Issues and Science, Published by Lab-Aids
Grade 6

- Solar System and Beyond
- Chemistry of Materials
- Force and Motion
- Waves
- Fields and Interactions

Reference: https://www.edreports.org/reports/detail/sepuplab-aids-issues-and-science-2019/sixth-to-eighth

SECTION I: NON-NEGOTIABLE CRITERIA OF SUPERIOR QUALITY
Materials must meet Non-negotiable Criteria 1 and 2 for the review to continue to Non-negotiable Criteria 3 and 4. Materials must meet all of the Non-negotiable Criteria 1-4 in order for the review to continue to Section II.

Non-negotiable	**Required**
1.THREE-DIMENSIONAL LEARNING: Students have multiple opportunities throughout each unit to develop an understanding and demonstrate application of the three dimensions.	**1a)** Materials are designed so that students develop scientific content knowledge and scientific skills through **interacting with the three dimensions** of the science standards. The majority of the materials teach the science and engineering practices (SEP), crosscutting concepts (CCC), and disciplinary core ideas (DCI) in an integrated manner to support deeper learning.

Justification with examples:

Issues and Science is based on an instructional model that integrates three-dimensional learning with a thematic approach to applying science and engineering in the context of issues—compelling personal, local, societal, and global topics or problems for students to debate, discuss, or explore to develop a decision or solution. These capture students' interest, focus their investigation into scientific concepts and processes, and enhance students' understanding. Students are then able to apply scientific principles and evidence to make informed decisions. The relevance of science and engineering practices and concepts becomes obvious, eliminating the question, "Why are we learning this?"

Issues and Science is designed to integrate the Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs) into student learning opportunities. Additionally, the Phenomena, Driving Questions, and Storyline section of the Teacher Edition outlines which activities in each unit are bundled together into a learning sequence centered around a driving question.

Across the series, each learning sequence consists of one or more learning opportunities (activities). Each learning sequence includes three dimensions and integrates SEPs, CCCs, and DCIs in at least one activity within the learning sequence. The materials are designed for SEPs and CCCs to support sensemaking with the other dimensions in nearly all learning sequences. The Teacher Edition provides support to help teachers introduce the CCCs to the students and provide opportunities for students to use the CCCs to make sense of the DCIs. Occasionally, a CCC is found only in an assessment question at the end of an activity or is not explicitly addressed in the student resource but is present through teacher facilitation. However, within the bundled activities within a learning sequence, students use one or more CCC to make sense of the concept or phenomenon.

Each unit provides three-dimensional learning objectives in the form of performance expectations (PEs). The number of targeted objectives (PEs) varies by unit. Each unit is organized into Activities (lessons); near the end of each activity is an Analysis section that serves as an assessment for the Activity. The PEs for the unit are assessed through specific questions within the Analysis sections and are embedded throughout the unit. The Analysis questions, identified as summative PE assessments, are color coded with three dots (orange, blue, and green). The Teacher Edition also provides a sample response. Not every analysis question assesses all three dimensions; some questions assess only one or two dimensions but across the unit, all three dimensions are assessed. The Teacher Edition for each unit contains an Assessment Blueprint indicating the activity and Analysis question that assesses each targeted PE.

- All units include overview documents that show how the 3 dimensions are used throughout the activities. To see a summary of the NGSS correlations for the 6th grade units, please visit the links below. They can also be found in the *Teacher's Edition* and *Teacher Resources* along with more in-depth NGSS correlations for each unit that also include activity descriptions, etc.
    - Solar System and Beyond https://www.lab-aids.com/sites/default/files/2020-07/Solar%20System%20and%20Beyond%203e%20NGSS%20and%20Common%20Core%20Correlations%20v3.1.pdf
    - Chemistry of Materials https://www.lab-aids.com/sites/default/files/2020-07/Chemistry%20of%20Materials%203e%20NGSS%20and%20Common%20Core%20Correlations%20v3.1.pdf
    - Force and Motion https://www.lab-aids.com/sites/default/files/2020-07/Force%20and%20Motion%203e%20NGSS%20and%20Common%20Core%20Correlations%20v3.1.pdf
    - Waves https://www.lab-aids.com/sites/default/files/2020-07/Waves%203e%20NGSS%20and%20Common%20Core%20Correlations%20v3.1.pdf
    - Fields and Interactions https://www.lab-aids.com/sites/default/files/2020-07/Fields%20and%20Interactions%203e%20NGSS%20and%20Common%20Core%20Correlatios%20v3.1.pdf

- In Unit: Solar System and Beyond, Activity 7: A Year Viewed From Space, students determine why the sun's path through the sky changes over the year, and how that change relates to seasons. Students use a computer simulation to model Earth's orbit around the sun to explain why we have seasons (SEP-CEDS-M3). Students make observations of the position of the Earth and sun from two locations, and record data to compare changes in daylight and temperature at four different times of the year, as well as the distance between the Earth and sun (CCC-PAT-M3). Students answer questions, using their data as evidence, to explain the relationship between the motion and distance between the earth, sun, and seasons (DCI-ESS1.B-M2).

- In Unit: Solar System and Beyond, Activity 13: Identifying Planets, students identify objects in our universe and their distances from the sun. Students read transmission information from four spacecrafts (CCC-SPQ-M1) and compare it with descriptions of the planets (DCI-ESS1.B-M1). They list the evidence from each transmission that helped them decide from which planet each transmission originated (SEP-DATA-M7). Students write their own transmission from a planet not used, compare properties of dwarf planet Pluto with the other planets, and use their knowledge to reflect upon how the work of engineers supported the Mars Exploration Rover mission to Mars.

- In Unit: Fields and Interactions, Activity 3: Gravitational Transporter, students determine how to design a moon transporter vehicle that utilizes changes in energy caused by gravity. Students create a system model (CCC-SYS-M2) to collect and analyze data (SEP-DATA-M7) to determine the impