.*
    b. *I do think I could choose science. I like science.*
    c. *I really like the experiments.*

Student Interview
Teacher 2
Unit: Magnetism
Vendor: PEER

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain. *Feel there's collaboration when giant posters but not other times. Posters of predictions, demag & mag nails. Experiments repetitive, 5 times mag nail when it could have been a demo. Doing the same thing everyday. Collab moments when doing packets, revise models when clarifying things.*
    a. Is having conversations with your peers something new to this unit or something you regularly do in science? *Usually do it in sci. when I'm stuck I get better understand talking w/ peers. Last year we worked w/ peers & other subjects. In other units.*
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not? *Helpful, if not sure talk about in a group like to get diff ideas there's not one specific way; my peers know this much, this is where I should be*
3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas? *Not really, but it did one, not always the central of unit, just beginning at begin & end; didn't focus on it all time; big idea came when we cut. Were supposed to fix compass but didn't; lesson take us to how it works just how to mag & demag nails. Not very clear on entities. Pretest had compass so we thought we'd do that. If you can do the compass prob. Held broken, didn't connect to the unit. How it demag & re-mag but in unit did similar but too far away from actual problem;*
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic? *In pretest, in posters, initial model.*
5. What kinds of evidence have you gathered in this unit? *Cut nail in half, ea behaves like sm mag; don't know how nails relate to compasses;* Did that evidence help you explain the phenomenon or answer the unit question*? NO t really for S3, taught some of mag worked, felt could have dug al lot deeper, did same thing over & over again. S1 & 4. Sim would have been helpful, like other units. Could have done diff types of experiments Explain*
6. Did the lessons link together to help you explain the phenomenon? All the same lesson. S5 learned how to mag & demag over & over again. Do you think you can explain it to me? If your compass broke. Who would carry a mag on a camping trip.
7. Were you able to ask your questions during the unit? *Yes, like in beginning, always let us ask questions. Learn better when you figure it out instead of someone telling you.* To whom did you ask your questions?
8. Did your teacher have students share their individual ideas before coming to class "consensus"? *Yeah, w/in grps, pull cards, 2 grps called on. Ask us and explain if we were right. In other units tables presented, liked that.*
9. Has your teacher checked to see if you understand the science ideas during the unit? *Sort of, expects us to ask us*. What did that look like? Were the questions fair or tricky?
10. Did this unit help you learn science ideas? *Sort of; some, same over & over. Understand more about mag than about compasses. Curr repetitive; summary questions on table all the same. Rushed to make the unit.* Did you like the way it was organized? *No, kind of a waste of time; did like to packet, we could work ahead. Amplify not a good way of teaching, sims saved a lot of time.* How is it different/the same as other units you have done? *Same structure, seemed more repetitive. Weren't spending a lot of time . didn't talk about electro mag, would have been interesting. Too basic.*
11. Do you think this unit is interesting? *No, at first yes. Would have been if we had gotten more detail into how mags worked. Took in nova video but didn't use that infol would have been nice to look at antimony. How to cut nail in half is all.* Do you think this is the kind of work that scientists do? *NO, there's rep in sci to get good results, but not like this. Explain.*

Curriculum Specialist Impressions and Summary: maybe if we had combined some of the experiments. Needs a sim, to have time; transitions, some hands on but need a balance. Liked a copy of lab book to take home, it's on Schoology. Others went into more detail.

Student Interview
Teacher 3
Unit: Magnetism
Vendor: PEER

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yes,
   I agree I definitely talked to more people this year
   Um hmm I learned in the process of talking
   The [results] were different in different groups so we would talk to other groups. We would consult other groups or borrow.
   a. Is having conversations with your peers something new to this unit or something you regularly do in science?
      We do that sort of but we did it more
      The elementary, your teacher gave you all the answers
      If you took too much time they'd just give you the answer
      "Tony, do you have anything else?"
      You learn stuff when you talk to your peers.
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   It was, yes, because if I didn't get it, someone else would
   Or multiple ideas of how something works
3. Did the unit have a clear phenomenon (you might need to explain what you mean by a phenomena)? Does a phenomenon help you understand the science ideas by giving you a reason to study the science?
   Sometimes they weren't that descriptive. They couldn't change.
   It did help. It gave us purpose. In the beginning, we were like, why did that happen. Instead of just learning. Some units didn't have a thing that made us want to learn.
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomena even before you began studying the topic?
5. What kinds of evidence have you gathered in this unit? Did that evidence help you answer the unit question? Explain
   How magnets work. How the world… the physics of the magnet. A lot easier because magnets is a daily thing. Some of the other things don't. physical evidence. We charge the nail and it aligns with the pole. It has real because we see it. Not some expert.
6. Did the lessons link together to help you explain the phenomena? Do you think you can explain it to me?
   Yes, we had it weaved in from past knowledges/experiences from class and my own.
7. Were you able to ask questions to get clarification during the unit? To whom did you ask your questions?
   Yes, Teacher and other kids. The people who know it well. They have some of the knowledge.
8. Did your teacher have students share their different ideas before coming to class consensus?
   Kind of, yea, the board thingy…the initial ideas. We all had pretty similar ideas
9. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
   Yes, in the final test. Also check the notebook. Ask you to more. If you do the work you are fine. They were fair.
10. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    Yes- help me learn magnets can be broken if hit or heated
    For the most part, yes. Why are we floating a nail? but then you get why.
    Different in MS because they just give you an experiment. You just do it so you can do it.
    It is more organized. If flows and goes chronologically.

    Its different. Other units had a summary chart but there wasn't that during this. But I wish we had that.

Curriculum Specialist Impressions and Summary:

- Students are empowered by the PEER Curriculum.
- During the interview, one student prompted another to join the conversation. Demonstrating the science practice of discourse!
- Students needed the help to organize their learning with a summary chart.
- Students referred to each other as experts on evidence rather than the teacher as the keeper of knowledge.

Student Interview
Teacher 4
Unit Name: Magnetism
Vendor: PEER

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   [All] Yes.

   We talk during every activity, and work together on the activities. That's normal in class.
2. Is having conversations with your peers something new to this unit or something you regularly do in science?
   We've been using this program all year.
3. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   I think it's definitely helpful, because you get to think on your own first, then when you talk to people and then – oh, that makes a lot of sense, and maybe I change my model and incorporate some other ideas. But everyone gets to think to themselves first.

   I think there's a lot more debate. It's gets you to actually look at other perspectives a little more. Like how someone else can see that. In other classes – it's all about how you understand things, but in this class, it's also about learning how other people think about things. And understanding how they came to those conclusions and contrast them with the way you think.
4. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   She gave us this Amazon review of a magnet thermometer, and a crock pot and it stopped working. And as we went on we gathered ideas in trying to explain why it stopped working.

   I think it does help – because when we started, we really didn't understand what was happening, but as we have gone through the unit, we have had more and more ideas, and we've been able to come to a conclusion about what was going on.

   I think that when you have a real-world scenario like that, it helps to ground your ideas, and you can connect from other ideas.
5. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   When we started, we thought it had something to do with the heat from the crock pot. But I really didn't know how that tied in. But as we've learned more, you know, being able to say that maybe, heat is energy, and maybe – but it definitely helped to ground it by starting with our first ideas and then building on that, and making inferences from there, versus just like – it can be very hard to learn something like this if you can't visualize it right away.
6. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   [See rest of conversation]
7. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   [See other segments of the conversation]
8. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   Well, we kind of do it at the end. I think it would be better if – I guess it's kind of nice as a review, you use your notes from your notebook to fill it out and it kind of helps solidify your understanding. And then you have the Summary Table for your test. You have to do it all at once, but I think it might be more helpful to do it as we go along. But it probably depends on the person.
9. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?

I think the models – for me, personally, it's just easier for me to articulate it through words. But I can see how others would benefit from it.

I think to think it out rather than draw it, but it it is helpful to have an actual drawing of what is going on, because it's a good reference tool and it's good to have when explaining it to others.

[Has your model changed at all as you have gone through the unit?]

[All] Yes.

Actually, that's what it's all about.

So, throughout the whole thing – we have our end goal, and we have our model, and after each experiment we add on or change the model.

One thing I would like to add on about models is that I've had a little bit of frustration about modeling. At the end of the experiments, it's not always clear what kind of change – and if the change we're making [to the model] is actually right. It's been puzzling, and it's great to find it out for ourselves, but I find that the scientific ideas reading at the ends are really helpful as it helps to qualify what we're thinking. I wish we had that at the end of every experiment. Or, that we would actually come to full consensus – not just as a class, but with what is actually accepted – at the end of every experiment.

I agree with that. I like the process of going through everyone's ideas, but sometimes it can be kind of vague to what the right answer is.

[Well, if you did all this work, and you couldn't come to a consensus, what would you do next?]

I think the answer is to do more experiments. In that sense, it's good – because it's really hands-on, and I really like hands-on, but then it's a problem on tests, because you can be penalized for not doing it right, and then you'll be more focused on trying to have the "right" answers, and then you're spending more time memorizing the "right" answers and not focused on expanding your learning. That's what's so essential on tests.

I really agree with that, because this is very abstract, investigative process, until it's time for the test, when it comes down to it, it comes down to a linear process, of just knowing the "right" answer, whatever "truth" it is. Which is interesting – I guess that's just how tests are, I guess, but it's just that's where it's hard, because you have to condense everything you've had, and it's hard to be confident you are doing the right thing.

I guess, testing might not be the best way to teach certain subjects, like science.

Even if you have the evidence to support your answer, if it's false, you'll still get dinged for it, maybe you'll get partial credit, but it's all about the answer and not really about the process.

On tests, you do need to back up your answers with evidence, but if it's wrong, you'll still get it wrong.

It's interesting, because coming from other subjects where you just have to memorize things, like history, say, you have to memorize a timeline – it's mentally difficult to shift into physics, which, honestly, if all school was like this it would be cool. Because it would be a lot of investigative, and natural, organic learning. But at the same time, tests aren't organic!

Regurgitating versus investigating why something is.

I will say, this is a very thorough approach to learning.

Yes – this is better, because it's not regurgitative, like, "here's this, now tell me what I just told you." Instead, you're finding it out for yourself, and I think that helps your learning, it makes it more interesting, and it helps you remember it long term – not just for a test, but for your life.

Part of the reason I like science, and this one especially, is because we have that kind of structure to it. Where you're not just going off of a textbook, you're learning through experiments and investigations. It's a lot more fun, we learn a lot more, and we learn it for longer.

10. Were you able to ask your questions during the unit? To whom did you ask your questions?
    We tend to be working together quite a bit, and if we get stuck, we can ask the teacher, she is always moving around the room to help us out during the experiments.

11. Did your teacher have students share their individual ideas before coming to class "consensus"?
    [See discussion above regarding discourse]

12. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
I think it works fine. There are times when it is a bit tricky, but it's the same way with anything. Like all classes are going to have parts that are harder than others. But I think it works well in general.

    Almost on the contrary – this is about the latest thing we have been doing – I think it was all to answer one question: are they similar? The straw and the nail. I mean, it was very thorough, but I think it was to the point of maybe we didn't need to do an entire investigation to answer one question that we could have answered faster. But I don't think that there are areas aren't thoroughly covered.

13. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
Certain parts do seem like, "okay, we get it", and it feels kind of basic, but I think it's helpful because everyone goes at different speeds. It covers things well in that – the point of that one, you could have added it into another experiment, but I think it was to show something important, that we shouldn't use plusses and minuses in our model, and that was very helpful to me. Maybe it could be more extensive, or more interesting, but I don't think it was bad either.

14. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
It sometimes feels pretty scripted, but that's okay. I mean, it says, "design an experiment", but there's not that much variety.

    But I think that's also because we have constraints on time, and resources, like, I could come up with this detailed experiment – but maybe we wouldn't have the materials needed for it. I guess there's just an obvious path. Why would I go through the bushes, when I can just take the path?

    I think one thing that's interesting about this whole unit of physics – for example, if you think about chemistry, it's probably something you'll never apply, it's very focused and specific. But physics, it's super abstract. It's cool to be answering questions that are all around you. I can't think of any super specific examples –

    I think I know what you're saying. I feel like physics is the foundation. I feel like a lot of things build on top of this. It's practical science. It's like, all around us – like forces. You might not even be consciously aware of using it but being able to understand the things around you is very helpful and makes life more interesting. Like if you know, "oh, I can solve this by doing this," it's great.

15. Would you recommend that we use these materials for ALL students in ____ across the district?
Yes. I don't think it's perfect, but it's good enough that I get a general understanding of physics.

    Yes. I think this is a good style of learning, and I don't know what else is being considered, but this way works for me and I am liking it.

    Yes. I like the way it works, so I like how it's fluid, and it goes into each topic.

    I definitely don't think it's perfect but I think it works very well.

    I don't think it's perfect, I think it needs a little improvement, like what we've been talking about, but I think it's a breath of fresh air in teaching styles. And I think it has a lot of potential.

PHYSICS B: PEER
SUMMARY OF EVIDENCE GATHERED DURING TEACHER OBSERVATION AND INTERVIEW
UNIT: ENERGY

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3
SEP attended to within the unit	3	3	3
Phenomenon			
• Presence of	3	3	3
• Revisiting	3	3	3
• Engaging	4	4	3
Evidence Gathered			
• Multiple types	3	3	3
• Student engagement	3	3	3
Student Discourse for sense-making	3	3	3
Students tracking their progress (self-assessment)	3	-	3
Student Explanations	3	3	4
Usefulness of Materials	3	3	4

Comments to Note:

Teacher 1:

- I observed student discussing their own ideas, sometimes disagreeing and talking about observations and reasoning for their thinking. And coming to a small group consensus together. Which is usually correctly supported by evidence.
- It is a good phenomena. We are helping a girl buy a new car and car crashes are always interesting to watch and we are applying energy to car safety such as seat belts and crumple zones. And explain why those things are good based on energy transfer. They are into it. Yes, they have all been in cars and they are very focused on experimental questions and immediate data. They start applying those ideas to the phenom and their own experiences in cars. Ex, when I left my E brake on and it got really hot and started smoking.
- I want to reemphasize that there needs to be more scaffolding upwards. A few kids are bored.
- This is an exceptionally engaging curriculum that invites students to be a larger part of their own learning in a welcoming and rigorous way that is at an appropriate level for the vast majority of students. It clearly emphasizes the science practices.

Teacher 2:

- The phenomenon is about helping Olivia buy a car. They were feeling really connected yesterday, and I asked them to put themselves in those shoes. I think it's going to end up pretty good, because we're just going to keep coming back to it. They're at the age that they're thinking about cars, and thinking about buying cars, so I think it's relevant.
- I really liked that they were able to really see the connection between the graphs and the motion. They see a graph, and they say, "oh, it's speeding up, it's going constant speed," but actually making that motion themselves was pretty great.

Teacher #3:

- The modeling is great in PEER. They draw good models, they give really good written responses, they draw good graphs, they have good discussions when they have inconsistencies between their models. They can explain what it is they're doing, which is really good to see.
- The phenomenon is good, but they do not go back to it quite enough. I think PEER needs to revisit the phenomenon more often to keep the lessons connected and the students engaged with it.
- For instance: negative velocity. That's not instinctive. When they look at a graph, and they see negative velocity, they immediately think that's an object slowing down. But by the time we have gone through the exercises, they're like, "oh! That's just an object moving backwards – back toward the plane of origin." They end up getting that. The way the curriculum is laid out, provides that to them. I feel like I don't necessarily need to teach it. I might have to point it out, and I reiterate it, and I go over it a few times because it's such a strange, new concept to them. But they end up giving some really sharp responses around it because of how the curriculum is laid out.

***Field Test* Classroom Observation**

Teacher: #1
Vendor: PEER
Unit: Energy

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   Introduced the 2 experiments clearly. Made sure students had the tools and equipment needed to successfully do and share observations and come to conclusion as small groups. Previously we establish some class norms for working in a group and how to use the curriculum in an effective way. Because I observed student discussing their own ideas, sometimes disagreeing and talking about observations and reasoning for their thinking. And coming to a small group consensus together. Which is usually correctly supported by evidence.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
   Yes. Clear directions for what students should do at each point and questions for prompting student thinking ad discussion and necessary info at key points in the toolboxes.
   I do wish there were more extension in this section. Kids that got really fast got practice questions, but questions didn't fit well.
3. Was there something that you would have liked to see that didn't happen?
   I don't think so. I have a group that doesn't face each other because one girl faces away to write.
4. What are your comments on the materials that you used today/ this week?
   no

Overall:

5. What are your students understanding or not understanding?
   That kinetic energy is closely related to speed. They know how to observe speed in life and velocity time graphs and infer KE from those observations. They know when and why KE of an object would change by a person adding KE by pushing and why things slow down from inferences of decreasing KE and increasing Thermal energy from observations of temperature.
   They also had analyzed data and communicating information and engaging in argumentation.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
   Yes they are. It is a good phenomena. We are helping girl buy a new car and car crashes are always interesting to watch and we are applying energy to car safety such as seat belts and crumple zones. And explain why those things are good based on energy transfer. They are into it.
   Yes, they have all been in cars and they are very focused on experimental questions and immediate data. They start applying those ideas to the phenom and their own experiences in cars. Ex, when I left my E brake on and it got really hot and started smoking.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   Yes, they gathered velocity using motion detectors of cars being pushed having collisions etc. they are analyzing data provided such as looking at slow motion videos to see when a person is touching a moving object. Some infrared and thermal data. Qualitative data such as rubbing your hands together. And watching a infrared video.
   Yes, they understand all of the data.
8. Have student to student discussions focused on sense-making around evidence collected?
   Yes, discussions in small groups are focused on making sense of things they see in the experiment and applying the ideas in the summarizing questions. And engage in argument in the consensus conversation.
9. How would you rate the explanations student generate using the tools from this unit?
   Good and still getting better. This unit is particularly challenging because energy is not something we can directly observe so getting the wording right. Observing and inferring. Wording is hard, but ideas are good.
10. Is there anything that we should know that I haven't asked you?
    We are not done, and I want to reemphasize that there needs to be more scaffolding upwards. A few kids are bored. This is an exceptionally engaging curriculum that invites students to be a larger part of their own learning in a welcoming and rigorous way that is at an appropriate level for the vast majority of students. It clearly emphasizes the science practices.

SECTION 4: Curriculum Lead's Reflections

This teacher has been to 3 PEER trainings and 1 year of PD. The student ownership and class culture is dependent on a teacher's own comfort in enacting specific PEER norms. Seems that this curriculum will fail if teachers are not bought in to creating this class culture.

***Field Test* Classroom Observation**
Teacher: #2
Vendor: PEER
Unit: Energy

SECTION 4: Post-Observation Notes
Curriculum Specialist: Ask the Field Test teacher these questions during a post-observation session. Record his/her responses.

1. What did you try today that seemed successful? Why would you call it successful?

   I really liked that they were able to really see the connection between the graphs and the motion. Some students have experience with that already, having taken physical science before and I believe some of the math classes do something similar. They see a graph, and they say, "oh, it's speeding up, it's going constant speed," but actually making that motion themselves was pretty great.

2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?

   Yes. The supports are there, there are several assessment opportunities within that I really liked.

3. Was there something that you would have liked to see that didn't happen?

   I wish there was a little bit more. I pushed these two experiments together because they were really quick – they were looking at one type of motion. It would have been really cool to have them design their own somehow. I do feel that's coming [in the lesson progression]. That's in the next couple of lessons, but it would have been cool to say, "design your own, and then trade with another group and see if they can make that motion too."

4. What are your comments on the materials that you used today/ this week?

   I think having taught motion before, I already knew – but putting myself in the shoes of someone who is a new teacher, they might find this unit a bit more challenging because there are a few tweaks you need to make in order to make it easier because the carts are designed to be mostly frictionless, and the tracks as well, so the students need to change the ramps to get the carts to actually slow down.

Overall:

5. What are your students understanding or not understanding?

   Students are definitely understanding the concepts so far, but we are early in the unit.

6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?

   So far, it's going okay, we just introduced it yesterday. It's Olivia's – it's about helping Olivia buy a car. They were feeling really connected yesterday, and I asked them to put themselves in those shoes. I think it's going to end up pretty good, because we're just going to keep coming back to it. They're at the age that they're thinking about cars, and thinking about buying cars, so I think it's relevant.

7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?

   Students have been using equipment to gather evidence on motion using the carts and motion sensors.

8. Have student to student discussions focused on sense-making around evidence collected?

   Yes, as students work as well as when they are completing the synthesizing questions, they are talking about their ideas and conclusions.

9. How would you rate the explanations students generate using the tools from this unit?

10. Is there anything that we should know that I haven't asked you?

***Field Test* Classroom Observation**

Teacher: #3
Vendor: PEER
Unit: Energy

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?

   Well, I thought we would get further today and had a lot planned for today. I thought we might get to the next experiment. It's fine that we didn't – I mean, today they're in here for 100 minutes. I have also found that you can't just push through an entire block period without providing them some leeway. Students tend to shut down if they don't get a mental break somewhere in the middle there. Sometimes I have trouble with the pacing. Sometimes, I'll get through it very quickly, other times, like today, I will not. But again, the first time you're teaching something you really don't have the experience with it yet and know which lessons have more challenging timelines. I mean, they're good kids, they're engaged, but if I really push them through the 100 minutes nonstop, they become zombies. And then I can't get anything productive from them.

2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?

   Physics is not my background – I am a Chemistry teacher, so I have to do a lot of work outside the classroom to make sure I am doing this justice for the kids. The PEER Curriculum does a great job of supporting me in that process.

   Progression is wonderful, Units and lessons are well designed.

3. Was there something that you would have liked to see that didn't happen?

   [See Question 1.]

4. What are your comments on the materials that you used today/ this week?

   I have not been working with the Student books – which is not a big deal, I was given access to everything online by PEER. But it means that in addition to printing the worksheets, I have been printing the other pages for students to access – I have been killing a lot of trees. But it hasn't been making a tremendous impact on my ability to teach the content.

Overall:

5. What are your students understanding or not understanding?

   The modeling is great in PEER. They draw good models, they give really good written responses, they draw good graphs, they have good discussions when they have inconsistencies between their models. They can explain what it is they're doing, which is really good to see.

6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?

   The phenomenon is good, but they do not go back to it quite enough. When I was teaching Chemistry, I used soap as my hook. So as we went through the unit, as we were learning about new concepts, I would always tie it back to the hook – Every single lesson I would have a slide that said, "what does this have to do with soap?" Why do we care about acid/base theory when we're learning about soap? Why do I care about stoichiometry when we're learning about soap? I made sure to be really, really clear about how it actually all fit together. I think PEER needs to revisit the phenomenon more often to keep the lessons connected and the students engaged with it.

   I also think that the phenomenon would be much more powerful if it were connected to more than just the Energy unit. I would connect it to Forces as well. It would have much more relevance and make more sense to the students. Having the anchoring phenomenon cover both energy and forces would make it easier to connect – so the students would understand the concepts about Olivia's car that go beyond the energy component to the safety component.

7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?

Yes, students are using discussions in their table groups and between table groups to make sense of the data. They have been conducting the experiments in PEER to gather evidence as we go. We will sometimes watch videos, as we did today, to gather evidence as well.

8. Have student to student discussions focused on sense-making around evidence collected?

   Yes, and the program is well-structured to allow for that.

9. How would you rate the explanations student generate using the tools from this unit?

   Generally, I have been impressed and satisfied that they have been – like when we talked about before, with the built-in redundancies [see Question 10], students will often say, "why are we talking about this again, didn't we just answer this?" so I'll say it's to reiterate the idea and bring it all together. As you may have been able to sense, a lot of my students are actually advanced learners, so they just "get it" really quickly. So they're giving me the responses I expect them to give me. Like, some of them will bring in the concept of the transfer of kinetic energy to thermal energy without me going over anything, because they know it when they came in the room.

   But what I do enjoy is the stuff that they don't know. That's the stuff they end up giving really good responses for. For instance: negative velocity. That's not instinctive. When they look at a graph, and they see negative velocity, they immediately think that's an object slowing down. But by the time we have gone through the exercises, they're like, "oh! That's just an object moving backwards – back toward the plane of origin." They end up getting that. The way the curriculum is laid out, provides that to them. I feel like I don't necessarily need to teach it. I might have to point it out, and I reiterate it, and I go over it a few times because it's such a strange, new concept to them. But they end up giving some really sharp responses around it because of how the curriculum is laid out.

10. Is there anything that we should know that I haven't asked you?

    PEER has a lot of repetition built in, which is actually great because teachers can take that for granted once they've been teaching a subject for quite a while. For example, as a Chemistry teacher, I probably take for granted that sometimes, students don't know something the first time they see it. This takes that into account.

    Sometimes, I would represent the data differently. [Shows graph in book with negative velocity.] But this is not the way that they've seen it in the experiments. Here are two objects colliding, and then moving away from each other. But the only way you would see this is if you were using two motion detectors. But we don't do that in class, so this confuses the students. I think superimposing the graphs would have been more intuitive. So that might be a little confusing for students. I checked with the students, and I'm not educated in Physics, but even my brighter students were like, "yeah, it shouldn't be drawn like that, it's confusing." It's only little things like that I can find to criticize.

PHYSICS B: PEER
SUMMARY OF EVIDENCE GATHERED DURING STUDENT INTERVIEW
UNIT: ENERGY

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3
Discourse for sense-making	3	3	3
Consensus building	3	3	3
Phenomenon present and helpful	3	3	3
Elicitation / Initial Model	3	3	3
Evidence helped understand the phenomenon	3	3	3
Way to track ideas through the unit	3	3	3
Assessments fair and helped know where you are	3	-	3
Does the unit help you learn science	3	3	3
Would you recommend these materials	3	2	3

Comments to Note:

- It is fun to settle the conflict. It always has to be evidence-based reasoning using stuff seeing in class.
- Students see the process of science and root their answers in evidence. Their connections to the phenomena are not incredibly strong but they know what the phenomena is and have revisited it a few times.
- *I like the connection to buying a car, because that is something pretty much everyone is going to do – but the charging was connected to anything but… balloons*
- *I don't think you can come up with a hook that will please everyone. I think you just need to come up with something that makes sense and is easy enough to focus on. Because if people care, they're going to focus no matter what it's really about.*
- *I think it's organized well. I mean, once we move on to a new unit, we already now know enough to be able to make a reasonable hypothesis about what is happening, and not starting from zero and then thinking, "what this??" We're able to use what we've learned in the past units, the past lessons, to think about how it could happen.*
- *And I feel like it's more hands-on than last year. For example, it's not like building a ramp like we did last year – building a ramp is just a task, it's not an investigation. It's not helpful, it's not gathering evidence. It's wasteful of our time. We're able to spend more time thinking about how the cart makes the graph look like that and less time just doing building tasks. Why does the graph look like that? We're working backwards, which I think is a more interesting way to be learning this content.*

Student Interview
Teacher 1
Unit Name: Energy
Vendor: PEER

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yes, it is a lot of group stuff to talk and figure out together. You aren't by yourself having to raise your hand.
   I like the groups grow. So that we can speak in small groups and have ideas that are shared. Another advantage is the conversations to conclude the ideas. It is fun to settle the conflict. It always has to be evidence-based reasoning using stuff seeing in class.
   Discussing what is seen in different groups and their interpretation.
   a. Is having conversations with your peers something new to this unit or something you regularly do in science?
      In chemistry we did that a little bit but this one forces you to do that. Make sure everyone is on the same page. Not if you just want to. You have to.

2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   Yes because reassuring me. On the same page as everyone to be confident.
   For learning as a whole yes. For some people they can get the ideas faster, and talking to their peers slow… it doesn't let them learn it by themselves.

3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   Which car should Olivia buy? The phenomena is clear but sometimes the lessons stray. Usually lesson are on general science. We do come back to the pehnom but very occasionally.
   Sometimes the phenomena helps me understand but I forgot we were talking about cars. It doesn't help me understand the concepts but it does a good job of helping apply those concept.
4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   Yes, we wrote initial ideas. A day or two of discussing ideas. Minimal resources were given and we used prior knowledge and tried to use evidence.
5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   From experiments, simulations, broad concepts are covered with real life things. I sometimes struggle with the loose analogies made for the broader concepts.
6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   Yes, no, we talk about cars at the beginning. We come back to the cars after each part. I wasn't sure how it was all related.
   It did connect. First velocity and speed, then energy. We made conclusion in velocity to get to energy. It seems to flow.
7. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   Yes, we have summary tables for the experiments. That is helpful and organizes things. All on one page.
   They feel redundant. They have been answered in the experiment.
   I find it helpful to have evidence and answer. Showing it to the teacher and discussing with group helps.
8. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
9. Were you able to ask your questions during the unit? To whom did you ask your questions?
   Group members. We ask our teacher questions but she doesn't give us the answer. She prompts the group to talk about it to come to a conclusion.
   Group members tell you their answer and their explanation.
10. Did your teacher have students share their individual ideas before coming to class "consensus"?
    Yes. Discuss I nthe summary table first then consensus.

11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    Yes, when we do our whiteboard stuff and she makes sure there are no unanswered question.
    Sometimes too easy. Many questions have been previously answered in the experiments. If the questions took the next step to answer a deeper connection.
12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    Nods. It is very organized. Its all based on steps and planned out. it can get kind of boring because it is repetitive.
13. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    Yes.
    No.
    Yes, this is the same process that scientist do. A good representation. You have the question and make an experiment and collect evidence for a conclusion.
14. Would you recommend that we use these materials for ALL students in ____ across the district.
    I would, I think one of the thing most lacking is the purpose of what people are learning. this unit provides the most purpose. Not just the concepts of energy but to know if to make the best cars. It provides a sense of what being a sci would be like
    It is cool to see the way we can play with the things and learn
    I agree. It is a good thing to learn with an actual purpose rather than learning just for learning.
    I agree. The purpose of why we learn is related to what we are doing.

Curriculum Specialist Impressions and Summary:
This group of students are advanced sophomores interested in taking IB their junior year. They could use more extensions. Students see the process of science and root their answers in evidence. Their connections to the phenomena are not incredibly strong but they know what the phenomena is and have revisited it a few times.

Student Interview
Teacher 2
Unit Name: Energy
Vendor: PEER

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Yes, we are always talking to our table groups. Our teacher almost never just talks to us – well, she gives us instructions, but then once we are gathering data or we are reading, we are always talking to each other about what we are learning.

1. Is having conversations with your peers something new to this unit or something you regularly do in science?
   [See above.]

2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?

   I do, yes. I think hands-on learning is good, but at the end, it should always be about talking about the data and what happened.

   And people have different learning styles, so it is important to be able to talk about it.

3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   [See Question 7.]

4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   We had a worksheet, where we recorded our evidence. And we had a class discussion as well.

5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain

6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   We're working on velocity right now. And we're looking at – we're interpreting data about velocity.

   It's about buying a car. And the things you would look at when you're buying a car.

   And the safety. Like, and old car vs. a new car. And we're looking at the gas efficiency. But we'll be focusing on the safety issues.

   We saw a video of an old car and a new car having a collision and comparing the end results of the cars after they crashed. I think we'll be interpreting the speeds of the cars and how that relates to what happened.

7. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   We take all our data down in our lab notebooks, and we use worksheets for labs and activities. I think it's really helpful to have our lab notebooks to keep track of all our work.

8. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
9. Were you able to ask your questions during the unit? To whom did you ask your questions?
   [See above.]

10. Did your teacher have students share their individual ideas before coming to class "consensus"?
    Well, we have discussions with our table groups. But I think the whole class discussions are really important, because you can have a table group that has completely different ideas than the table right next to it, and you can get really confused by which one seems more correct.

    [So, who is it up to in determining which group is correct?]

    [Laughter] Our teacher never says who is correct. She won't tell us what is correct until the very end, when we're doing the summarizing questions at the end of the unit. Then it's up to us to do the work and answer the questions correctly. Then the day before the test, she'll have a PowerPoint to help.

    Sometimes it's still not always clear.

There was this one time on the day of the test she had to go back and tell us what we had done wrong, because all the groups had gotten confused – and so that was a little rough, but we definitely learned about it at the end!

I mean, it was because of the data we collected, everyone had different data. It was a real-world problem.

So I definitely think it's important to have class consensus every time. So then the class can figure it out together, and it's easier for a teacher to know if a class is figuring it out or not.

11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
I understand how the course is designed, to where it's set up so you figure out what is right and wrong and all that. But sometimes you're still confused on the last day before the test because you didn't discover what the answer was by doing the experiments. Then we do the review, and then it becomes clear what you don't understand. But right before the test.

    It's also nice to be reassured – instead of, "well, this might be correct, or this might not be correct." And then you're reassured by your test scores, and then it's too late!

    Well, there are times when I have written down what I know, and I am supporting it with what I have learned through the experiments, but it's still not correct. But it's what I know, and I thought the test would be based on what I learned, but sometimes it's not.

    I mean, it can be difficult – not saying that's a bad thing. Sometimes there's three questions hidden inside of one question on the test, and if you don't answer all three of those questions completely within your one answer, then you don't get full points.

    You kind of feel like overexplaining everything.

    And then, I feel sometimes that if I overexplain it, she'll think I'm doing that because I don't understand it! [laughter]

12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
[See above.]

13. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
[See below.]

14. Would you recommend that we use these materials for ALL students in ____ across the district.
I feel like I am learning – but that's not the problem. I just don't know if I find it truly interesting.

    You know that they are trying to make you learn a specific thing, but you don't know what it is. And that's the hardest part. Because if you're trying to figure it out with the only help being your classmates, sometimes it gets confusing. You're determined that you think it's this thing, and then your friend thinks it's the completely other thing, and then you're like – because there's good evidence for both of these ideas. So, we'd need more time to do more experiments. But we don't have that.

    I feel like some of it is oversimplified, where you are doing things repetitively. And I feel like, maybe personally I am thinking, I don't need to do this again, but everyone might be in different places. So maybe it shouldn't go faster, but I am done.

    I'd like it to be connected more to real-world thinking, too, because we spent like, a couple of months on charges – like, am I ever going to be sitting there thinking about charges in real life? I don't know, it depends on what you do for a living. It's just not connected to – I don't know, even if it were just connected more with other things we were doing in class it would be better.

    I like the connection to buying a car, because that is something pretty much everyone is going to do – but the charging was connected to anything but… balloons. [laughter]

    I mean, it was connected to static electricity, and I always wondered what that is about, but it's just not – it's not going to be very important in life.

    And I'd say that doing some of the experiments wasn't what I'd call… fun. If you really want students to be engaged and enjoy their learning, it's important to do interesting labs.

    You're just going through the motions.

    I think the context is great. You know, learning by doing.

Student Interview
Teacher 3
Unit Name: Energy
Vendor: PEER
Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   There are usually four of us in a table group. We often have a class discussion beforehand about what we'll be doing for the day. And then we'll go over it with our groups, and we'll look at it and come up with our predictions before starting. Because of the small groups, we're able to talk more and spend more time going over the science without it being overwhelming with too many people involved in the conversation.

   We also have time for synthesizing our thoughts. Synthesizing questions or debriefs afterwards. Questions on a sheet, or on the screen that we have to answer after the experiments. And we work together on those as a group.

1. Is having conversations with your peers something new to this unit or something you regularly do in science?
   No, we have worked together in table groups before in Chemistry. But in some of our old classes, we sometimes did and sometimes didn't.

2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
   Definitely, yes. That way, you can also learn about what other people are learning as we do this, so if you are questioning one of your own answers, and someone else has a better answer, you can kind of tie in their answer and see how that compares to what I said.

3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   We started with, what car should this lady buy? And why should she buy it. And it had a bunch of information. Like, miles per gallon, safety of an older car vs. a newer car. And at the end it also asked – it said, at the end of this unit, you're going to be building a car, an eco-friendly car, how would you go about doing it?

   I would say that this one – I am not sure if our teacher made it up or not – but about the car, I would say it's pretty interesting. I mean, I've got my driver's license right now, but I don't have a car yet. So at some point I will be buying a car, so this might not deal directly with me – I might not have an 89 Volvo or a new Prius, but it might eventually be really important to me when I go to buy a car. These are things I need to consider.

   I don't think you can come up with a hook that will please everyone. I think you just need to come up with something that makes sense and is easy enough to focus on. Because if people care, they're going to focus no matter what it's really about.

4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   We also watched videos of cars crashing, and then we talked about our ideas about what we saw.

   We discussed what we think would be a better first-time car based on the data we had been given. We also talked about why one car was safer than the other.

5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   I can see how being able to graph motion is important to speed and how it will impact the outcome of any crashes you might have. I still don't know how it will affect the motion impacts whether one car or another would be a best first-time car. But I can now see how speed will be an important variable in all sorts of things about making a car decision.

6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   Well, it's about the little cars. We're learning about velocity vs. time graphs. And using the track with the push cars – and the motion sensors – to be able to see the motion rather than just having it on paper.

We've been doing a lot of doing predictions about what we think it's going to look like, and then we actually get to see what it actually looks like, whether it's videos – he's shown us some videos – or pushing the cart on the track. We get to see the graph being generated. Also, just doing it on our own.

7. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   No, not really. But we have our own personal folders, and we work off the worksheets from the teacher. He collects them and then gets them back to us as we are working.
8. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
   We have been drawing graphs but not really models yet.
9. Were you able to ask your questions during the unit? To whom did you ask your questions?
10. Did your teacher have students share their individual ideas before coming to class "consensus"?
    We work together in our table groups and share our answers with each other, then the teacher has us share from our tables in different ways, and all the ideas are out there, and then we work together as a class to come to consensus. Usually if there are different ideas, there's one group that's out there and the rest are on the same page, so we bring everyone together.
11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    We have questions that are on the worksheets and on the screen that the teacher is using, and they are all good questions that are helping us think about the evidence.

    There was one worksheet that was very frustrating. [Shows me the worksheet.] "Vehicles with low miles per gallon utilize less energy to travel the same distance as those with high miles per gallon."

    No one in my group liked that, either! It's backwards! Then, we're looking at the graph… They need to fix that.
12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    I think it's organized well. I mean, once we move on to a new unit, we already now know enough to be able to make a reasonable hypothesis about what is happening, and not starting from zero and then thinking, "what this??" We're able to use what we've learned in the past units, the past lessons, to think about how it could happen.

    We learned about speed for a while, not just velocity, and it was really helpful because then we came into this with some idea of how velocity works and how it will affect everything.

    I would say at least during Chemistry, it was each lesson building on the last lesson, all connected to the hook, which I think was about bacon frying. And it feels like this is the way we're going in Physics too. It's a good way to go through the science.
13. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    Yeah, I like it.

    I am enjoying this class a lot more. I had a whole year of physics last year and I am liking this class a lot more than anything from last year. I felt like my previous class was set up where we were presented with this task, and we had to come up with a scenario – like one example would be, trying to do velocity tables or velocity arrows, and we had to build a ramp for our block to go down. We were presented with a task, and then we had to represent something, and we had to come up with a way to do it in the lab report. Whereas in this class, we're more… I think we're presented with more of the information, and we have to come up with our own thoughts about it. We're given the opportunity to prove it right – instead of just knowing that it's right or being told that it's right.

    But not knowing why it's right not necessarily. And I feel like it's more hands-on. For example, it's not like building a ramp – building a ramp is just a task, it's not an investigation. It's not helpful, it's not gathering evidence. It's wasteful of our time. We're able to spend more time thinking about how the cart makes the graph look like that and less time just doing building tasks. Why does the graph look like that?

    We're working backwards, which I think is a more interesting way to be learning this content.

    In my last unit in physics last year, we built a cardboard house. And then we wired it. We were learning about electricity. But, like, 90% of my time was spent building a cardboard house. And 10% of it was spent actually

working with electrical components. So, I felt like it was just a waste of time. It might not have been as fun – because I enjoyed building the house – but it would have been more educational. Because I didn't learn anything from – well, I learned how to build a cardboard house! [Laughter]

[Do you feel that this is the type of work that scientists do?]

I think it's probably similar. I mean, they probably wouldn't get a big pile of packets with a bunch of stuff saying what they should be doing.

Yeah, you wouldn't have all the information handed to you.

But also you would already have a lot of that information on hand already, if you went into a career like that. You would be able to come up with this kind of stuff.

If you're trying to come up with why something does something, you have to figure out what your problem is and then work backward from that, which is what we're doing.

14. Would you recommend that we use these materials for ALL students in ____ across the district.
Yes! Having something like this where you are able to physically see what's happening, and not just have someone speaking at you the whole time and you are able to get hands-on experience where you're able to figure out a problem, an actual problem – not just, "why are we doing this, we're not actually every going to use this." Compared to other classes I've had where they're just talking at you the whole time and you don't understand the point of it, and they're just like, "you just need to know this at some point for some reason." This is more helpful to see the end goal.

Personally, I'm learning much better when I am actually participating in something. Like, if I'm talking with the teacher, or I'm doing an experiment, it helps me focus.

Yes, because I would say working better and smarter is a good way of learning things.

[Whispers] I would also say it really helps to have a great teacher! [laughs]

I would also say that if you have a program for all the Physics classrooms across every school, and science programs in general, if someone is transferring schools, it's not like they're learning something they already knew, or they end up somewhere and you don't know anything that's going on and saying, "I don't know anything about this!" You'd be able to transfer schools if you need to and it's not a total shock to your whole system.

Attachment I.4
CHEMISTRY B: STEMScopes
SUMMARY OF EVIDENCE GATHERED DURING TEACHER OBSERVATION AND INTERVIEW
UNIT: ELEMENTS, COMPOUNDS AND REACTIONS

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3
SEP attended to within the unit	3	3	Teacher dropped out of the field test but offered her students to give their insights in an after school sessioin
Phenomenon			
• Presence of	1	2	
• Revisiting	1	2	
• Engaging	1	1	
Evidence Gathered			
• Multiple types	2	2	
• Student engagement	3	2	
Student Discourse for sense-making	2	2	
Students tracking their progress (self-assessment)	1	-	
Student Explanations	-	2	
Usefulness of Materials	1	1	

Comments to Note:

Teacher 1:

- Like the laptop part, not a million papers. Help kids take care of missing papers. Helps students who are not organized. Too many papers with the other curriculum. but the discourse is dead now. Their nose is in the computer. No prompts for discourse strategies. Is this an individual based curriculum.
- Picture vocab is helpful
- BIG holes. Guides you and then drops you off a cliff. "teach them stoichiometry". How does it fit in.
- This is a Wolf in NGSS clothing

Teacher 2:

- I'm following the questions, but they are not based on sense making. They are concrete. They are not about the evidence or investigative phenomenon. Asks them to describe 'what they learn' after instruction.
- I still don't like it. It asks students to make large jumps that aren't explain. I feel like I need to add in so much so they know where they are going. Some things they are taught are not NGSS and traditional but necessary. Frustrating for students.
- If we chose this, there would be so much work to do to scaffold. It feels very lecture based because I explain after the explore activity. The accelerate tab doesn't actually help. And the ELL scaffolds are not specific.
- I really hate STEMscopes.

***Field Test* Classroom Observation**

Teacher: #1
Vendor: STEMScopes
Unit: Elements, Cmps, Rxn

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
    a. Like the laptop part, not a million papers. Help kids take care of missing papers. Helps students who are not organized. Too many papers with the other curriculum.
    b. Picture vocab is helpful

2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
    a. Yes, once I realized that the teacher guide has steps and videos to set up labs. Also has answer keys and gives teacher prompts
    b. Not, accompanying ppt. This is where all of the explain material in order. BIG holes. Guides you and then drops you off a cliff. "teach them stoichiometry". How does it fit in.
3. Was there something that you would have liked to see that didn't happen?
    a. Laptops are good for keeping their work but the discourse is dead now. Their nose is in the computer. No prompts for discourse strategies. Is this an individual based curriculum. I can't tell what it wants to be and how it wants.
    b. Chemistry is a good level for them. One video is for elementary. Kids were frustrated.
    c. Pushing them to think without tools to build them.
    d. No NGSS rigor. SEP's
4. What are your comments on the materials that you used today/ this week?
    a. See #3

Overall:

5. What are your students understanding or not understanding?
    a. Hard to figure out. What is missing is the learning objective. Where is my evaluative tool. How do I check in. Tons of copying of each other's work.
    b. Tons of googling happening. Not drawn in to figure it out.
    c. Videos but no Phet's
    d. "This curriculum is tedious" say kids. 13 Lewis dots.
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
    a. Kids don't know what it is. Not engaging. Asks about a reaction. Not even something they know about.
    b. The video of the phenom is very poor.
    c. Not expanding their thinking
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
    a.
8. Have student to student discussions focused on sense-making around evidence collected?
    a. Questions are not 3D. Recall.
    b. No strategies for discourse.
9. How would you rate the explanations student generate using the tools from this unit?
    a. Can't yet. The big CER is at the end.
    b. Do have CER questions at the end of every explore. "analogy to explain the mole to your parents".
    c. Not bad, just not what it is intended to be.
10. Is there anything that we should know that I haven't asked you?
    a. Where the curriculum is vague, I take time to explain.
    b. Been interesting because this is one of my favorite parts of chemistry so I know the path I want them to go.
    c. No disposal instructions
    d. No micro labs these are all macro displays.
    e. Wolf in NGSS clothing

***Field Test* Classroom Observation**

Teacher: #2
Vendor: STEMscopes
Unit: Elements, Compounds and Reactions

SECTION 4: Post-Observation Notes

1. What did you try today that seemed successful? Why would you call it successful?
   Giving clear instructions and having self-select groups. They were engaged and not forced. They helped and talked. I'm glad I labelled the bag with the symbols because they don't know them even with a test.
2. Did the instructional materials provide you with the scaffolds you needed to have a successful lesson?
   Yes and no. fairly straight forward. Not sure what to use the difference column for. It confuses students. That wasn't explained. To find the mass you have to subtract, and it is not explicit. Scaffolds provided for discussion, but we didn't get there. Teacher materials told us neg numbers ok. No differentiation provided.
3. Was there something that you would have liked to see that didn't happen?
   I've done a similar lab that puts in 1/2 a mole. That helps them compare. It doesn't tell them it is a mole. The metals were not easy to cut. None could define a mole at the end. They can't explain what a mole is in the end of these questions.
4. What are your comments on the materials that you used today/ this week?
   I hate that we had to use metals, the videos go very quickly. The videos are part of explain. Explore took 3 hrs. questions are worded non-accessibly. Then introduced to electronegativity and then practice. Timing is off. Takes way more time to do each lesson.

Overall:

5. What are your students understanding or not understanding?
   Get that you need a metal and metal for ionic. And covalent. Understand electronegativity is used to distinguish ionic covalent. Don't understand that they need to meet both requirements.
   Lewis dot is still a struggle
6. How have your students engaged with the phenomenon? Has this phenomenon helped them to expand their thinking about this topic?
   Phenom- HCL on Mg. students thought it was like an explosion. Investigative phenom did not work. Reinforced a misconception about mass lost in a reaction. Sort of engaging. Timing is off. Too much time is listed. We haven't come back to it and then we move to ionic bonds. Asking use to prove H2 gas made but there isn't a strong tie back.
7. What kinds of evidence have students gathered so far in this unit? Have students been able to make sense of the evidence they have gathered?
   Gathered evidence of Lewis Dot. The mole. Not the first lesson. But maybe the vinegar and baking soda…
8. Have student to student discussions focused on sense-making around evidence collected?
   I'm following the questions, but they are not based on sense making. They are concrete. They are not about the evidence or investigative phenomenon. Asks them to describe 'what they learn' after instruction. They didn't know what instruction meant.
9. How would you rate the explanations student generate using the tools from this unit?
   Maybe some of the higher performers. Some others will still struggle. There isn't a ton of supports and scaffolds to apply it to something else.
10. Is there anything that we should know that I haven't asked you?
    I still don't like it. It asks students to make large jumps that aren't explain. I feel like I need to add in so much, so they know where they are going. Some things they are taught are not NGSS and traditional but necessary. Frustrating for students.
    If we chose this, there would be so much work to do to scaffold. It feels very lecture based because I explain after the explore activity. The accelerate tab doesn't actually help. And the ELL scaffolds are not specific.
    I really hate STEMscopes.

SECTION 4: Curriculum Lead's Reflections

Teacher seems extremely dissatisfied with the teacher and student supports.
Problems with timing of lessons
Curriculum doesn't seem to expect that students can understand at a high level because it asks such low level questions of them.

CHEMISTRY B: STEMScopes
SUMMARY OF EVIDENCE GATHERED DURING STUDENT INTERVIEW
UNIT: ELEMENTS, COMPOUNDS AND REACTIONS

4: Superior Evidence 3: Strong Evidence 2: Moderate Evidence 1: Minimal Evidence 0: No Evidence

Characteristic	Teacher 1	Teacher 2	Teacher 3
Discourse for sense-making	1	2	2
Consensus building	1	2	1
Phenomenon present and helpful	1	1	1
Elicitation / Initial Model	1	1	2
Evidence helped understand the phenomenon	2	2	1
Way to track ideas through the unit	-	-	-
Assessments fair and helped know where you are	2	2	-
Does the unit help you learn science	3	2	1
Would you recommend these materials	2	2	0

Comments to Note:

- *Some might like it. Our experience.*
- *No, not for everyone. It doesn't make learning fun. There aren't scenarios. It makes it fun. Not even intriguing. If it was more connected to real life I'd want it. Seems fictional.*
- *CS:* Students seems to miss group work and regular consensus conversations.
- *Phenomenon:*
  - *Isn't it the MgCl? Not apparent. Told it and forgot it. Definitely puzzling.*
  - *Not as clear as the penny. Not going back to it as often.*
  - *We have only revisited it briefly.*
  - *Is it important? Sometimes it is limiting. When it is interesting, I want to know how it happens. This phenom, is not as engaging.*
- *Formatting is clunky. Manipulating the platform is difficult. It is tedious.*
- *I see the purpose of each lesson but I don't see how they fit together*
- *Sometimes I am not sure what and why I am learning on the computer but wish I had a better understanding of how this links to the phenomenon*
- *I love technology. Using laptops is important. But not all of the time. Know when to use it! The laptop constrict conversation. (Google the answer). I like being able to go home and go back to an assignment. Practice doing the questions again. My grade is there. Picture vocab. One stop shopping.*

Student Interview Protocol
Teacher 1
Vendor: STEMScopes
Unit Name: Elements, Compounds and Reactions

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
    a. *Our teacher has us turn in one piece of material.*
    b. *Yes. A lot of time we work on things together.*
    c. *Kinda forced to talk about it, I need to turn to my peers*
    d. *Sometimes the material leads us to a wrong conclusion. So we need help*
    e. *Good to look at the vocab*
2. Is having conversations with your peers something new to this unit or something you regularly do in science?
    a. *Regularly*
3. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?
    a. *Yes, because when I am lost I can ask for help easily*
    b. *Something it is easier to talk to people at my table because they can better explain.*
    c. *Everyone seems on the same page. We are either lost together.*
    d. *Depends on the unit. Some people finish the whole thing early.*
    e. *Part of our culture*
4. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
    a. *Isn't it the MgCl? Not apparent. Told it and forgot it. Definitely puzzling.*
    b. *Not as clear as the penny. Not going back to it as often.*
    c. *We have only revisited it briefly.*
    d. *Is it important? Sometimes it is limiting. When it is interesting, I want to know how it happens. This phenom, is not as engaging.*

5. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
    a. *We had a piece of paper with what do you think will happen? But the phenomenon was very foreign. We had no idea what to do. Reaction alone was challenging. We did not have a context previously to attach to this phenom.*
    b. *Penny was easy, bathtub was easy.*
    c. *Sometimes we are afraid to be wrong.*
    d. *Asked to imagine the balanced equation even before we started.*
6. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
    a. *A lot of data tables on the computer. We used the tables to figure out the reaction.*
    b. *Tables to require subtraction, and typing numbers rather than analyzing*
    c. *Formatting is clunky. Explore 2*
    d. *Manipulating the platform is difficult. It is tedious.*
7. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
    a. *Feels random. I see the correlation but point A to point B travel time are a little bit cloudy.*
    b. *Card sort and Lewis dot, what is the mole weighing, Lab*
    c. *I see the purpose of each one but I don't see how they fit together.*
    d. *Wish there a reference to the phenomena*
    e. *Not context to the phenomenon so it is hard to go back.*
    f. *Before, during and after. The during box is random and I don't know how is goes together.*
    g. *Sometimes I am not sure what and why I am learning on the computer but wish I had a better understanding of how this links to the phenomenon*
    h. *Part of the problem, only one person is on the computer, I don't see what is there.*
8. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?

    a. *They can be helpful. I think they are good when you are learning stuff.*
    b. *I like someplace where everything is*
    c. *What evidence, reasoning behind evidence, point toward what to know from this activity, phenomenon/driving questions. Sometime it is vague. I like the picture box.*
9. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
    a. *Depends on the thing. Helps me organize it. If I can see it, and visualize it, it helps me see where I am going.*
    b. *Not with the current curriculum. Initial drawings are usually very bad.*
    c. *Helps me see that I am learning. I don't feel that way-I was wrong-didn't know how wrong I was.*
10. Were you able to ask your questions during the unit? To whom did you ask your questions?
    a. *No*.
11. Did your teacher have students share their individual ideas before coming to class "consensus"?
    a. *I don't think I did. I didn't link it back to the phenomenon. Didn't' know why what was happening happened.*
    b. *Too much to keep track of and see connections.*
12. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    a. *Not at all in this unit.*
    b. *Parts of it, the parts we turn in and then the teacher checks it. But it takes time to get my ideas back.*
13. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    a. *Yes. General.*
14. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
15. Would you recommend that we use these materials for ALL students in ____ across the district.
    a. *50% no*
    b. *50% maybe if we are able to fix it.*
16. Technology:
    a. *I like being able to go home and go back to an assignment. Practice doing the questions again. My grade is there. Picture vocab. One stop shopping.*
    b. *Schoology has components but this is all in the same place and integrated. Sometimes I just can't get it to work.*
    c. *I love technology. Using laptops is important. But not all of the time. Know when to use it! The laptop constrict conversation. (Google the answer). VR*

Student Interview
Teacher 2
Vendor: STEMScopes
Unit Name: Elements Compounds and Reactions

Questions

1. Has this unit allowed you to engage in conversations with your peers to make sense together of the science ideas? Explain.
   Not as much as we had earlier. Cause you work with partners not the whole class. We don't get to do a lot of group activity on the website. It's easier to think creatively but its not that effective. It was just more easy.

   a. Is having conversations with your peers something new to this unit or something you regularly do in science?
      We normally do group discussions. But now we only work on our own stuff. The talking helps because when you hear your peers, it helps you understand what's goin on. If you only ask the teacher, but not hearing others…
      In a group, it helps you get different perspectives and a lot more ideas to solve the problem.
2. Do you find it helpful to talk to your peers about the science you are doing in class and hear their ideas? Why or why not?

3. Did the unit have a clear puzzling situation, phenomenon (you might need to explain what you mean by a phenomenon) that you are trying to figure out or explain through the unit? Does a phenomenon help you understand the science ideas?
   Yea but I have a lot of questions.
   I'm not sure what it is. I just know that it is an end game. Something will click.
   In the previous curriculum there was a step to step, but this one not really
   When you explain something like the fireworks from microscope level up it is easier.

4. At the beginning of the unit, did your teacher ask you your ideas about the phenomenon even before you began studying the topic?
   What is the phenomena? *I'm sure it happened. She's always asking questions. She gives a lot of opp to brainstorm*
5. What kinds of evidence have you gathered in this unit? Did that evidence help you explain the phenomenon or answer the unit question? Explain
   Lab- measuring the mass of stuff. Scaling and trying to figure out different definitions. What chemistry words really means. It will in some shape or form. When the puzzle pieces come together. It was more about reaction but today was more about measuring a certain amount of atoms.

6. Did the lessons link together to help you explain the phenomenon? Do you think you can explain it to me?
   Yes, it just gets more complicated.
   I'm not sure. Sometimes yes, sometimes no. reactions to mass didn't chain together.
7. Did you keep a summary table/ideas journal/learning tracking tool? Was it helpful? How so?
   Yes. Yes, when I really write something. Sometimes, I write fast but I have to really know what it is.
8. Did you start the unit by drawing your initial model? Did you revisit your model? IF so, why did we do that? Was it helpful?
9. Were you able to ask your questions during the unit? To whom did you ask your questions?
   Ms. T. if she doesn't ask me another question. She doesn't like just giving us the answer. She breaks a big chunk in smaller. It takes a long time. And she still asking questions.
10. Did your teacher have students share their individual ideas before coming to class "consensus"?
    Yes, we write our own ideas first.
11. Has your teacher checked to see if you understand the science ideas during the unit? What did that look like? Were the questions fair or tricky?
    Yes, extensively. She'll see the answer and ask us how we got it. She'll sometimes just ask how you are doing.
    In catalyst, she puts questions related to previous lesson
12. Did this unit help you learn science ideas? Did you like the way it was organized? How is it different/the same as other units you have done?
    No, I don't like it. We get less individual help. There's less group work.

13. Do you think this unit is interesting? Do you think this is the kind of work that scientists do? Explain.
    No, maybe if the plot was more.... I like the packet.
14. Would you recommend that we use these materials for ALL students in ____ across the district.
    Yes everyone should experience it. Some might like it. Our experience.
    No, not for everyone. It doesn't make learning fun. There aren't scenarios. It makes it fun. Not even intriguing. If it was more connected to real life I'd want it. Seems fictional.
    Formation of water, you see the formula. But.

Curriculum Specialist Impressions and Summary:
Students seems to miss group work and regular consensus conversations.
This does not connect to real life for students.

Student Interview Ballard
Vendor: STEMScopes
Unit: Elements, Compounds and Reactions

Questions

1. **What is this unit about?**
   [Comparing some of the topics to what they had learned in class already:]
   Iconic and covalent bonds, moles, VESPR tables, types of reactions, dimensional analysis
   Law of Conservation of Mass.
   It's not very clear what the unit is about. The first activity just throws you into it and I felt a little lost.
   You think you know what's going on but then the next activity is completely different, and it's really confusing.
   It was titled Elements, Compounds, and Reactions, so that must be what it was about.

2. **Can you see a phenomenon? What is it? Is it engaging? Would it make you want to learn this idea?**
   No.
   There were 3 questions at the end of the first lab which seemed to be a puzzling phenomenon. But I don't remember what they were at this moment.
   There wasn't a focus question, it was just, "what happened to the mass?" There wasn't really anything to think about, it was basically worksheet questions.
   There's an objective thing that you should know by the end of the unit – Distinguish between elements and compounds, explain the Conservation of Mass in a reaction… etc. [reads from book]

3. **What are the lessons that are in this unit? What evidence will you collect in each lesson? Will the lessons help you answer this phenomenon or unit question?**
   We were playing Bongo Balance, and it was fun, and we were learning about balancing chemical reactions. We were just kind of practicing, there wasn't any evidence collecting.
   We looked at the PhET simulation about a question when you start about how you can balance an equation, and then it lets you experiment on your own to balance the equation. We used it in class before.
   The lesson is about moles. We are learning that right now. It starts with a big paragraph. But then it just jumps into this investigation and they want you to figure out what a mole is. It doesn't really – there's no real transition from the example into actual chemistry. We didn't actually learn anything new about the mole, we actually ended up more confused in the end.
   We did the content connections video. We were looking at the video. This woman took a book off the shelf and I thought it was a metaphor for the periodic table, but it turns out she just took out this big book and opened it up and started reading about the periodic table. To be honest it just lost me because I was waiting for another connection. It threw me and it made no sense. Why did she pick up a big book off the shelf, when it seemed it was going to be referencing a big atom, and then she just flipped right to the page she needed to read about the periodic table! It made no sense.
   I did a reading activity. First off, there's no headers, or bolded text – it's just a wall of text. It wasn't even talking about what I thought it was, it was more the history. It didn't say it was about the history, but then it asked me questions that were different.
   The questions at the end are all multiple choice, and they really didn't get me thinking in the end. Again, it's just answering questions.
   We have to have headphones! Otherwise we can't have it reading to us.
   We did this activity and it's a mess. The text is all different sizes, some of it doesn't even fit in the bubbles. We already have two other resources that do the same thing.
   Sometimes it's asking questions, and it's really clear what the answer is, or if it's multiple choice, there's clearly one correct answer.

4. **Tell me about the lessons. What are you doing?**
   [See above]

5. **Is there an opportunity for you to discuss your ideas with your peers? Cite an example.**
   I didn't see it, but in an investigation, it didn't direct me to talk to anyone – it's supposed to be an investigation, and you need to talk to others about it, but it didn't direct me to do that. How can we not talk to each other about our results?
   It would make sense to look for that activity would be in the questions – to talk to others. But I look at the questions and they're all individual questions. "Here's a question, great, you have the information! Let's move on," It doesn't have that aspect of talking to each other. It specifically needs to tell you that you need to talk to others and I haven't found that.

6. **Is there a way to track your learning in this unit?**
   There is a place for grades, and a place for our notes.
   I don't know if this is exactly related – but the lessons start off in order, but as you open them, they start to get jumbled up, and it's hard to keep track of where they are, where is the hook and the lessons attached to them.

7. **Do you think this unit will help you learn the science ideas intended?**
   [Asks for thumbs up, sideways, or down]
   Students show a complete mix of thumbs.

8. **Are there places in this unit that the teacher can check your understanding? Do you think the questions are fair? Do they challenge you to think deeply?**
   It wasn't clear when the teacher would be engaging us in conversation or having us talk to each other. It wasn't clear how the teacher would be running the class.
   With the assessments: They were almost just guess-and-check. There were 5 questions, and 5 answers, and they give you the same answers over and over. So you could just scroll down and try to get the answer right again.
   And there was nothing to stop you from opening a tab and looking up the answer.
   The other thing that was annoying is that you would have to scroll down for the answer underneath the question – very annoying.

9. **Do you think the unit is interesting?**
   [Thumbs]
   Most thumbs are down – some are sideways – only a few are up.

10. **Is the technology adding to your learning? Is the technology necessary?**
    Concern about the fact that in one of the lessons, you are asked to enter in molecular formulas. It underlines them in red, as if they are wrong – but it's just the spellcheck doing work it shouldn't. That could send the wrong message to students, they would think they have done it wrong but they might have done it right. The spellcheck isn't even working correctly, it won't make suggestions of how to correctly spell it.
    How are teachers supposed to control what kids are doing? What's to stop them from going in the back and watching YouTube?
    It wasn't clear what the individual lessons were.
    It does have a really nice annotating tools. And then my annotations go into a file for me.
    I wrote some stuff down, and I went back, and it wasn't there. I am not sure this thing is storing data, which is something you'd want it to do. Storing, word processing, it all seems like it's incomplete. It seems like it was built in the wrong order.
    Some of the best things tech can be used for like PowerPoints and sharing data, and accessing your data at home, we like the accessibility of having it here and at home.
    There's a lot of words. When you write down notes when the teacher is doing a PowerPoint – when I'm just reading a huge block of text, I'm not absorbing anything.
    It's well customized – you can change the font size and have it read to you – so it's good for students who need accessibility – but the content isn't there, it makes me feel like I'm doing this on my own, and what's the point of being in the classroom if we're not going to be working together?
    I wish it had a search bar so you could look up words in the text. The annotation is good but it's missing the search bar.
    I think the technology should be used once a week, otherwise it would be too distracting. I think your brain starts to shut off if you're staring at a screen too long. Accessibility: I have my notebook. I put all my data in it, I take my notes in it… So I already have accessibility. I don't need it on the computer.
    Oh, I had my notebook stolen!
    I have a lot of trouble remembering things, so being able to write things down is important, and sometimes I can type it out but I would like to write it too.
    I think it depends on how the student learns. I have heard a lot of negativity – but I think this will be very helpful to a lot of students.
    So there's already PhET simulations, and there are already apps like OneNote that lets you record data. So that stuff already exists. What is actually in here that makes learning better?
    I think with this in particular – I don't see anything in here that's unique to STEMScopes. I'm fine typing into a computer, and if I want to write it can, but I do like having my data accessible anywhere online. But I don't see what this is adding that doesn't already exist.
    We already do the PhET simulations once every two weeks and I think that's all the computer I want in the classroom.
    We need to have technology, because we need to build our skills around technology. The world expects us to know how to use technology when we get older.

11. **Do you feel this is something we should put in every classroom in SPS?**
    [Poll]
    Yes: 1
    Maybe: 5
    No: 15

Attachment I.5A: Field Test Teacher Panel Transcript
Carbon TIME: BIO A

MM: Introduces panel for Carbon Time Field Testers. MM explains her affiliation with CT Grant and that she will have no personal gain and that she serves only to collect data & aid in professional development.

PANEL: BC, JP, MP, AK

CATEGORY 1: STANDARDS ALIGNMENT

1. Was it apparent to you which DCI's were expressed in this unit? Did you feel this unit provides opportunities for students to develop and build on these core ideas?
    - BC: Core ideas were easily apparent & expressed. JP felt students really had to understand and express learning goals, and they had a good understanding of that. MP felt like it had a clear modelling piece and data interpretation.
2. Science and Engineering Practices: Was it apparent to you which SEP's were practiced in this unit Did students actually engage in those practices? Please give specific examples of SEPs students engaged in.
    - MP & AK: Both felt students were exposed to real data and manipulation. JP: Enjoyed the Learning Tracking Tool and how students were able to reflect on their learning.
3. Cross-Cutting Concepts: Was it apparent to you which CCC's were the focus of this unit? Please explain how the students used the CCC's in this unit.
    - Cause & Effect and feedback loop learning was prevalent throughout the unit, as well as systems and change being very explicit; built upon other units like photosynthesis & respiration. (AK) Students could reflect on applicability to scale and seemed to understand these cross-cutting concepts.
4. Phenomenon & Modeling: Was there an anchoring phenomenon? Was it engaging? Did students draw an initial model at the beginning, and did they revisit the model? Did these opportunities help deepen understanding?
    - JP: Phenomenon was engaging, the LTT was a great skeleton for the unit to give kids cohesion; more could have been done to answer, "why do we care". BC: found this phenomenon was more and more complex to students & more engaging since many students felt they already knew the answer but actually learned much more than they realized they didn't know. AK: Students can end up reflecting on how their lives impact this phenomenon.
5. Did the lessons sequence coherently string together to build a storyline that helped students collect evidence to explain the phenomenon/driving question?
    - AK: (Explains phenomenon), takes students step by step through how this is happening, what are solutions, again, relations to systems and scales, and policy actions.

CATEGORY 2: ASSESSMENTS

1. Were the assessments provided 3 or 2 Dimensional & were they accessible to all students?
    - MP: Assessments 3D and had crosscutting concepts, apparent in the questions (and the Big Idea Probe that reflects on data), felt questions were accessible to all students- I have a wide range of learners but felt everyone had an entry point. Struggling learners made substantial learning progress through the unit. JP: Enjoyed the unit's interpretation of graphs and the reflection of these skills in the assessments. AK: Language level (esp. for ELL students) was thoughtfully chosen and accessible.
2. Were formative assessments embedded throughout the unit and did they offer information to both the teacher and student about learning progress?
    - MP: Wishing she had more informal formative assessments built into the unit. AK: Used the LTT tool to provide some formative assessments.
3. Did the assessments provide you with information that you were able to use in planning and modifying instruction?
    - MP: Big Idea Probe indicated when/where to move forward.
4. Were summative assessments fair and did they accurately measure student learning of the intended standards?
    - BC: Felt the summative assessments were fair, some small components relied on information that students should have gained from the jigsaw activity which may have been somewhat unfair, but this proportion of the assessment was small. Lots of great analyzing data, creating arguments using data, etc. Rubrics are provided and explain components of answers well (i.e. what a level 4 look like). AK: Tips embedded that indicate where learning gaps might be.
5. Were tools provided for you to be able to score assessments and provide feedback for students? Were there options to conduct these on a digital platform?
    - AK: Carbon Time has an online platform with a handful of systems that you can use for pre/post assessments (with pie charts that can show learning to students & teachers), have machine scoring as an option so that you can focus on patterns in short answer responses. Holistic assessments in which students can agree/disagree and explain/justify their answers, without being wrong.

CATEGORY 3: INCLUSIVE EDUCATIONAL PRACTICES

1. Did the instructional materials leverage student's prior knowledge, and are culturally inclusive and interesting to your students? BC: Phenomenon do play into students' former knowledge & culture, LTT provides students a way to articulate other questions that the phenomenon invoked and that they'd like to understand more on.

2. Did the instructional materials provide a balance of activities to offer students the evidence needed for sense-making of the content and phenomenon? AK: Lots of variety in activities: analyzing data, simulations, readings, did white boarding of ideas, etc., all

leading back to the phenomenon. MP: Unlike other units, this unit didn't have a wet lab, but did have ownership over their graphs, data, jigsaw findings, and conversations around evidence.

3. Did the instructional materials offer opportunities for students to explore or learn about career opportunities in this area? AK: Carbon time put in "storyline readings" which introduce careers and research scientists that were diverse.
4. Did the instructional materials offer cultural perspectives showing work of scientists from different ethnic backgrounds and sharing how different communities are impacted by science? JP: Kind of no on this question; the "lifestyle choices" questionnaire had some reference to cultural relevance and a teacher could expand on this, but CT doesn't itself facilitate that.
5. Did the curriculum provide options for differentiation to address students at various skill levels? BC: CT has notes for creating differentiation and levels of complexity, both supporting students that are struggling and for creating challenges for advanced students.

CATEGORY 4: EVALUATION OF BIAS CONTENT

1. Did you see any evidence of bias content from the perspective of ethnicity, culture, gender, physical disability, characteristics, age, family structure, socioeconomic status, or geographic setting? JP: No, and I thought the lifestyle lesson (referred to in Q14) was handled well around what might have been a delicate situation.

CATEGORY 5: TEACHER PLANNING, USABILITY, AND SUPPORT

1. Was the unit constructed in a way that helps a teacher enact 3D teaching? MP: In general, all lessons include a science skill and was very 3D, attaching content to cross-cutting concepts. Students are expected to see patterns in data, talk about cause/effect, etc.
2. Did the materials guide teachers on how to engage students in the phenomenon, collect evidence to explain it, and revise their models and develop a scientifically accurate explanation about it? BC: Instruction materials laid out explicitly and with a clear progression, building up to explanations that are very inclusive of all the learning.
3. Did the instructional materials identify opportunity for students to engage in discourse and sense-making throughout the unit? AK: Kids engage in discourse and sense-making in every lesson; and prompts were embedded for both students and teachers in the curriculum.
4. Does the instructional program contain teacher guidance, with annotations and suggestions, for how to successfully implement their units and daily lesson plans, including common issues that arise & how to respond? JP: Super detailed keys, an understanding of student preconceptions with back pocket questions for teachers to tackle that incoming knowledge.
5. Do the teacher support materials provide background knowledge related to scientific content? MP: The curriculum materials are all digital with links to videos, materials, documents, at-a-glance materials… all designed to support teachers & students.

COMMITTEE QUESTIONS TO PANEL:

1. What about links/videos being available in the future? The lessons themselves are supported by static data, so this shouldn't be an issue. The links are generally for optional, supportive materials.
2. Are there wet labs in other units? Yes, all the other units have them.

Attachment I.5B: Field Test Teacher Panel Transcript
Teacher-Developed Curriculum: BIO B

MM: Explains development of this curriculum and the needs it hoped to address (i.e. scaffolding students from Carbon Time curriculum).

PANEL: BC, MP, CC

CATEGORY 1: STANDARDS ALIGNMENT

Q1: Was it apparent to you which DCI's were expressed in this unit? Did you feel this unit provides opportunities for students to develop and build on these core ideas?

- BC: Unit is a genetics unit (development), and specifically the single cell, cell division, and differentiation of cells. MP: Again, scales of models is relevant in reflection on cellular vs. organism levels.

Q2: Science and Engineering Practices: Was it apparent to you which SEP's were practiced in this unit Did students actually engage in those practices? Please give specific examples of SEPs students engaged in.

- CC & BC: Planaria investigation: lots of good data gathering & use of data that students wouldn't consider data (images, previous research, etc)

Q3: Cross-Cutting Concepts: Was it apparent to you which CCC's were the focus of this unit? Please explain how the students used the CCC's in this unit.

- MP: Students were definitely thinking of scale & systems/system models, looking at cells and change over time, also structure & function of proteins and specialization- all of which blew her students' minds!

Q4: Phenomenon & Modeling: Was there an anchoring phenomenon? Was it engaging? Did students draw an initial model at the beginning, and did they revisit the model? Did these opportunities help deepen understanding?

- BC: Anchoring phenomenon: how does a single cell become a complex organism? Provided opportunities for students to change initial ideas, explain what happened, etc.

Q5: Did the lessons sequence coherently string together to build a storyline that helped students collect evidence to explain the phenomenon/driving question?

- CC: Very clear how to progress through concepts as students and teachers; found it hard teaching mitosis prior to DNA replication which led to having to correct misconceptions. Other than that, progression was well thought out and enriched the learning. MP: Curriculum stacked itself well & kept students engaged despite snow days!

CATEGORY 2: ASSESSMENTS

- Were the assessments provided 3 or 2 Dimensional & were they accessible to all students? BC: Assessments were at least 2D with some 3D, particularly cross-cutting concepts like scale. Also, some modelling and constructing explanations to apply understanding. They were accessible because there were multiple opportunities for students to express their understanding (i.e. if prose wasn't their strong suite). MP: Some

lower learning had problems with summative assessments, but there was ample opportunity to gauge student learning through other assessment tools provided.

- Were formative assessments embedded throughout the unit and did they offer information to both the teacher and student about learning progress? MP: Huge number of informal opportunities for assessments, but very few formal formative assessments, but they're easily pulled from the information that's already there. Students are always sharing ideas, white-boarding, etc.
- Were tools provided for you to be able to score assessments and provide feedback for students? Were there options to conduct these on a digital platform? All: No

CATEGORY 3: INCLUSIVE EDUCATIONAL PRACTICES

1. Did the instructional materials leverage student's prior knowledge, and are culturally inclusive and interesting to your students? CC: Pulled from knowledge about cell division from middle school, culturally: this unit showed that

2. Did the instructional materials provide a balance of activities to offer students the evidence needed for sense-making of the content and phenomenon? BC: opportunities to work and collect data, modelling activities, hands-on construction of a chromosome and understanding replication, lots of group discussions and sense-making, etc.

3. Did the instructional materials offer opportunities for students to explore or learn about career opportunities in this area? All: No

4. Did the instructional materials offer cultural perspectives showing work of scientists from different ethnic backgrounds and sharing how different communities are impacted by science? BC: Structure of DNA and Rosalind Franklins work and how that relates to gender issues in science; small lesson provided on Henrietta Lacks, addresses ethics in science, racial issues, etc.

5. Did the curriculum provide options for differentiation to address students at various skill levels? MP: Multiple readings that take place after the readings, so they end up being "just-in-time" instruction: each reading has 3 levels providing modification as do some of the questions; differentiation is embedded in the curriculum.

CATEGORY 4: EVALUATION OF BIAS CONTENT

1. Did you see any evidence of bias content from the perspective of ethnicity, culture, gender, physical disability, characteristics, age, family structure, socioeconomic status, or geographic setting? All: No

CATEGORY 5: TEACHER PLANNING, USABILITY, AND SUPPORT

1. Was the unit constructed in a way that helps a teacher enact 3D teaching? Science & engineering .. (?)

2. Did the materials guide teachers on how to engage students in the phenomenon, collect evidence to explain it, and revise their models and develop a scientifically accurate explanation about it? CC: Constant reflection back to initial Planarian lab, always gathering evidence, further learning, and data to explain the phenomenon. BC: Tells teacher what students should be able to add & connections they should be making.

3. Did the instructional materials identify opportunity for students to engage in discourse and sense-making throughout the unit? BC: Opportunities every day to engage with discourse and sense-making; they used an evidence-based argument tool that allows student teams to really unpack what they are seeing and ask further questions about the big idea. CC: Fantastic unit of sense-making and for students to create unanswered questions.

4. Does the instructional program contain teacher guidance, with annotations and suggestions, for how to successfully implement their units and daily lesson plans, including common issues that arise & how to respond?
   CC: Everything is organized, exceptionally easy to navigate, print and figure out. Clear learning goals and for a first-year teacher (and new mom!) this was top-notch!

5. Do the teacher support materials provide background knowledge related to scientific content? MP: Again, extra resources are provided for this, YouTube videos and other online resources. BC: Great storyline progression document is provided & a teacher-level gapless learning document with a full-explanation of the unit.

COMMITTEE QUESTIONS TO PANEL:

1. Anything that addresses Engineering Practices specifically? BC: Not really an opportunity to design a solution to a problem, so at least in the development unit, this wasn't really addressed. CC: However, in the next unit, Gene Expression, there's a lot of opportunity for this.
2. If you were a first-year teacher, would you need to have a biology teacher to teach it? MP: I think it's very supportive to anyone with a science background. CC: I think it's helpful to have a biology background to answer the other questions that the teachers have.
3. Do you feel like this unit is complete? Teaches everything you think the students should know? MP: For me, it was as complete a curriculum that I've ever seen. CC: There are also lots of resources for further learning if the teacher would want to go there.
4. Would finished Carbon Time set up students well for an AP/IB course? MP: Yes, absolutely prepares them for deeper learning, particularly development and cell differentiation. Last week in my AP Bio class, my current students actually needed these

concepts re-taught since they didn't come in with as comprehensive knowledge as my carbon time learners.

5. Does this teacher-developed curriculum lend itself for students to easily roll into it after Carbon Time? BC: I think the teachers that created this modelled a lot of the tools after those used in Carbon Time, so the students are used to processing information in these ways. CC: Yes, I think the progression is such that students respond well.

Attachment I.5C: Field Test Teacher Panel Transcript
PEER: PHYS A and PHYS B

Introductions of FT teachers: Physics A: PA 1, 2, 3, 4 and Physics B: PB 1, 2, 3; PA-4 and PB-2 are the same person.

1. DCIs: Was it apparent to you which DCIs were addressed in this unit? Did you feel this unit provides opportunities for students to develop and build on these core ideas?
    a. PA-2: Phys A: Mag only few DCI's addressed 1 & 2 but not the 3rd connection between mag & electricity
    b. PB-3: Phys B Energy Curriculum: conservation clearly covered
2. SEPs: Was it apparent to your which SEPs were practiced in this unit? Did students actually engage in those practices?
    a. PA-1ua: Phys A: Magnetism: deepest modeling ever witnessed. SEPs flowed throughout. DCIs: pretty baseline. Models created & edited over time mind blowing, got to domain model, conversations about revising model, PEER excels. Give us an ex: John asked, (PA-4 and PB-2 will show you some models) started drawing w/ plusses & minuses, then mag cut in half, then in fourths, where to put the + & -? iron filings: what if I put +/- all over, then they saw +/- don't make sense. PA-4 and PB-2 provided student samples.
    b. PB-1: Phys B: all practices embedded in day-to-day curriculum, engaging in sense making the whole time. Energy less than explicit model building but still forming conceptual models in their heads. What does it even mean for an object to have energy, how do I know when it transfers. Explicit drawing and conceptual understanding of model is changing as they go.
    c. PA-3: students looking at evidence they collect themselves, they're doing actual thinking.
3. Phenomenon and Modeling: Was there an anchoring phenomenon for this unit? What was it? Did students find this phenomenon engaging? Did the students draw an initial model to show their ideas about the phenomenon at the beginning of the unit? Were their opportunities to revisit this phenomenon and revisit the model? Did these opportunities help deepen student understanding of the phenomenon?
    a. PA-4 and PB-2: loved anchoring phenomenon, kept coming back to Grill Master Shelly, kids bringing it up
    b. Phys B: PB-3: which car should Olivia buy? Opinions change once they got more evidence
    c. PB-1: enriched their discussions, talked about personal experiences
4. CCC: Was it apparent to you which CCCs were the focus of this unit? Please explain how students used the CCCs in this unit.
    a. PA-4 and PB-2: Structure & Function
    b. PA-2: in there but not explicitly called out. Cause Effect, Systems, Models
5. Lesson sequence: Did the lessons sequence within the unit coherently string together a storyline that helped students collect evidence to explain the phenomenon/driving question?
    a. PB-1: sequence of learning, starts w/phenomenon/interesting question. Norm: no one is wrong, not allowed to evaluate w/o evidence. Then move through series of

evidence collecting, look back at your initial ideas. then done w/evidence collection, summarizing questions then whole class consensus, should be drawing the same conclusions. Last part of cycle involves reading, formalizing ideas, introducing vocab to things they have already seen. These are the ideas we take with us to the next section.

6. Assessments: Were the assessments provided 3- or 2-dimensional? Explain
    a. PA-3: Had a hard time identifying dimensionality and having hard time forming them. There is an assessment bank.
    b. PA-1ua: deep thinking, mostly 2D, break them down by level, part of chapter, difficulty level.
    c. PA-4 and PB-2: lots of diff things you can use in the curriculum as assessment, 2D or assessment bank has both 1D and 2D and big formal assessment is 3D.
    d. PA-3: Teacher Manual: clear what is expected, what students should be able to explain
    e. PA-1ua: Teacher Manual uses kid font for samples of student thinking, very clear what are expectations
7. Accessibility to all learners: Were the questions accessible to all learners? Explain.
    a. PA-2: HCC: accessible, no questions requiring cultural knowledge
    b. PA-1: cycle so deliberate, slowly builds, all my kids can access it. Rule: can't move on until everyone has an answer. Never had SpEd kids achieve so much understanding because they had to work together, had to explain, make connections. Gives me joy, I never taught so well.
8. Formative Assessments: Were formative assessments embedded throughout the unit and did they offer information to both the teacher and students about the student learning progress throughout the unit ? Yes
9. Digital access: Were there options to conduct the assessments on a digital platform, and were those options practical? Not an option.
10. Inclusivity: Did the instructional materials leveraged student's prior knowledge, are culturally inclusive and are interesting to your students.
    a. PB-3: anchoring phenomenon something they could relate to, driving age, thinking about driving, can use this info to determine which car I could buy. Although purchasing is very low priority, some felt excluded.
    b. PA-1ua: the materials showed this person talking to this person, women talking to each other, animating, one wearing hijab, not just white names, small touches; my students saw themselves in the materials.
11. Balance: Did the instructional materials provide a balance of activities (sims, hands-on, readings, discussions) to offer students the evidence needed for sense-making of the content and phenomenon? Yes
12. Career opportunities: Did the instructional offer opportunities for students to explore, or learn about, career opportunities in this area?
    a. No

13. Offer cultural perspective: Did the instructional materials offer cultural perspective showing work of scientists from different ethnic backgrounds and sharing how different communities are impacted by science?
    a. See PA-1ua's answer
    b. Light on historical context in Phys B, topic didn't lend itself to this, when scientists mentioned, not one in particular, just science thinking.

14. Differentiation: Did the curriculum provide options for differentiation to address students at various skill levels? Please share an example of said modifications.
    a. PB-1: yes, reach broad, good scaffolding; some students is a little too low, some a little bored content wise but they're not yet good w/ practices. Would like to see more rigor in content. Can it be built in? YES, definitely. Between cycles good place. Is it providing a firm base, "I may know these things but how do I know these things are true?"
    b. PA-3: struggling students: weakness, trouble w/ reading complicated sentences makes it difficult to answer questions. Providing more support in language support w/ sentence starters, obvious where to do that and they are still engaging in the practices.
15. Evidence of bias content: Did you see any evidence of bias content from the perspective of ethnicity; culture; gender; physical disability; physical characteristics; age; family structure; socioeconomic status; geographic setting?
    a. All said no
16. Teacher planning: Was the unit constructed in a way that helps a teacher enact 3-dimensional teaching?
    a. PA-4 and PB-2: Not called out explicitly, can be changed, if you are running through PEER's learning cycle then you're enacting 3D teaching
17. Guide in phenomenon explanation: Did the instructional materials guide teachers on how to engage students in the phenomenon, collect evidence to explain the phenomenon, revise their models and develop a scientifically accurate explanation about the phenomenon?
    a. PB-1: Teacher's Manual has information about the phenomenon, background content, list of suggested questions, supplementary videos to show, well thought out w scaffolds
    b. PA-1: ex of student models at ea point
18. Did the instructional materials identify opportunities for students to engage in discourse and sense-making through the unit?
    a. Everyday, but not on test day (!)
19. Does the instructional program contain teacher guidance, with annotations and suggestions, for how to successfully implement their units and daily lesson plans, including common issues that arise and how to respond to them?
    a. PA-2: Heavily annotated, extensions, tips, models, videos, deep or diff directions in extensions

    b. PA-1: videos of labs to use in class for pulling out evidence, great opportunity if lab did not go well and students were not able to gather sufficient evidence. I could have used more details on how to prepare the nails, I spend a lot of time trying to get these right.
    c. PB-1, oh yeah? mine came out right the first time!
20. Do the teacher support materials provide background knowledge related to the scientific content?
    a. PA-4 and PB-2: Yes. Beginning of each section all science things you need to know
    b. PB-1: non-physics person could do this. Teacher's Manual also includes all things that could go wrong. You don't need to know what's going on (Jokingly), because you need students to know--you are not telling them anything, not giving them the answers, they are explaining it to you!
    c. PA-1: feign ignorance.
    d. PA-3: IA in your classroom, they don't need to know anything but when one does, they derail student thinking because they end up telling the students what to think. Best to give IA guiding questions

6:13 AC convening at their tables about what questions they want to ask the panel

1. Pacing question:
    a. PB-1: 3rd year teaching this curriculum, 1st year went very slowly. Going to PEER PD's found this to be very common: difficult to gauge what students are thinking about in Year 1. Now I have a better feeling of when we can move forward. Pacing is variable depending on students and your comfort.
    b. PA-2: for HCC, no problem at all for them to complete, set up for small improvements of model, students wanted bigger chunks.
2. How was teaching this diff from other such units. If it's different, how did you feel about shift?
    a. PA-3: totally different, shifted from *about science*, to *thinking scientifically*, building models, continue to do this until everyone is doing this. Remediating that part that's difficult to explaining thinking. I love it, student didn't love it until they felt they didn't have to get it right the first time
    b. PA-1
    c. PB-3: enjoy focus, thematically. Traditionally by units, this changing these w/phenomenon build on concepts, logically building they come to class w/ their bearings, they know the build, excited about the build, students appreciate, not a lot of scattered energy
    d. PA-4 and PB-2: last year pulled from diff resources; PEER made me see I was not coherent.
3. Back to 1st question: PA-2: DCI that involved magnetism, idea of attraction & repelling, at a distance, connection between mag & electrostatic, that one not covered. I would add it in. PA-1: building a lot of knowledge, short, freedom to dive into other things; they have a baseline of charge & mag. PA-2: I wouldn't change what's there, only have an extension.

4. PHYS A falls on 1st year teachers: PB-3 & PA-1 yes. PB-3 not a physics person, I'm a chem person. First year felt I taught it well. Effective curriculum. PA-4 and PB-2: thinking back to my first yr, spent a lot of time planning, this is all planned out for you, can focus on discourse, think deeply. PB-1: struggled w/ building good classroom culture, norms built in this is helpful, norms of respectful discussion.
5. What about experienced teachers: PA-3: they have to do the SEPs. PB-1, I also have physics background, these are all the experiments I do anyway. PA-1: it is a culture shock if you're used to just giving answers, but if they valued students' learning & retaining material, they will
6. Is their homework: PB-3: use scientist reading as homework, print it out, maybe summarizing questions as homework, good snapshot, PA-1: used very little of it as homework. PB-1: teachers get to pick
7. If you teach this year after year, would it give you energy. PB-3: I would teach as is because of the model building but would add here & there. PB-1: yes as long as I can add for all my kids. PA-4 and PB-2: making notes of what I want to add or have students build their own investigations. PA-2: yes, I don't' have to get through on the what but on the how, more valuable. PA-1: perfect for 9th graders, conversations incredible, doesn't matter where they come from, students no longer asking about grades but asking questions about what they are learning. PA-3: hope to teach this next yr.
8. MM: past 7 years collaborations to look at student work, not everyone comes, contract doesn't require.

Attachment I.5D: Field Test Teacher Panel Transcript
Teacher-Developed Curriculum: CHEM A

Panel: DV, TF, JT, TR
Disclosure: TR helped develop this and will recuse from the vote

Standards alignment:
MM: DCIs was it apparent which ones were supposed to be addressed? Were they?
DV: PS1-a structure and property of matter, basic atomic theory, atomic something element
MM: were they addressed?
DV: they were addressed, they are very big standards, we will come back to them later, but we started them here. I appreciated the logical way in which things followed. Foundational and easy to people who know chem. For students it's a lot of new information and flowed in logical sequence
JTB: this really focuses on the DCIs, Physics focused on practices. First unit of semester, introing BASICs of DCIs but is very clear

Science and engineering practices
TF: asked to organize through of how atoms could be organized. Depended on organization of patterns and structures. But that is CCCs, but imp' looking for SEP….
JTB: practices are NOT an easy thing to read. I am came in as a teacher and I learned how to use and implement and LOOK and them through collaboration. Working with other teachers in this district. DCI CCC SEP doesn't make sense. That is something you CAN'T understand on your own…
TR: I saw evidence of using models, developed the periodic table model, they carried out investigations, two investigations out of 6 lessons. They definitely analyzed data and observations. And they did some mathematical thinking with isotopes
DV: to calculate average atomic mass.
DV: to explain he phenomenon is very hard, even if you can recite the periodic table
John: what is the model that they use to develop the structure of the atom
TR: they use an online simulation of the Bohr model: where are the p, n, e, and how does it change with every element on the periodic table. What are the relationships between copper and gold in terms of protons and neutrons

MM: CCC
TF: cause and effect, scale and proportion, they had to calculate average atomic weight, patterns in the periodic table, structure and function of things inside of an atom and atom functionality. Clearly addressed

Phenomenon:
DV: yes, engaging, take pennies and TURN THEM INTO GOLD. They're actually making brass. Every kid was really excited. Give them an initial model page to draw zoom bubbles of what's going on inside the penny. Helpful as a teacher because you can't build on anything if you don't know what they come in with. Wide variety of kids, some know they made brass, but can't draw it in the zoom bubble. Three drew their initial model and discussed, and we revisited it after every lesson. Even though sometimes they felt like they were getting more confused, it kept them engaged and they were able to build on it. I feel like learning with a phenomenon helped them to go away from years of facts to going "what's the next thing I need to know to explain this" they get the big picture, everything in this table is made of the same three things, but then in the end they can explain it. It's a really hard phenomenon, it's not perfect, but it's darn good.

MM: Sequence of lessons

JTB: the lessons build really well, exploring the model and its rules, how is the model used to build the periodic table with patterns. I think the phenomenon is al title too big. It builds intrinsic motivation (how do I sell this penny for $10), we don't get to metallic bonding at all so it's not super satisfying, but they know they did NOT make gold. You get information, understand information, and use it in the next lesson

TR: approach I took, my students knew we didn't make gold. We focused on (after doing peer) collecting evidence to prove we didn't make gold. Developing arguments using evidence. What can we do with this information to collect evidence to prove it's not gold. "if I made copper into gold, they're in the same properties, so they should act the same" students proposing tests to gather evidence to build a scientifically sound argument.

MM: assessments, embedded assessments, provided, 2D 3D, accessible?

JTB: There's an assessment bank broken down by unit that has a mix of 1D (especially for unit 1 which is building basic understanding, we just have to know some specific language), there is some 2D that is seeking out preconceptions, and there are some 3D. They were mostly accessible for my kids, some are too wordy and my kids get lost in the language.

TF: I feel like that's always true for questions that are more than 1D, some students get lost in the words

DV: work to do on assessments, some are 3D some are 1D, we need more. This is why it's valuable for this curriculum to be collaboration where the work is ongoing. It's not 100% ready in this aspect but we have a really good start and its being updated. One assessment was an atom, and some students were still saying "it's got three red ones" but they have to explain how they know its lithium. They have to do complex explanations. It won't be perfect EVER, assessments are really hard.

MM: formative assessment, was there enough to check in?

TF: formative assessments came naturally; their understanding was displayed on the table, I could just walk around the room and see if they get it or not? Ask different members of the group and easy to know who gets it and who doesn't.

TR: some lessons call out opportunities for formative assessments for first year teachers who might not know when to do that

JTB: there was a summary table that kids filled in that you could collect and assess. Yes it was helpful.

DV: laid out very nicely online. I printed a few out, each lesson says what students should be able to explain at the end. Notes to look specifically at certain parts of assignments to do quick check ins

JTB: the fact it's on Schoology is helpful.

MM: summative assessments, fair, accurately measure standards and learning

JTB: one and a half questions applied to a different unit, but not this unit. Besides that the questions are great

TF: the pre and post assessments, I agree with josh. Other than that it was a good very fair assessment.

DV: before you give an assessment you think "they're all gonna get this" so it's a good assessment where you can see who doesn't get it.

JTB: the explanation of the difference between protons and neutrons: one was shaded and one wasn't. the assessment shows holes in the curriculum

DV: watch out for this in the teacher notes. Work in progress, but collaboration is powerful.

MM: student work is important

MM: guidance of how to score
Panel: no
DV: but you should know what a proton and neutron are

MM: digital format?
Panel: no
JTB: but it would be easy to make since it's already on Schoology and on an online format

Inclusive educational practices
MM: interesting, culturally relevancy
TR: didn't really leverage prior knowledge, it's very foundational. I know students walk in with atomic structure and periodic table, but I wasn't leveraging that to make sure we were all on the same page.
TF: the anchoring phenomenon, I didn't even have to suggest that they continue to look back at the phenomenon, that in itself was activating prior knowledge about the importance of gold
JTB: even for students who could work faster, I could print everything out and move some groups ahead while other students needed to look at the simulation longer. It evens out in the end where everyone finds a lesson that is harder.
TF: you're an excellent teacher
MM: yes he is

MM: balanced activities
Panel: yes all those things
DV: discourse tools very helpful. I have all white, all HCC students who come in wearing periodic table socks and they can recite the periodic table. They could still engage in the discourse and it was really important for them to see how all of their facts fit together. We did three stay one stray. Had to come up with what is your model on whiteboard, one student would be a spy and the rest of the group is an interview panel. Students wanted to take a picture of their board because the thing they created together was the thing they wanted to study. Using simulations and discussion was especially valuable. The card sort was great. The game was good too, they had game pieces and a nuclear game.
JTB: I thought they would hate it and they wanted to play it again the next day
DV: kids have to collaborate, play the game, with a few well-placed questions "what is going on when you have to move two steps back" "oh what's your game piece repressing again?" students can answer questions and talk while playing without being scared

MM: opportunities for career opportunities
Panel: no

MM: cultural perspectives of different ethnic backgrounds
JTB: hokey PPT on alchemy, but provides additional info and how chemistry branched out of alchemy. Talks about how alchemy started in Asia and Africa and we get to start by talking about discoveries about female scientist and scientist of color and their contribution to chemistry. The reason you all think about "magic' and things "not real" is because we belittle other cultures and let's talk about the beginnings of chemistry before we jump into chemistry.

MM: differentiation
JTB: [from before] students worked at different paces

TF: intrinsic within the unit with lots of formative assessment ongoing; providing support in the moment when students need it. I would want to differentiate more up if I were to teach this again.

TR: I have an integrated school, I have HCC in with general ed students and sped students. Frustrating in 9th grade integrated, HCC students know about the atom… but still can't provide an argument. Lessons show them that they don't know everything. It's not asking them to regurgitate facts. Gives HCC students an opportunity develop their practices and CCC. Lots of questions that are simple enough for lower students to access, be challenged, and develop understanding.

Bias Content:

TF: all historical model scientist were old white men

Panel: nothing else

Teacher usability and support

MM: constructed in a way you could use 3D teaching

TF: the lessons provided opportunities to students to try those things. Having a phenomenon forces them to use all three of those dimensions.

TR: document that shows the connections of each dimension and where they are in that unit

DV: having that document helped me a lot to call out dimensions within the lesson as you go. "you're sorting these cards… is there another pattern you can use to sort them" very useful teacher tool. Not easy to teach like this but we need to rise to the challenge. Really appreciated having the storyline document; helpful with building models.

MM: guide you in how to storyline with a phenomenon

TR: that document with the storyline says how everything connects, how students can build their model, and what they should walk away with

TF: this is the first time I've taught chemistry in a few years, and the website is laid out in a very helpful way. Don't have to flip through, website is linked though intuitively and well

MM: discourse

MM: DV already shared about discourse, how often were kids engaged in discourse a sense making

JTB: called out on each lesson page, giving discourse strategies that are helpful

TR: linked through with directions if that's not your thing

MM: *mumbles* stem teaching tool

MM: missed that because I was laughing

JTB: teacher created, everyone invited to the collaboration. Going is incredibly helpful to be surrounded by excellent colleagues who developed this and has reassign behind it. First things we looked at are what are the standards and what are ninth grades capable of? Coming in to SPS is really scary, the collaboration helped me feel like I knew what to do and what to teach and what my students needed to know. That's what this curriculum has in mind. We can go back to the collaboration and provide feedback as an equal. It's nice to be able to do that in person to people we know instead of emailing someone who we don't know. I have kids who have no idea how to round a number so I feel like I can advocate for my students for their place in this curriculum. Instruction materials are helpful, collaboration is more helpful.

TR: as someone who helped develop this curriculum, it was interesting to field test it because I've never actually looked at the schoolboy. I did it like it was intended to be used. I knew that if there were parts I didn't understand because it was different than what I had done in the past, I knew who to ask for clarification.

MM: materials provide background info in terms of content

TF: I didn't read that part very carefully

TR: three are some resources, but not a lot

JTB: there were some, there would be a "teacher power point, don't show the kids" info about the history of alchemy,

DV: model of final explanation, even if you have all the parts, it's still hard to put it all together. I don't think this unit really had things we didn't know very much.

TF: if we didn't know, we could ask the teacher next door

JTB: if the collaboration continues, that's a great safe place to ask for help with content. We have brilliant and passionate teachers in this district.

MM: professional development would be included in the adoption

Yolanda: what are some of the logistical aspects that are listed on Schoology, teacher guidance, was that something you could find easily

DV: yes, summary, NGSS components, teacher tips notes, what students should be able to explain, additional reassures, assessments called out. It's very organized and teacher friendly.

JTB: Schoology also has a forum to ask questions

Committee Member: when teachers create curriculum, we borrow from other stuff. If we adopt, do we have to purchase things, or copyright infringement, things during an official adoption, do we need to go through the borrowed stuff

MM: we would have to do that and vie been talking with the attorneys, along with ADA compliance. We have other people (not teachers) to do that. That need to be done no matter what curricula we use. Vendors have internal sources that report on that, we don't, so we would have to take care of that/

Committee Member: if we find that we have things that need to be done, would that prevent us from adopting?

MM: categories on voting that says "yes" "no" "we need to do a thorough vetting before deciding"

Committee Member: would someone from another district find this curriculum as collaborative? SPS teachers can go and talk to people here, how would that work in another district? Just as collaborative?

MM: what do you mean by collaborative

Nina: its hat because it was developed internally?

MM: yes, usability of components are what we're considering. Collab has helped these teachers. Nothing to evaluate the collaboration

TR: Schoology is super user friendly. Wheat we're trying to highlight is that we have the ability to continue to make this curriculum even more users friendly. The collaborative model makes that easier.

Committee Member: I was looking for a content perspective, you pulled from different curricula, that's pretty common, and how much of it was pulled from universities where some curricula we looked at was much linked. How much is this content linked to other sources?

DV: I'm not sure but I think our district is in the forefront of the US developing good and NGSS aligned curriculum. It's not complete, but it is really what it needs to look like according to the standards and where we want to go, so I think it will be useful for other districts, and could be presented at a more national audience when finished

MM: the question this committee needs to decide is if this is good enough. We want to support first year teachers, have all Seattle students have a common experience,

Committee Member: if it's not complete, will it be complete at the time it needs to be?

MM: that's part of the vote
Committee Member: I have a hard time defining what's "complete"
Committee Member: is it teachable?
DV: its teachable, it's not perfect
MM: are all the pieces there for a whole semester
Panel: yes
Committee Member: Danielle is saying there's a lot of things to add
DV: it's all there, there are a lot of details to iron out
JT: any curriculum will be better modified for particular students; we have immense control to be hyper critical of our own work and our students' learning. With a university they have to decide "is it worth the time to re-do and re-print" we just have to talk and make it better and re-upload.

Committee Member: if we decided that the STEMScopes is not appropriate for chem B, what are our options
MM: Let's save that for later and talk to the panel for now

Committee Member: josh and tammy said that they could ask questions of teachers? In small schools there will only be one teacher teaching this with less support from their building
Committee Member: first year teaching, only chem teacher, for me it was laid out very clearly. When I did have questions, I was part of the collaboration and could email contacts there and get immediate help. It was easy to use and easy to get help when I infrequently needed it.

Committee Member: my group wanted it to be field tested, but thought we needed safety material added. Did you have safety material added?
TR: there are safety precautions in the only lab in this section, the gold penny lab.
Committee Member: it seemed like it was assuming knowledge
Committee Member: I added that before it went to field test

Committee Member: would you continue to use this method in the future? This format, modular approach?
Panel: yes
DV: yes, students are benefitting and engaged

Committee Member: did you feel like you will be supported by your administration in your work to continue? (building level)
TF: we didn't rely on our building admin
DV: I think it is supported especially because it requires 21st century skills, we can do things instead of learning facts. When admin comes in they want to see kids argue from evidence, but that's NGSS, so if we're aligning with NGSS we're good
MM: we have a once a month principal meeting and I have presented to them 4 times, I have been bringing the principals up to speed and I think when I was at the last meeting the educational director for the region said "once the material is adopted, all schools will implement the materials as they are adopted" important to show equity across the district, important for all student to be able to learn phenomenon based instruction

JTB: lots of color coping, but easy to share materials and pick them up the morning of. It's so nice to have a local curriculum.

Committee Member: collaboration seems key in this curriculum, it we move on with any curriculum, we will continue to collaborate. Outside of the collocation what makes this curriculum something good to work with.

JTB: the website has everything on the Schoology page. Even if you wanted to never talk to another teacher again, everything is there.

Attachment I.5D: Field Test Teacher Panel Transcript
STEMScopes: CHEM A and CHEM B

Panel: RN: CHEM A: RN, RK, TC, JG CHEM B: AT, SL

Standards:
MM: DCIs apparent? Curriculum helped you meet them?
Chem A:

JG: DCI structure of an atom, reservation: built around assumption that students already know that… hook: build an atom "remind that atoms have protons and neutrons"; kids don't know about protons and neutrons while trying to talk about complex bonding

MM: that was the FIRST chapter

RN: document at start of unit that lists DCIs and SEPs that are the goal of targeting. The actual lessons and they way it's set up is unclear how those are addressed for CCCs too. There's a screenshot of the NGSS website, but as you go through its unclear how they're aligned

TC and RK agree

Chem B:

AT: agree with RN, no purpose or goals for each lesson, I'm sure you could figure it out, but it was hard

SL agree

Practices:

MM: do they practice the practices?

RK: heavy on looking at developing models and IDing patters. At the end it talked about data collection.

MM: developing models, using models, or both

RK: both

JG: using the model for us. Lots of manipulating images of atoms. One of the standards was the periodic table, we did learn how to use the PT, how to position things in the PT, but they were never given a PT which became limiting

Chem B:

SL: in questions, listed and color coded (doesn't say which ones) "this covered an SEP", carried out investigations, did not plan them, did lots of data analysis but I'm not sure if they had the tools to analyze correctly but they looked at it

TC: CCC were flagged and we did the pattern ones, but understanding what was behind the patterns, why or uses, was not there

Phenomenon:
MM: was there a phenom? Did they go back to it?
ChemA:

RN: scopes and bundles. Bundle is a unit, scope is more like a chapter. We tested one scope. The phenomenon was a swirly animation of a green blob and it said "how are atoms different from each other" the bundle phenomenon was a video of throwing sodium into water and it explodes, but the ocean doesn't explode. Not called out in lessons or revisited at any time. Students would not be able to explain at the end of the scope

JG: how are elements different from each other? They don't know what elements are… no examples of elements like how is gold different than copper.

RN: sodium exploding elementally vs in NaCl is a very different question than what are differences between elements

TC: never tied back to the swirling ball; students could try to piece it together, but not explicit at all. "make sure students know ___" was the only opportunity to address the model

ChemB:

AT: phenom for B was MgCl with HCl acid. Prove that you have MgCl and H_2 gas. Which is… not engaging and we never went back to it. Not a huge fan of the word prove.

MM: dd you feel that the assignments/activates within the scope told a story? Storyline? Cohesive?

ChemA:

RK: No connection btwn activities, no fluidity. Pieced out with not a lot of connections to previous activities. Collection of random information

RN: no prescribed sequence (5 E model), teacher materials said "do an explore activity and then do an explain activity" no order, grab one from column A and grab one from column B. We agreed to do the same thing as a group, but not from the curriculum

MM: engage, explore, explain, elaborate, evaluate (5 E model)

Chem B:

SL: four explore activities to make sense of a chemical reaction; didn't tie together. At the end of the explore, "explain the relevant material" as a chem teacher I could explain some things… I don't know how you would feel if you are not already a chem teacher. I don't think they hook together.

Assessments:

MM: dimensionality of assessments, formative and summative

ChemA;,

TC: an attempt was made, I don't' think they were truly 3D

RN: an attempt at 2D when it was linking into patterns; in the summative assessment it was still a lot of 1D; there was one CER question but it was very simplistic.

MM: 3D is DCIs tied to a skill and bundled with a CCC; CER is claim, evidence, reasoning

ChemB:

AT: I agree with TC and RN

Accessibility:

MM: could your kids access?

JG: we had difficulties. Summative, look at periodic table labeled with roman numerals when we had taught them with normal numbers; unnecessary roadblocks. Evaluating atomic structure was hard for them to identify even if they knew the concept

RK: questions were vague; "what" questions, not a lot of "why" and "how" lots of teacher to student communication

TC: lots of click on something and write what you see, not a lot of why

Chem B:

AT: lots of the questions were teacher friendly language "criteria for selection of" kids couldn't parse questions. Very frustrating for students.

MM: formative assessments help teachers and students know where they are. Embedded? Offer opportunities to track progress and modify instruction?

Chem A:

JG: questions were written in a way that gave me very limited information. Ex: card sort where they arrange atoms using # of valence electrons. 8-10 questions that were like "I paired them to make 8" students weren't getting at the subtleties. Useful one: identifying elements listed as an "intervention strategy"

ChemB:

SL: lots of worksheets and activities, but I wouldn't call them formative assessments. There were a lot of questions on worksheets asking over and over again. Had to draw 12 Lewis

dot structures on the computer, lots of time to look at and assess. Hard to do quick feedback, hard to assess understanding.

MM: summative assessments fair and accurate in terms of student learning? Did they give you tools to score?
Chem A:

RK: one of the questions on the summative assessment was not mentioned at all in any of the lessons. That was concerning. We searched through all of the questions we had at hand, there are really only three that are short answer. No rubric on how to score that type of problem. At best, 2D problems.

TC: questions often not phrased in a way that was familiar to students; new language; very difficulty

RN: physical process of scoring the assessments, they took the test in an online platform, no way to download or look at more than one. Had to scroll through a whole assessment and then do the next student's test. No way to score one question at a time. Can download score data once it's scored but no way to take their answers out of the program (but it's an overall percentage)

MM: Chief Sealth has no constant access to computers, RK has computers, TC has computers, JG does not, we had to borrow and provide computers to provide

Q: When you download information is it private?
MM: it's private
Q: if you download locally it will take the name off the thing?
MM: STEMScopes does not have access to student data because of our firewall
RN: no students names on their accounts
Q: the board will be looking for student privacy

ChemB:

AT: summative assessments were not fair; students struggled; covered one standard. There was a grading rubric, and added a rebuttal which my students hadn't done before. Not a huge fan of the rubric… they can get half credit for a rebuttal that was not connected. I appreciated having a rubric.

MM: assessments in a digital platform?
A: Yes we had to.
JG: no digital feedback for students
AT: only teacher language. "this is what the chemistry says it should say" not realistic for high schoolers.

Inclusive Educational Practices: meeting needs of all of our learnings
MM: leverage prior knowledge?
Chem A:

JG: did not find this culturally inclusive. Disconnected, lost opportunism. No context. No visuals for ELL students, not good practice. Assignments for a scientist who is a person of color, but doesn't give context for why they should care about what he did. Video about welding, no video. "No machines can replace a man's hands." A video has a woman narrating saying science is boring.

RK: assumption of prior knowledge is absurd
ChemB:

SL: asked to make huge jumps in their understanding. "now write a balanced chemical reaction" when they had never practiced that and no guidance for teachers

MM: balance of activities
Chem A:

RN: 3/5 of activities were card sorts, the other two were simulations. 18 page reading was provided but no place to put it in.

Chem B:

SL: card sort and 3 hands on labs. Third lab called for a ridiculous amount of materials, so we had to do it as a demo. Not the safest material to use either.

MM: silver nitrate, crazy expensive. No way we could afford it.

SL: 20 ml per lab group.

MM: disposal promlems too.

Q: set up to be done as a lab in the curriculum?

SL: yes, and I have seven lab groups

MM: yeah we had to do a modification, kids were involved, but we couldn't afford it as a lab

MM: career opportunities, JF said welding career video
Chem B:

AT: listed and not mandatory, not planned or built in to lessons; half paragraph blurbs, I don't remember what they were

MM: Cultural perspectives? Different ethnic backgrounds, JF touched on this earlier
Panel: nothing to add

MM: differentiation for different skill levels

JG: Looking at all different levels, at the end of the lesson there's a few boxes for including ELL strategies. Some strategies given were things that were super obvious and not specific to this lesson ex: "wait time" other things not helpful or appropriate, puts them on the spot in language insensitive way: stand somewhere to agree or disagree… need to know what it says. Tuva platform was helpful for students who had trouble graphing, but it's very complex and there are no helpful strategies, the only thing was at the end of the lab, give them sentence starters. Some students need a lot of time and some finish very quickly. There aren't extra assignments, I can add assignments, but they're too high for students needing actual interventions

TC: with HCC, students with strong academic language still struggled with the instructions for the lab. Lots of time helping parse out instructions and questions. The explore activity with graphing was potentially a strong activity but the language used doesn't line up with the graph… make a leap that clocking the "graph" button is the same as clicking the "graph now" button. Kids found it very frustrating and confusing.

Chem B:

AT: like JF said, colored boxes at the end. "they can keep sharing their ideas" no way to actually intervene or help scale the material. Unhelpful suggestions, did not lead to a better or deeper understanding.

SL: color codes strategies were not helpful.

TC: "have them make a periodic table of something fun" no actual activity made; vague reference to something one could make for them

MM: Bias content

RN: The one woman who was in any of the videos had a Spanish accent and played very dumb the whole time. It was disgusting.

SL: same video assigned in chapter two. Students called me over and I thought they were exaggerating and they weren't.

JG: the other character in that video is a robot with a distorted voice, hard for ELL kids.

MM: teacher planning usability and support, could you enact 3D teaching?

RK: disjointed lessons, no guidance on how to connect them or lead into activities. 2D at best

TC: timing was very off. "teach all of atomic structure" "make sure students understand ___" scary to rely on the instructions because they assumed lots of prior knowledge

JG: from the perspective of CRT, little opportunity for dialogue and groupwork, speaking is powerful and they didn't do that. Lots of "tell your students." Asks little of students on paper, but goes very far beyond that in expectations of what they should know (based on lecture)

Chem B:

AT: don't feel like it was 3D and I actively felt like I was becoming a worse teacher

SL: magnified in unit 2, lessons said "two days", we need things in minutes and then it said "explain stoichiometry to them" in a lesson (which should be a unit)

Phenomenon:

MM: did the materials guide on how to guide storyline/sequence?

RK: there was a phenomenon, but the activities never referred back to an explanation by students.

SL: I just realized we didn't even model our phenomenon

Discourse:

MM: discourse opportunities? How often?

RN: some activities, groups of 2-4, but there was no scaffolding of discourse. Hope they figure out the octet rule. 1-1 technology detracted from discourse, they were very focused on their screen.

RK: if norms hadn't already been built in my class, this would have been a disaster. Teacher was the keeper of knowledge. I am used to teaching as a facilitator. It made my students very angry with me. Students came in and wanted me to do something different and I told them I was sorry and couldn't (field test)

TC: too much jumps for students to get to where the lesson wanted them to get, with lots of distractors thrown in, things presented as absolute truth, not realistic for my students to get there in a group setting

ChemB:

SL: labs in groups, but questions didn't seem like they should be worked on together; screens make them individualistic

MM: day to day? I didn't 'catch this; content supported?

TC: clear what I was supposed to do, some of those steps were nonsensical, some of them didn't seem to help my students get to where we wanted them to get to

JG: I had to often go to my colleagues to ask about the chemistry "explain the difference between metallic, covalent, ionic bonding" couldn't find the important information in the curriculum; needed experts around to help with content

RN: very long background info document which often doesn't overlap with what's in the unit

AT: lessons did not have anything for guidance, common issues/preconceptions "some students might say this" hard to include into the lesson. Background knowledge, I didn't look at it a ton. They skipped one of the basic chemical reactions and had some slides that were inaccurate and weird labeling things that wasn't great.

SL: inaccuracies in things to present to students which was frustrating. Videos on how to set up the labs, that would be helpful. I needed more help on how to guide my students through assignments with HUGE jumps.

AT: setups were great, no cleanup or how to take care of materials. Especially with dangerous materials. Told you how to do it, but often hard chemicals to work with and clean up

TC: poor answer keys, “answers will vary” on short answer questions

Additional Questions

Committee Member: protocol, committee members also part of the field test. If someone outside of this committee could question bias how could we resolve that?

MM: we had a meeting with the attorney. We have a community that is small, so people stepped forward to pilot and these are the people who came forward. Int his case Rebecca and autumn signed that they would be as impartial as they could.

Committee Member: noted in our evaluation into the board?

MM: yes, I appreciate bringing this forward. Attorney said as long as they said they would represent the materials with as little bias as they could.

Committee Member: I think teachers who are both on the committee and field testing have given a lot of time, so I think it’s clear that you’re here to help and find the best thing for students. Thank you!

Committee Member: is there anyone who would choose to use this material into the future?

Panel: *long awkward silence*

RN: I really wanted to like this. I wanted a curriculum with developed units and answer keys, I really wanted it to work.

JG: it would be hard for me to meaningfully implement this if it was adopted.

Attachment J: Analysis and Synthesis Summary of Feedback and Data for BIO A

A. Stage 1: Committee determines finalists for field test
    a. Review Criteria Tool can be found in Attachment E
    b. Summary scores of Carbon TIME:

Category	Weighting	Team 1	Team 2	Average
Category 1: Standards Alignment	0.24	**70.3**	**68.8**	**69.5**
Category 2: Assessments	0.20	**78.8**	**82.7**	**80.8**
Category 3: Inclusive Educational Practices	0.17	**44.2**	**51.9**	**48.1**
Category 4: Evaluation of Bias Content	0.16	**15.0**	**20.0**	**17.5**
Category 5: Instructional Planning and Support	0.23	**67.1**	**72.4**	**69.7**
Total, based on weighting		**58.0**	**61.7**	**59.9**

B. Field Test Data Collection found in Attachment I
C. Summary of Community and Family Input and Feedback found in Attachment G
D. Stage 2: Analysis based on:
    a. Review Criteria of Vendors (above)
    b. Consensus Scores for Field Test Components in Attachment I
    c. Summary of Community and Family Input and Feedback

Summary Posters of this analysis:

Team	Consensus Score
Team A	68.5
Team B	60.6
Team C	67.1
Team D	74.0
Team E	75.8
Team F	73.2
Team G	71.5
Team H	71.6
AVERAGE	**70.2**

Carbon TIME	Team A		**Score** **68.5**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**59.9**	**34.0**	**20.4**
Field Test Data	**72.5**	**55.9**	**40.5**
Public Feedback	**75.0**	**10.1**	**7.6**

Carbon TIME	Team B		**Score** **60.6**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**59.9**	**34.0**	**20.4**
Field Test Data	**72.0**	**55.9**	**40.2**
Public Feedback	**0.0**	**10.1**	**0.0**

Carbon TIME	Team C		**Score** **67.1**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**59.9**	**34.0**	**20.4**
Field Test Data	**69.9**	**55.9**	**39.1**
Public Feedback	**75.0**	**10.1**	**7.6**

Carbon TIME	Team D		**Score** **74.0**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**59.9**	**34.0**	**20.4**
Field Test Data	**79.0**	**55.9**	**44.2**
Public Feedback	**93.3**	**10.1**	**9.4**

Carbon TIME	Team E		**Score** **75.8**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**59.9**	**34.0**	**20.4**
Field Test Data	**58.3**	**55.9**	**47.7**
Public Feedback	**NA**	**10.1**	**NA**

Carbon TIME	Team F		**Score** **73.2**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**59.9**	**34.0**	**20.4**
Field Test Data	**79.8**	**55.9**	**44.6**
Public Feedback	**95.0**	**10.1**	**9.6**

Carbon TIME	Team G		**Score** **71.5**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**59.9**	**34.0**	**20.4**
Field Test Data	**81.0**	**55.9**	**45.3**
Public Feedback	**58.1**	**10.1**	**5.9**

Carbon TIME	Team H		**Score** **71.6**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**59.9**	**34.0**	**20.4**
Field Test Data	**80.8**	**55.9**	**45.1**
Public Feedback	**60.0**	**10.1**	**6.1**

Attachment J: Analysis and Synthesis Summary of Feedback and Data for BIO B

A. Stage 1: Committee determines finalists for field test
    a. Review Criteria Tool can be found in Attachment E
    b. Summary scores of the Teacher-Developed Curriculum:

Category	Weighting	Team 1	Team 2	Team 3	Average
Category 1: Standards Alignment	0.24	**76.6**	**71.9**	**73.4**	**74.0**
Category 2: Assessments	0.20	**76.9**	**84.6**	**71.2**	**77.6**
Category 3: Inclusive Educational Practices	0.17	**44.2**	**44.2**	**44.2**	**44.2**
Category 4: Evaluation of Bias Content	0.16	**15.0**	**5.0**	**2.5**	**7.5**
Category 5: Instructional Planning and Support	0.23	**60.5**	**56.6**	**59.2**	**58.8**
Total, based on weighting		**57.6**	**55.5**	**53.4**	**55.5**

B. Field Test Data Collection found in Attachment I
C. Summary of Community and Family Input and Feedback found in Attachment G
D. Stage 2: Analysis based on:
    a. Review Criteria of Vendors (above)
    b. Consensus Scores for Field Test Components in Attachment I
    c. Summary of Community and Family Input and Feedback

Summary Posters of this analysis:

Team	Consensus Score
Team A	67.6
Team B	64.0
Team C	67.8
Team D	74.8
Team E	75.0
Team F	66.3
Team G	71.5
Team H	82.4
AVERAGE	**71.2**

BIO Teacher-Developed	Team A		**Score** **67.6**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**55.5**	**33.6**	**18.6**
Field Test Data	**74.0**	**63.9**	**47.3**
Public Feedback	**NA**	**2.5**	**NA**

BIO Teacher-Developed	Team B		**Score** **64.0**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**55.5**	**33.6**	**18.6**
Field Test Data	**71.0**	**63.9**	**45.4**
Public Feedback	**0.0**	**2.5**	**NA**

BIO Teacher-Developed	Team C		**Score** **67.8**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**55.5**	**33.6**	**18.7**
Field Test Data	**76.8**	**63.9**	**49.1**
Public Feedback	**0.0**	**2.5**	**0.0**

BIO Teacher-Developed	Team D		**Score** **74.8**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**55.5**	**33.6**	**18.7**
Field Test Data	**88.0**	**63.9**	**56.2**
Public Feedback	**NA**	**2.5**	**0.0**

BIO Teacher-Developed	Team E		**Score** **66.3**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**55.5**	**33.6**	**18.6**
Field Test Data	**74.6**	**63.9**	**47.7**
Public Feedback	**-**	**2.5**	**-**

BIO Teacher-Developed	Team F		**Score** **66.3**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**55.5**	**33.6**	**18.6**
Field Test Data	**74.6**	**63.9**	**47.7**
Public Feedback	**-**	**2.5**	**-**

BIO Teacher-Developed	Team G		**Score** **71.5**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**55.5**	**33.6**	**18.6**
Field Test Data	**74.6**	**63.9**	**47.7**
Public Feedback	**-**	**2.5**	**-**

BIO Teacher-Developed	Team H		**Score** **82.4**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**55.5**	**33.6**	**18.6**
Field Test Data	**86.5**	**63.9**	**55.5**
Public Feedback	**-**	**2.5**	**-**

Attachment J: Analysis and Synthesis Summary of Feedback and Data for CHEM A

A. Stage 1: Committee determines finalists for field test
    a. Review Criteria Tool can be found in Attachment E
    b. Summary scores of the two finalist programs:

Category	Weighting	Teacher-Developed	STEMScopes
Category 1: Standards Alignment	0.24	**64.1**	**60.4**
Category 2: Assessments	0.20	**31.2**	**34.0**
Category 3: Inclusive Educational Practices	0.17	**29.3**	**27.6**
Category 4: Evaluation of Bias Content	0.16	**10.0**	**15.8**
Category 5: Instructional Planning and Support	0.23	**37.2**	**46.1**
Total, based on weighting		**36.8**	**39.1**

B. Field Test Data Collection found in Attachment I
C. Summary of Community and Family Input and Feedback found in Attachment G
D. Stage 2: Analysis based on:
    a. Review Criteria of Vendors (above)
    b. Consensus Scores for Field Test Components in Attachment I
    c. Summary of Community and Family Input and Feedback

Summary Posters of this analysis:

Team	Teacher-Developed	STEMScopes
Team A	61.9	32.6
Team B	48.7	29.6
Team C	57.5	22.5
Team D	62.1	24.4
Team E	62.2	20.2
Team F	71.2	24.1
Team G		24.1
Team H	60.2	28.1
AVERAGE	**60.5**	**25.7**

CHEM A Teacher-Developed	Team A		**Score** **61.9**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**36.87**	**33.4**	**12.3**
Field Test Data	**71.0**	**52.5**	**37.3**
Public Feedback	**87.5**	**14.1**	**12.3**

CHEM A Teacher-Developed	Team B		**Score** **48.7**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**36.8**	**33.4**	**12.3**
Field Test Data	**69.4**	**52.5**	**36.4**
Public Feedback	**0.0**	**14.1**	**0.0**

CHEM A Teacher-Developed	Team C		**Score** **57.5**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**36.8**	**33.4**	**12.3**
Field Test Data	**86.0**	**52.5**	**45.2**
Public Feedback	**NA**	**14.1**	**NA**

CHEM A Teacher-Developed	Team D		**Score** **62.1**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**36.8**	**33.4**	**12.3**
Field Test Data	**79.9**	**52.5**	**42.0**
Public Feedback	**56.0**	**14.0**	**7.8**

CHEM A Teacher-Developed	Team E		**Score** **62.2**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**36.8**	**33.4**	**12.3**
Field Test Data	**78.3**	**52.5**	**41.1**
Public Feedback	**NA**	**14.1**	**NA**

CHEM A Teacher-Developed	Team F		**Score** **71.2**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**36.8**	**33.4**	**12.3**
Field Test Data	**85.6**	**52.5**	**44.9**
Public Feedback	**100.0**	**14.0**	**14.0**

CHEM A Teacher-Developed	Team G		**Score**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**36.8**	**34.0**	**12.3**
Field Test Data	**71.0**	**55.9**	**37.3**
Public Feedback		**14.1**	

CHEM A Teacher-Developed	Team H		**Score** **60.2**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**36.8**	**33.4**	**12.3**
Field Test Data	**78.5**	**52.5**	**41.0**
Public Feedback	**50.0**	**14.0**	**7.0**

STEMScopes	Team A		**Score** **32.6**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.5**	**13.0**
Field Test Data	**29.5**	**52.5**	**15.0**
Public Feedback	**NA**	**14.1**	**NA**

STEMScopes	Team B		**Score** **29.6**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.4**	**13.1**
Field Test Data	**31.5**	**52.5**	**16.5**
Public Feedback	**0.0**	**14.1**	**0.0**

STEMScopes	Team C		**Score** **22.5**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.4**	**13.1**
Field Test Data	**18.1**	**52.5**	**9.5**
Public Feedback	**NA**	**14.1**	**NA**

STEMScopes	Team D		**Score** **24.5**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.4**	**13.1**
Field Test Data	**21.7**	**52.5**	**11.4**
Public Feedback	**0.0**	**14.1**	**0.0**

STEMScopes	Team E		**Score** **20.2**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.4**	**13.1**
Field Test Data	**18.9**	**52.5**	**10.4**
Public Feedback	**NA**	**14.1**	**NA**

STEMScopes	Team F		**Score** **24.1**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.4**	**13.1**
Field Test Data	**21.0**	**52.5**	**11.0**
Public Feedback	**-**	**14.0**	**-**

STEMScopes	Team G		**Score** **24.1**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**34.0**	**13.1**
Field Test Data	**21.0**	**55.9**	**11.0**
Public Feedback	**-**	**14.1**	**-**

STEMScopes	Team H		**Score** **28.1**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.4**	**13.1**
Field Test Data	**21.0**	**52.5**	**11.0**
Public Feedback	**-**	**14.1**	**-**

Attachment J: Analysis and Synthesis Summary of Feedback and Data for CHEM B

A. Stage 1: Committee determines finalists for field test
    a. Review Criteria Tool can be found in Attachment E
    b. Summary scores of STEMScopes:

Category	Weighting	Team 1	Team 2	Team 3	Average
Category 1: Standards Alignment	0.24	**28.1**	**82.8**	**70.3**	**60.4**
Category 2: Assessments	0.20	**25.0**	**76.9**	**DNF***	**34.0**
Category 3: Inclusive Educational Practices	0.17	**13.5**	**69.2**	**DNF***	**27.6**
Category 4: Evaluation of Bias Content	0.16	**5.0**	**42.5**	**DNF***	**15.8**
Category 5: Instructional Planning and Support	0.23	**22.4**	**69.7**	**46.1**	**46.1**
Total, based on weighting		**20.0**	**69.9**	**27.5**	**39.1**

*DNF = Did not finish review; rejected curriculum by consensus.

B. Field Test Data Collection found in Attachment I
C. Summary of Community and Family Input and Feedback found in Attachment G
D. Stage 2: Analysis based on:
    a. Review Criteria of Vendors (above)
    b. Consensus Scores for Field Test Components in Attachment I
    c. Summary of Community and Family Input and Feedback

Summary Posters of this analysis:

Team	Teacher-Developed Curriculum
Team A	31.3
Team B	32.0
Team C	24.0
Team D	22.2
Team E	30.7
Team F	25.7
Team G	25.5
Team H	27.5
AVERAGE	**27.4**

STEMScopes	Team A		**Score** **31.3**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.6**	**13.1**
Field Test Data	**27.0**	**60.0**	**16.2**
Public Feedback	**NA**	**6.4**	**NA**

STEMScopes	Team B		**Score** **32.0**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.6**	**13.1**
Field Test Data	**31.5**	**60.0**	**18.9**
Public Feedback	**0.0**	**6.4**	**0.0**

STEMScopes	Team C		**Score** **24.0**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.6**	**13.1**
Field Test Data	**18.1**	**60.0**	**10.9**
Public Feedback	**NA**	**6.4**	**NA**

STEMScopes	Team D		**Score** **22.2**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.6**	**13.1**
Field Test Data	**15.1**	**60.0**	**9.1**
Public Feedback	**NA**	**6.4**	**NA**

STEMScopes	Team E		**Score** **30.7**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.6**	**13.1**
Field Test Data	**25.5**	**60.0**	**15.3**
Public Feedback	**NA**	**6.4**	**NA**

STEMScopes	Team F		**Score** **25.7**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.6**	**13.1**
Field Test Data	**21.0**	**60.0**	**12.6**
Public Feedback	**-**	**6.4**	**-**

STEMScopes	Team G		**Score** **25.5**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.6**	**13.1**
Field Test Data	**20.5**	**60.0**	**12.3**
Public Feedback	**-**	**6.4**	**-**

STEMScopes	Team H		**Score** **27.5**
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**39.1**	**33.6**	**14.0**
Field Test Data	**21.0**	**60.0**	**13.5**
Public Feedback	**-**	**6.4**	**-**

Attachment J: Analysis and Synthesis Summary of Feedback and Data for PHYS A and B

A. Stage 1: Committee determines finalists for field test
    a. Review Criteria Tool can be found in Attachment E
    b. Summary scores of PEER:

Category	Weighting	Team 1	Team 2	Average
Category 1: Standards Alignment	0.24	**65.6**	**50.0**	**57.8**
Category 2: Assessments	0.20	**48.1**	**55.8**	**51.2**
Category 3: Inclusive Educational Practices	0.17	**28.8**	**44.2**	**36.5**
Category 4: Evaluation of Bias Content	0.16	**7.5**	**15.0**	**11.3**
Category 5: Instructional Planning and Support	0.23	**53.9**	**56.6**	**55.3**
Total, based on weighting		**43.9**	**46.1**	**45.0**

B. Field Test Data Collection found in Attachment I
C. Summary of Community and Family Input and Feedback found in Attachment G
D. Stage 2: Analysis based on:
    a. Review Criteria of Vendors (above)
    b. Consensus Scores for Field Test Components in Attachment I
    c. Summary of Community and Family Input and Feedback

Summary Posters of this analysis:

Team	PEER Score
Team A	68.1
Team B	63.5
Team C	59.0
Team D	59.4
Team E	58.9
Team F	65.3
Team G	62.1
AVERAGE	**62.3**

PEER	Team A		Score 68.1
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**45.0**	**38.2**	**17.2**
Field Test Data	**90.0**	**56.6**	**50.9**
Public Feedback	**0.0**	**5.2**	**0.0**

PEER	Team B		Score 63.6
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**45.0**	**38.2**	**17.2**
Field Test Data	**76.0**	**56.6**	**43.0**
Public Feedback	**67.0**	**5.2**	**3.4**

PEER	Team C		Score 59.0
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**45.0**	**38.2**	**17.2**
Field Test Data	**73.8**	**56.6**	**41.8**
Public Feedback	**0.0**	**5.2**	**0.0**

PEER	Team D		Score 59.4
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**45.0**	**38.2**	**17.2**
Field Test Data	**68.8**	**56.6**	**38.9**
Public Feedback	**62.5**	**5.2**	**3.3**

PEER	Team E		Score 58.9
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**45.0**	**38.2**	**17.8**
Field Test Data	**66.8**	**56.6**	**378**
Public Feedback	**75.0**	**5.2**	**3.9**

PEER	Team F		Score 65.3
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**45.0**	**38.2**	**17.8**
Field Test Data	**85.0**	**56.6**	**48.1**
Public Feedback	**-**	**5.2**	**-**

PEER	Team G		Score 62.1
	Consensus Score	**Weight**	**Score x Weight**
Review Criteria Score	**45.0**	**38.2**	**17.2**
Field Test Data	**72.5**	**56.6**	**41.0**
Public Feedback	**75.0**	**5.2**	**3.9**

Attachment K

Racial Equity Analysis Tool

It is the moral and ethical responsibility and a top priority for Seattle Public Schools to provide Equity Access and Opportunity for every student, and to eliminate racial inequity in our educational and administrative system.

Research indicates that racial disparities exist in virtually every key indicator of child, family, and community well-being. Individual, institutional and structural impacts of race and racism are pervasive and significantly affect key life indicators of success. The **Racial Equity Analysis Tool** lays out a clear process and a set of questions to guide the development, implementation and evaluation of significant policies, initiatives, professional development, programs, instructional practices and budget issues to address the impacts on racial equity. To do this requires ending **individual racism**, **institutional racism** and **structural racism**.

The concept of **racial equity** goes beyond formal racial equality — where all students are treated the same — to fostering a barrier-free environment where all students, regardless of their race have the opportunity to achieve. This means differentiating resource allocations, within budgetary limitations, to serve students with the support and opportunities **they need** to succeed academically.

Why and when should I use it?

- ***Use*** this tool to create an equity lens for educational leaders:

  The Racial Equity Analysis Toolkit provides a set of guiding questions to determine if existing and proposed policies, budgetary decisions, programs, professional development and instructional practices are likely to close the opportunity gap for specific racial groups in Seattle Public Schools.
- ***Apply*** the tool to decrease the opportunity gap, and increase positive outcomes for students of color.

Department/Region/School: **Science/All District/K-12 Schools**

Facilitator: **MaryMargaret Welch** Date: **April 2015 - Present**

Committee/Community members: **MaryMargaret Welch, Alisha Taylor, Brad Shigenaka, Christine Benita, Christine Boyll, K-8 Adoption Committee members, and future 9-12 Adoption Committee membership, which will be finalized by October 15, 2018.**

Decision/Policy: **K-12 Science Instructional Materials Adoption**

Making a new decision? **Yes, the Committee will recommend instructional materials for adoption.**

Expected Outcomes: **Equitable access for all students to current, high quality, standards-aligned science instructional materials.**

Have you had any Equity Training from SPS? **SPS Race & Equity Team training series**

How many times have you used the Analysis Tool? **Science Alignment Team work 2016-17**

Please mark the type of decision below:

Applicable Policy: No	Procedure: No
Program: Yes	Budget Issue: No
Professional Development: No	Hiring and Staffing: No

Racial Equity Analysis Tool

Glossary:

Race: Race is a powerful social idea that gives people different access to opportunities and resources. Race is not biological but is real. Race affects everyone, whether we are aware of it or not.

Individual racism: Pre-judgment, bias, stereotypes about an individual or group based on race. The impacts of racism on individuals include members of certain racial groups internalizing privilege and people of color internalizing oppression.

Institutional racism: When organizational programs or policies work to the benefit of certain racial groups and to the detriment of people of color, usually unintentionally or inadvertently.

Structural racism: The interplay of policies, practices, and programs of multiple institutions which leads to adverse outcomes and conditions for people of color compared to members of other racial groups. This occurs within the context of racialized historical and cultural conditions.

Accountable: Responsive to the needs and concerns of those most impacted by the issues you are working on, particularly to communities of color and those historically underrepresented in the civic process.

Educational and Racial Equity: Providing equitable access to opportunities, resources and support for each and every child by intentionally recognizing and eliminating historical barriers, as well as the predictability of personal and academic success based on race, background and/or circumstance.

Racial Inequity: When communities of color do not have access to opportunities and a person's race can predict their social, economic and political opportunities and outcomes.

Stakeholders: Those student, families and community groups impacted by proposed policy, program or budget issue who have potential concerns or issue expertise. Examples might include: specific racial/ ethnic groups, other institutions like Seattle Housing Authority, schools, community-based organizations, staff and families.

Culture: The ways that we each live our lives; including values, language, customs, behaviors, expectations, ideals governing childrearing, the nature of friendship, patterns of handling emotions, social interaction rate, notions of leadership, etc.

Expected Outcomes: A measurable result that is planned for, using the racial equity tool.

SEATTLE PUBLIC SCHOOLS

Racial Equity Analysis Tool

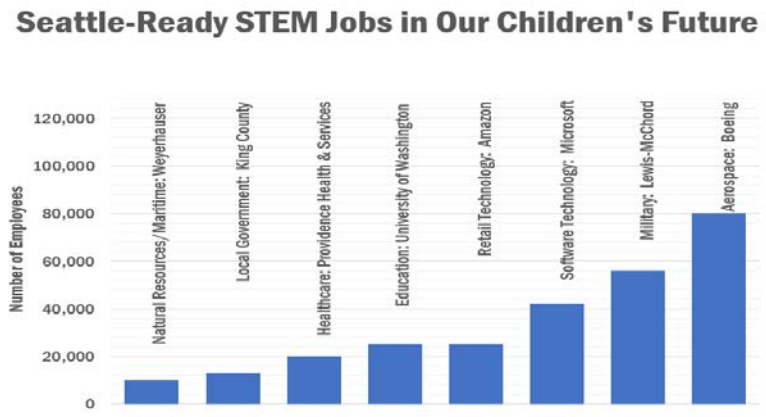
STEP 1: Set Outcomes, Identify and Engage Stakeholders
Leadership sets key racially equitable outcomes and engages stakeholders (SPS staff and community members.)

1. What does your department/division/school define as racially equitable outcomes related to this issue?

Seattle Public Schools Science Departments has used this tool to ensure that the Science Materials Adoption Committee members represent Seattle's diverse population. This tool was also used to ensure the Adoption Committee evaluates materials using a racial equity lens. Our goal is to improve accessibility for all students to culturally relevant, rigorous science learning called for by Next Generation Science Standards which the state adopted in 2013, known as the Washington State Science Learning Standards, WSSLS, in order to eliminate the opportunity gap for students of color in regards to STEM careers so that our students are college and career ready.

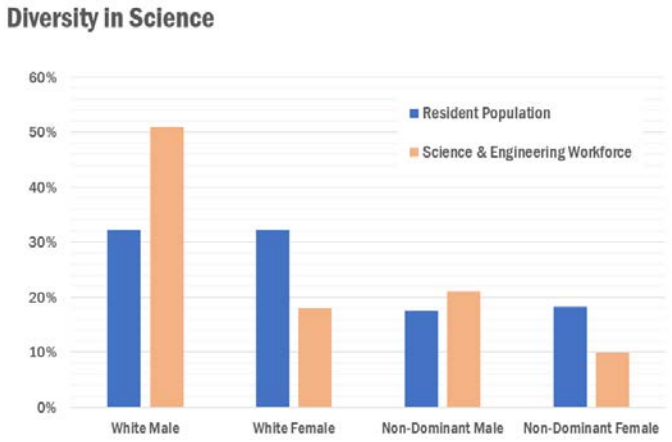
The WSSLS calls for students to learn science and engineering practices through engaging, culturally relevant content. We have defined racially equitable outcomes for students of color, English language learners, and students with special needs as the increased participation and success in science of these students. Historically, K-12 science has focused on direct instruction, observation and an overemphasis on the scientific method, making it difficult for many learners to access the content. In fact, nationally, we have a crisis in equity in STEM fields, and in our state of Washington there is great disparity between the concentration of STEM-related jobs and a prepared labor pool. The data below quantifies the manifestation of the opportunity gap for students of color locally and nationally at both K-12 and in the workforce:

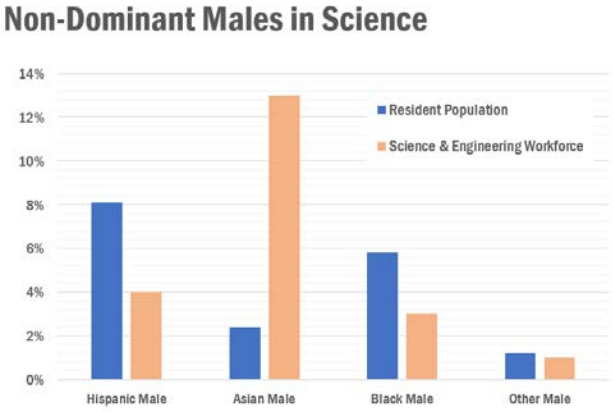
- Washington 4th grade African American and Hispanic students, respectively, score 31 and 29 points lower on the National Assessment of Educational Progress in Science. (*2015 National Assessment of Educational Progress (NEAP) Nation's Report Card - http://nces. ed.gov/nationsreportcard/states/*.)
- Washington's achievement gaps in math and science have not improved in over a decade and are the 12th largest in the nation. If we continue to address the achievement gap at this current glacial rate, it would take 150 years for our African American students to realize the same level of achievement as their peers. (*Center for Education Policy, The Achievement Gap: Slow and Uneven Progress for Students, 2010*.)

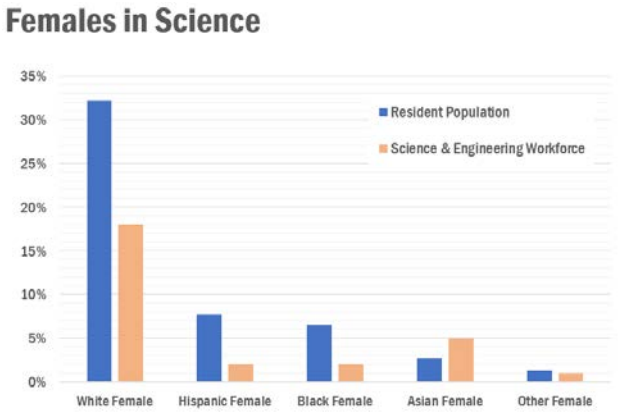


Source: Washington STEM, www.washingtonstem.org, 2016.

- In 2014, only 43 percent of U.S. high school graduates were ready for college work in math; 37 percent were ready in science. (*The Condition of College & Career Readiness. Iowa City, IA: ACT, Inc., 2014 < http://www.act. org/research/policymakers/cccr14/readiness.html>*)







Source: Guterl, Fred. "Diversity in Science: Where Are the Data?" Scientific American, 1 Oct. 2014, www.scientificamerican.com/article/diversity-in-science-where-are-the-data/.

The Adoption Committee will select instructional materials that are aligned to the WSSLS. The adopted materials will increase equitable access to all K-12 students and prepare them for success in core science courses in high school and college preparatory science courses (AP/IB). Moreover, the shift in science pedagogy embedded within this alignment provides all students with 21st century skills not previously embedded within science coursework, as described in Appendix D of the Next Generation Science Standards. This appendix highlights how these standards have been developed for all students, how these standards can be met and exceeded by students of color, students with disabilities, economically disadvantaged students, and English language learners.

2. How will leadership communicate key outcomes to stakeholders for racial equity to guide analysis?

In order to diversify communication channels and reach the maximum number of stakeholders, channels for communication with stakeholders will include the district Science Adoption webpage, district social media accounts, district newsletters, and printed materials be available in school offices. The SPS Science Program and Adoption Committee will communicate throughout the adoption process key outcomes to all stakeholders to be impacted by the adoption, including racial and ethnic communities as well as families of ELL, Special Ed, and HCC students.

- Application materials for the Science Adoption Committee for staff/teachers and for family/community members will be available to stakeholders through the communication channels above and will be available in four languages on Schoology and will be translatable into district languages on the SPS website. Adoption application deadline will be included on application.
- Selected K-8 Adoption Committee applicants were identified, confirmed, and committee membership was announced on June 13; 9-12 Adoption Committee applicants will be identified, confirmed, and committee membership will be announced on October 22.
- To ensure input and feedback from all racial and ethnic groups to be impacted by the adoption, as well as families of ELL, Special Ed, and HCC students, the Adoption Committee will engage stakeholder through the completion of a survey that will be communicated through the channels outlined above to elicit qualitative and quantitative data about their perceptions, attitudes, needs, and concerns as they relate to the adoption of science materials. The Adoption Committee will use this data in conjunction with the Race & Equity Analysis Tool and Instructional Materials Evaluation Criteria tool to inform their review and evaluate Instructional Materials for field-testing.
- The Adoption Committee will select and announce the candidate Instructional Materials for field-testing. Field test instructional materials will be on display for public viewing in multiple locations across the district. The Adoption Committee will elicit feedback from families and community members through both electronic and paper channels.
- Input and feedback from teachers about this experience with instruction, assessment, management, and preparation of the candidate instructional materials will be systematically collected throughout the field test and shared at a public hearing. Student feedback, input, and attitudes about engaging in shifts in science practice will be captured throughout the field test process to ensure student voice.
- Adoption Committee synthesizes and analyzes all input and feedback from all stakeholders on candidate instructional materials, including the field-test, and announces their recommendation for adoption to stakeholders via the communication channels outlined above.

3. How will leadership identify and engage stakeholders: racial/ethnic groups potentially impacted by this decision, especially communities of color, including students who are English language learners and students who have special needs?

The Adoption Committee will engage stakeholders, including administrators, teachers, families and the community in the instructional materials adoption with a Needs Assessment Survey to assess their needs, attitudes and concerns related to the selection of science instructional materials. To ensure equitable access to the input survey, it will be translated into the district's top four languages, be available in paper form, and open throughout the year so the community has multiple opportunities to access the survey either in paper form or electronically.

Administration, teachers, Seattle Public Schools Communications Team as well as community members will ensure our racial/ethnic groups, including communities of color, impacted by the adoption of new science materials receive and engage with the survey.

Racial Equity Analysis Tool

STEP 2: Engage Stakeholders in Analyzing Data

Stakeholders (SPS staff and community members) gather and review quantitative and qualitative disaggregated data and specific information to determine impacts or consequences.

1. How will you collect specific information about the school, program and community conditions to help you determine if this decision will create racial inequities that would increase the opportunity gap?

The application process will ensure that the Adoption Committee membership includes representation from Seattle's diverse racial and ethnic communities. The work sessions will be held when the committee members are available to meet. At the first meeting, the newly formed committee will determine future dates and locations to ensure the majority are able to attend. We will work with the ELL Department to have translators and transportation for committee members. The Adoption Committee will analyze qualitative and quantitative data and engage in sense making of patterns and trends from the input survey in order to ensure racially equitable outcomes for the selection of science instructional materials. The evaluation tool used by the Adoption Committee has criteria addressing racial equity to help screen materials; this criterion was developed using multiple resources including Washington Models for the Evaluation of Bias Content in Instructional Materials.

According to a 2017 statewide data survey from Washington STEM, 94% WA voters believe that every child in the state should have access to a high-quality STEM education in Washington's K-12 public schools. 83% believe that a high-quality STEM education is a "necessary part" of the state's obligation to provide "basic education". 88% of WA state residents agree that children who live in poverty have a better chance to break the cycle of poverty if they have a strong STEM education.

2. Are there negative impacts for specific student demographic groups, including English language learners and students with special needs?

Currently not all students receive equitable access to science instruction and materials. This is particularly impactful to our underserved populations of students, including English language learners and students with special needs. The adoption of new science materials will address the need to provide science learning that will include multiple modalities in both instruction and assessment.

Chapter 11 of the NRC Framework for K-12 Science Education acknowledges that in schools serving the most academically at-risk students, there is "today an almost total absence of science in the early elementary grades. This is particularly problematic, given the emerging consensus that opportunities for science learning and personal identification with science—as exemplified in this framework—are long-term developmental processes that need sustained cultivation. In other words, the lack of science instruction in early elementary school grades may mean that only students with sources of support for science learning outside school are being brought into that long-term developmental process; this gap initiates inequalities that are difficult to remediate in later schooling."

According to a study published in 2013 by the ASPIRES Project, a student's science aspirations and views of science are formed during the primary years and solidified by the age of 14. The study concludes that efforts to broaden students' aspirations in relation to science and engineering should begin in the primary grades, and that "the current focus of most activities and interventions – at secondary school – is likely to be too little too late". The research is clear: a strong cradle to career STEM education prepares students for high-demand jobs and contributes to the vitality of their families, communities, and local economies.

Racial Equity Analysis Tool

STEP 3: Ensuring educational and racial equity /Determine Benefit or Burden
Stakeholders (SPS staff and community members) collaborate to analyze how this policy/ decision/proposal/initiative/budget issue will increase or decrease educational and racial equity.

The Adoption Committee will be comprised of a diverse representation of stakeholders who will engage consistently throughout the adoption process to collaboratively analyze the potential outcomes of decision-making to ensure equity, including:

- The Race Equity Analysis Tool serves to guide the adoption process from communication, evaluation, selection and onto implementation of adopted instructional materials.
- Analyze data collected from the family and community stakeholder input survey.
- Analyze instructional materials using the Instructional Materials Evaluation Criteria Tool, which includes category #3: *Accessibility for Diverse Learners* and category #4: *Evaluation of Bias Content.*
- Analyze feedback data from teachers, students, families, and community members about the candidate instructional materials used in the field-test.

1. What are the potential benefits or unintended consequences?

The adoption of instructional materials will provide a common scope and sequence of instructional units across the grade levels, across the district. The impact of transient students, who are more often students of color, English language learners, and students with lower socio-economic status, will be minimized; therefore, the impact of student learning will be minimized. The adoption of science materials will also ensure, regardless of the schools' demographics, all schools will receive equitable distribution of the same materials. By providing students with aligned core science units in all buildings, students who move schools have less "catching up" to do while already experiencing the significant life change of moving. Teaching a common scope and sequence of units will maximize the teacher's ability to participate in a professional learning community focused on analyzing student work to improve instruction and to shift their practice to align with the new state standards thus providing more equitable outcome for students. As students continue to experience the pedagogical shift of the WSSLS, new instructional materials in K-12 will provide the foundation of science learning for all students to be successful in high school and to be college ready.

To ensure that this adoption does not result in the unintended consequence of perpetuating the current educational and racial inequities in our district, the adoption committee must analyze how the adoption process and implementation of the adopted materials will:

- Include sustainability of teacher supports, including materials, technology, instruction, and pedagogy.
- Provide continued ongoing professional learning for teachers around shifting classroom instruction and pedagogy to equitable teaching practices, including learning opportunities that support teachers in developing and maintaining a growth mindset.
- Include an ongoing data collection from students, teachers, and other stakeholders about attitudes and perceptions of science learning and teaching as a result of the adoption. Analysis and evaluation of this data must be used for ongoing modification and optimization of the adopted instructional materials to ensure equitable learning outcomes for all students over time.

2. What would it look like if this policy/decision/initiative/proposal ensured educational and racial equity for every student?

By increasing access of all students to science, particularly students of color, English language learners, and students with special needs to science, Seattle Public Schools will continue to prepare students for STEM fields. As previously mentioned in Step #1: students of color have inequitable STEM field and college preparatory classes. The adoption of high quality, culturally responsive, standards-aligned instructional materials, that feature culturally relevant science phenomena and engineering design opportunities, will empower students to see themselves in a potential STEM-field career. The pedagogical methods embedded in the aligned instructional materials will support students in "thinking like a scientist/engineer" as they learn how to "figure out/problem solve" instead of simply "learning about". Accordingly, this can increase the educational opportunities of these students, including increased access to college preparatory science classes (AP/IB), as well as increased opportunities to colleges, universities and STEM fields.

Racial Equity Analysis Tool

STEP 4: Evaluate Success Indicators and/or Mitigation Plans

Stakeholders (SPS staff and community members) identify ongoing measures of success or mitigation plans for negative impacts

1. How will you evaluate and be accountable for making sure that the proposed solution ensures educational equity for all students, families and staff?

   The Science Program, as well as individual teachers and schools will continue to assess the successes of all students in science learning. The completion of science summative assessments of student learning from each unit will provide quarterly student growth data and can be disaggregated for racial and ethnic groups, English language learners, and other underserved student groups. The WCAS high-stakes assessment also provides an opportunity for teachers, schools, and Seattle Public Schools to evaluate the performance of different student groups on an WSSLS-based test. This data will inform teacher professional development learning in which teachers work together to refine, and improve shared pedagogy, instruction and materials through collaboration.

2. What are specific steps you will take to address impacts (including unintended consequences), and how will you continue to partner with stakeholders to ensure educational equity for every student?

   To continue to improve learning for all students, particularly the impact on students of color, English language learners, students with disabilities, and other student populations, the SPS Science Program, teachers, and schools will continue to qualitatively and quantitatively monitor the science achievements of all students using the formative and summative assessment systems provided by the instructional materials programs. The SPS Science Program will engage Special Education and ELL teachers through professional learning resources and opportunities in increasing embedded strategies to support students served in these programs and to engage in the aligned science coursework.

   To continue to improve science education in Seattle Public Schools for all students, the SPS Science Program will implement data driven gap-closing measurable outcomes such as

   - implementation of science discourse strategies to increase student voice for sense-making and development of academic language
   - launching units with culturally relevant science phenomena to provide equitable pathways to learn science content in the unit
   - embedded formation assessments providing frequent feedback for both students and teachers.

   The SPS Science Program will continue to seek resources for equitable teacher supports to implement the adopted science instructional materials, and maintain a robust student data gathering system to inform any optimization of materials. We will continue to elicit feedback from our stakeholders on student learning and attitudes to ensure equitable outcomes for students in our highly impacted communities before, during, and after implementation of the adoption of materials.

Attachment L: Consent Decree Compliance

To ensure maximal accessibility of all products purchased by Seattle Public Schools, and to comply with a 2015 Consent Decree relating to all electronic resources purchased by Seattle Public Schools, completion of the most recent version of the Voluntary Product Accessibility Template (VPAT) was required of vendors submitting materials for review by the middle school science textbook adoption committee.

In April 2019, at the request of the science content area and the purchasing office, Angie DeBoo, Seattle Public Schools Information Security Network Analyst, reviewed the response for the finalist product. Below are the results of this review:

Curriculum	VPAT Status	Notes
Carbon TIME	Not currently compliant	Michigan State University did not submit a VPAT. Instead, they submitted a statement that if they were selected, they would work with the District to find a vendor to do the work or defer to the District to oversee the work.

The program manager was informed that any vendor product selected must pass the VPAT review to meet WCAG 2.0 AA requirements prior to implementation of their product. This will require the District to oversee an audit of the curriculum and to coordinate with Michigan State University to implement required updates and revisions to the curriculum.

Attachment L: Consent Decree Compliance

To ensure maximal accessibility of all products purchased by Seattle Public Schools, and to comply with a 2015 Consent Decree relating to all electronic resources purchased by Seattle Public Schools, completion of the most recent version of the Voluntary Product Accessibility Template (VPAT) was required of vendors submitting materials for review by the middle school science textbook adoption committee.

In April 2019, at the request of the science content area and the purchasing office, Angie DeBoo, Seattle Public Schools Information Security Network Analyst, reviewed the VPATs for the finalist product. Below are the results of this review:

Curriculum	VPAT Status	Notes
PEER	Partial Compliance	Several VPAT areas marked as "partial support", with notes that they will be compliant in Spring/Summer 2019. PEER's Digital Student Resources will be relocated to a different platform, titled VitalSource, estimated to launch in Spring 2019. VitalSource's VPATs show some areas supported, some are supported with exceptions.

The program manager was informed that any vendor product selected must pass the VPAT review to meet WCAG 2.0 AA requirements prior to implementation of their product.

Attachment M

MEMO: 2019 Curriculum Adoption Teacher Survey: K-12 Science Adoption
TO: Curriculum, Assessment and Instruction
FROM: Research & Evaluation
DATE: March 22, 2019

Overview

A critical part of the district's process for adopting and implementing new curriculum materials is learning how to best support teachers, for example by providing professional development, support, and resources where they are most needed. Accordingly, the SPS Research & Evaluation (R&E), in partnership with the Curriculum, Assessment and Instruction (CAI) department administered a survey in February 2019 to certificated classroom teachers regarding their experiences with new or planned curriculum materials. The survey included question panels on K-5 English Language Arts, Middle School Math, and K-12 Science. This memo shares findings related to the K-12 science instructional materials adoption.

Response rates for science are detailed in the table below.

Table 1. Response rates

	Number of Responses	Response Rate
Elementary	437	20%*
Middle School	81	84%
High School	83	57%
TOTAL	**601**	**24%***

*Conservative estimate, as the anonymous survey was administered to all elementary teachers, and not all elementary teachers teach science.

Because there are three concurrent science adoption processes underway, this memo provides overall findings (i.e. aggregated across all respondents) as well as breakouts for **elementary**, **middle school**, and **high school** grades.

Current State

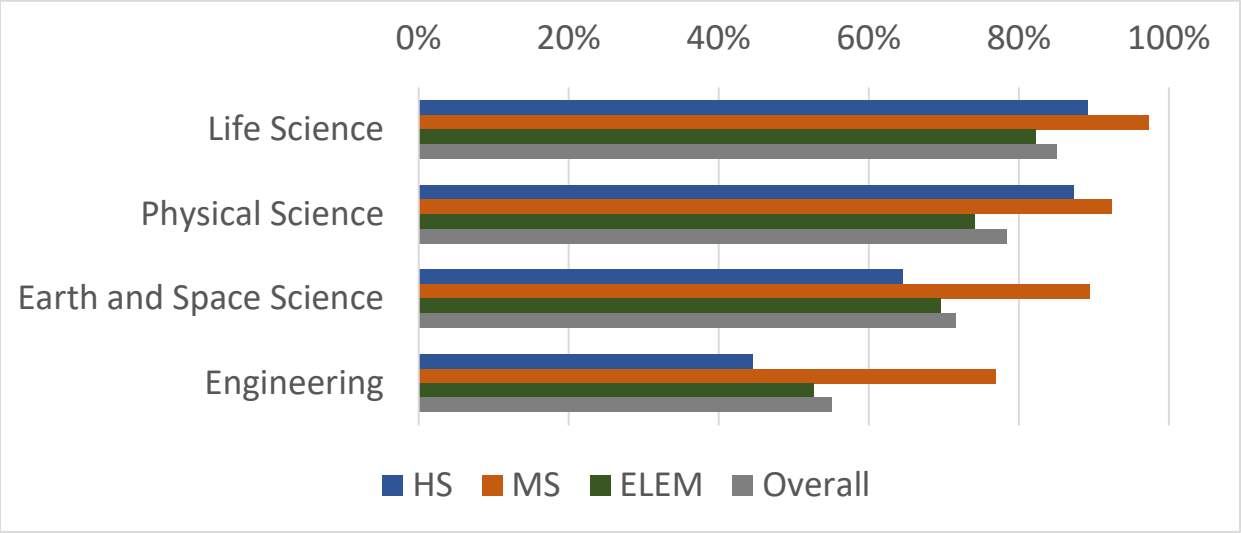
To calibrate the supports teachers need moving forward with NGSS-aligned instructional materials, it is first necessary to understand the supports that teachers currently use in the classroom.

- **Elementary**: Approximately two-thirds of elementary teachers (69%, n=435) report using the District FOSS/STC kits. The remaining one-third report using "other" materials, which are mainly materials being piloted through the adoption process, including AmplifyScience, HMH, McGraw Hill, STEMScopes, and TCI. However, some teachers also note that they teach Mystery Science, an online program, or use various other resources to teach science in elementary grades.
- **Middle School**: 17% of respondents report using District FOSS/STC kits, 30% report using waiver materials, and 53% report using "Other" materials. In the "other" category were mainly AmplifyScience users (28 teachers) and teacher-sourced materials (12 teachers).
- **High School**: The vast majority of high school teachers (89%, n=79) report using "Other" materials. Commonly mentioned materials include PEER (for physics), CarbonTime (for biology) Living by Chemistry (for chemistry), and International Baccalaureate materials.

Looking across the grade bands, relatively few teachers (7%, n=595) report using Superintendent-approved waiver materials. However, 43% of teachers overall (n=596) mention that they "moderately" or "extremely" modify the curriculum currently in place. These percentages are approximately the same across all grade bands.

Additionally, we asked teachers about their current level of confidence in their content knowledge across the sciences. Looking across the grade bands, middle school teachers report higher levels of confidence than do their elementary and high school colleagues. Looking across the content areas, life science is the area with the highest level of confidence overall, and engineering is the lowest.

Figure 1. Confidence in science content



Finally, we asked about the extent to which teachers currently use formative assessments to inform their science instruction. Overall, 84% (n=572) of respondents report that they use formative assessments to inform instruction at least "a couple of times per unit." The reported rates of assessment use are higher in middle school (100%, n=79) and high school (89%, n=83) than they are in elementary school (78%, n=410).

NGSS Readiness

The Next Generation Science Standards (NGSS) were adopted by Washington state in 2013. The SPS CAI department describes the shift as following:

> *"Historically, science teaching has been focused primarily on content, but NGSS recognizes that 21st century skills involve a deep understanding of Science and Engineering Practices, Disciplinary Core Ideas (content), and Crosscutting Concepts that apply to all scientific disciplines. This shift in practice moves us towards a pedagogy that focuses on 'figuring out instead of telling about.'"*

The NGSS contain eight approved practices of science and engineering that are considered essential for students to learn. Accordingly, we asked teachers the degree to which they feel confident in that their current instructional practices prepare students for these eight practices. Results, disaggregated by grade band, are in Table 2 below.

Table 2. Confidence by NGSS practice standard

	ELEM	MS	HS	Overall
Ask questions (for science) and define problems (for engineering)	68%	91%	80%	73%
Develop and use conceptual models	60%	92%	93%	69%
Plan and carry out investigations	71%	78%	75%	73%
Analyze and interpret data	66%	95%	90%	74%
Use mathematics and computational thinking	63%	74%	77%	66%
Construct explanations (for science) and design solutions (for engineering)	53%	92%	84%	63%
Engage in arguments from evidence	63%	96%	92%	72%
Obtain, evaluate, and communicate information	69%	92%	93%	75%

In addition to the eight practice standards, we probed on teachers' confidence in two areas of specific interest to Seattle Public Schools: technology usage and engaging students in scientific discourse with their peers. Results from these two questions are in Table 3 below. Similar to the previous findings, teachers in middle school report the highest levels of confidence (Table 3). High school teachers follow close behind, but elementary teachers report much lower levels of confidence in these areas.

Table 3. Confidence with technology and student discourse

	ELEM	MS	HS	Overall
I feel confident having my students use technology in the service of gathering scientific evidence	46%	96%	87%	61%
I feel confident that my students can engage in scientific discourse with their peers to make sense of complex scientific ideas	56%	89%	81%	64%

Professional Development

A key district strategy to increase teachers' confidence in science content and the NGSS practice standards is to provide targeted professional development. Accordingly, we asked teachers both about the professional development they have already received, as well as the professional development they would like to receive in the future.

Data indicate that a high proportion of teachers in high school (98%, n=83) and middle school (89%, n=81) have received specific NGSS professional development. Elementary teachers report lower PD participation rates on the NGSS (44%, n=436).

When we asked about the NGSS-aligned PD that teachers would like to receive in the future, we find that the types of PD vary quite a bit by grade band. Top areas for **elementary teachers** are developing student-centered units, developing assessments and analyzing student data, and deepening their content knowledge. Top areas for **middle school teachers** are developing student-centered units and navigating and understanding the curriculum resources. And top areas for **high school teachers** are

developing student-centered units, navigating and understanding curriculum resources, and incorporating instructional technology.

	ELEM	MS	HS	Overall
Developing student-centered unit that follow clear storylines to explain anchoring phenomenon	71%	54%	54%	67%
Navigating and understanding the curriculum resources	38%	47%	42%	53%
Deepening my content knowledge	48%	29%	23%	42%
Incorporating instructional technology	45%	20%	38%	41%
Developing assessments and analyzing student data	59%	39%	37%	40%
Other	14%	18%	26%	16%

As shown above, 16% of teachers (90 in total) indicate they would like "other" types of professional development. We analyzed open-ended responses about these other types of professional development and found some unifying themes:

- **Elementary teachers** want access to quality, NGSS-aligned materials that incorporates hands-on laboratory experiences for students. They also want more time to incorporate NGSS-aligned strategies and materials, including time for PD, time for collaboration with peers, and time to study the standards themselves.
- **Middle school teachers** want access to quality, NGSS-aligned materials as well. They also want guidance on facilitating culturally responsive student discourse in the classroom, for example by focusing on talk moves.
- **High school teachers** want access to high quality laboratory equipment, as well as specific PD on engineering and design content and problem-based learning (PBL). They also want to better understand how to differentiate science instruction within the context of NGSS.

Equity-Focused Open-Ended Responses

To conclude the survey, we asked teachers an open-ended question (no word limit) about the equity moves that a K-12 science adoption would bring. The question was:

> *"In 2018, Seattle Public Schools initiated an adoption process for 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."*

We systematically coded and analyzed open-ended responses, and three key themes emerged about teachers' hopes for the future science adoption: system-wide benefits, instructional quality, and student engagement and achievement. We detail the findings below, including quotes from **elementary teachers**, **middle school teachers**, and **high school teachers**.

System-wide Benefits

Teachers hope that a K-12 NGSS-focused science adoption will elevate the role and importance of science education in the district, enabling teachers to teach high quality science curriculum in all schools to all students. Elementary teachers believe that a common approach is an equity move particularly for high mobility students, as they will experience continuity in their science learning. And middle and high school teachers stressed the importance of having students enter secondary with common learning experiences and exposure to science instruction. Additionally, teachers anticipate that collaboration with peers, both within and across schools, will increase as well. However, teachers caution that system-wide benefits are only realized if the selected curriculum is high quality, if materials are distributed equitably, if meaningful professional development is delivered by the district office, and if the district and schools explicitly carve out time for teachers to teach science.

ELEM	*"It will prioritize and place a sense of urgency in science instruction, which currently is lacking due to our outdated materials."* *"If all classrooms are teaching a rigorous and engaging science curriculum in SPS and teachers are given excellent training, then I feel like this will provide an equitable opportunity for all students to become scientifically literate."* *"I am hoping more resources given to science at a district level will actually show teachers and students that the district cares about science instruction"* *"An adoption cannot influence equity without deep commitment from downtown to offer support, including opportunities for multisensory hands-on science activities and project-based science learning for all learners."*
MS	*"All students will have access to the process of doing science rather than only students at schools with outside funding. Students will learn current science rather than patchy obsolete topics."* *"I think NGSS aligned materials ensure that every student has access to the same content regardless of school. But really engaging puzzling phenomena are what makes equitable opportunities."* *"Based on the harsh reality that elementary schools do not consistently provide students with science learning the hope is that students would be moving to middle school with a better foundation of science so that literacy would be scaffolded providing more opportunities for science teachers to propel students' science learning."* *"As it stands, many teachers are doing different things or repeating topics with students over their time in Seattle Public Schools. A unified adoption will allow us to examine the trajectory of learning for students in the district and build on scientific thinking skills each year."*

HS	*"As a south Seattle teacher, I feel the adoption will greatly help my students. Students being able to move from one school another, but expect the same standards and classes helps our students be successful across the entire district. It also allows me to find support from other teachers and share expertise. This adoption is only good. I see no negative impacts."* *"The adoption process will allow us to work collaboratively across the district to identify the best resources and strategies for our students. It will allow students who move from one school to another to have an equitable experience. It will ensure that everyone is teaching with high quality, standards-aligned instructional materials."* *"It will help new and struggling teachers to make sure their expectations and content are aligned with other schools."* *"It allows us to know what instruction and opportunities are offered to students district-wide, so that we can ensure that our students at an underresourced high school have access to that same level of rigor and opportunity. If budgeted for, NGSS materials will also offer our students access to physical resources like lab materials that we currently struggle to purchase."*

Instructional Quality

Teachers hope that high quality, NGSS-aligned materials – combined with culturally responsive teaching practices – will allow them to engage *all* students in rigorous and engaging science content. Teachers mentioned both high quality, carefully scoped content, as well as the physical materials (e.g. kits and laboratory equipment) that will help them to achieve this goal, allowing them to focus on students' learning instead of curriculum development. Many teachers expressed frustration with their existing curriculum and science kits, saying they hope that newer materials will be better, easier to use, and more engaging for students.

ELEM	*"I am looking forward to teaching science with a curriculum that is well aligned to the standards. This is equitable because students across the district will have the opportunity to participate in high quality science instruction with high quality materials."* *"I teach at a Title I school with limited access to STEM experiences (although many of my students are very interested in engineering and scientific design). It is very apparent that equitable opportunities for all students are not currently a district priority as it relates to scientific literacy, and I would love to have the materials and resources needed to provide my students with 21st-century learning."* *"When I have provided materials and curriculum I am able to spend my time planning from formative assessment and thinking about how my questioning practices can support students; without materials and curriculum I do not have time to plan instruction in a deep and meaningful way."* *"I am hoping it will provide updated content that will engage students to think deeper about science. It would be nice to have a lot of hands on opportunities, provides culturally relevant examples and makes students think critically and design and communicate solutions to problems."*

	"Adopting a new curriculum based on NGSS will help our students learn the skills real-world scientists use. Hands-on exploration combined with digital models, constructive conversations, and opportunities to analyze and synthesize evidence gives opportunity for all students to access the content."
MS	*"If the curriculum that we adopt has clear storylines and anchoring phenomena, with opportunities for students to construct explanations and argue from evidence, then all students will be able to learn deeply, instead of just the students who are able to memorize a lot of facts out of a textbook."* *"I am a first year teacher who has no access to NGSS aligned curriculum from the district. Creating my own lessons and designing them or even just modifying them from the old kits is very time consuming and I do think it has weakened my teaching in the sense that not everything is mapped out and much of it is happening for the first time. Having a road map that was based on NGSS and some tried and tested units within that would give me a more solid base to fall back on and build from, rather that struggling to work with. This would create a more cohesive education for my students and therefore help increase their scientific literacy."* *"If the curriculum we adopt is truly aligned with NGSS, then it will engage students from all cultures and ability levels by engaging them in solving problems and answering questions that are relevant to them and guided by phenomena and storylines meaningful to all. It will be rigorous but well scaffolded and differentiated to meet the needs of ELL and learners of diverse abilities."*
HS	*"Having a reliable source of curriculum will allow me to spend more time on the students thinking and less on preparing materials."* *"Model based instruction based on phenomenon and real-life projects offers opportunities for all students to access scientific ideas and concepts as scientists, no matter their race, gender, ability or socioeconomic status. Discourse pushes all students to work at their level and build on their understanding, whatever that might be."* *"Teaching with a storyline is equitable because it provides all my students with a common starting point of understanding. The shared experience at the beginning of a new unit gives students common ground."* *"I will be able to focus much less on adapting materials and more on analyzing the work my students do."*

Student Engagement and Achievement

Teachers hope that new NGSS-aligned materials will help to engage students in authentic, hands-on learning experiences that center around a scientific phenomenon that students can relate to their own lives. This, they said, will help students who might typically not have enjoyed science become enthusiastic science learners. Teachers also asserted that interest and skills in science are necessary to succeed in the highly scientific and STEM-based economy into which they will graduate.

ELEM	*"The NGSS align with the currently STEM world that we are living in and that our students will be growing up to be working in. It's important to be stretching our students' thinking in the way that the standards ask and that the materials we are providing to teach are fun, engaging and accessible to all students."* *"By having layers of ways to explore a phenomenon, students take control of their own learning and have context upon which they can attach new learning. Without this, students already see themselves as "not scientists" by middle school."* *"The adoption of NGSS aligned units should provide a common entry point for students nationwide, and allow schools to access a common body of knowledge for equitable assessment."* *"STEM fields are where growth and profitability are in our economy right now so providing a curriculum that provides these skills will allow ALL students to have access to these careers in the future."* *"The NGSS-aligned materials will prepare students to perform well on the science portion of SMA. The NGSS standards have been in effect since 2013 and the district has not adapted a science curriculum to meet this standards. Students are not prepared to take take tests based on these standards, if they do not have the curriculum or materials available to them."* *"I believe a curriculum that is NGSS aligned will prepare my students for a world where science is everywhere. It will also better prepare them for high stakes testing that will ask them questions regarding modern science standards, not antiquated science kits that are older than some teachers at our school."*
MS	*"New NGSS-aligned curriculum needs to offer students an entry-point that is socially relevant to their lives. Students need to see why science matters to them."* *"The adopted curriculum NEEDS to have an interesting phenomena that ends in a casual, evidence based, explanation that students are invested in sharing and writing. Otherwise I worry that the difficult concepts and vocabulary heavy field of science will remain inaccessible to many."* *"We need to develop good strong, PBL, phenomenon driven projects kids can DO and feel proud in other to become scientifically literate."*
HS	*"If the materials are interesting, rigorous, and straight-forward to follow, then I will be able to inspire and motivate all students in my classes to understand how science connects to their lives and to engage in real science in the classroom."* *"Having aligned materials will help me collaborate with others to implement best practices, engineering practices, and relate phenomena that teach science in a way that allows students to be in the driver's seat and curious about what they are learning."* *"The NGSS requires students to act like scientists, rather than passively learning about others' discoveries. This is more engaging than the traditional approach and gives students all students the skills required to succeed in STEM fields."*

More Information

For more information about the survey content, administration, or findings, please contact the Research & Evaluation Department at research@seattleschools.org.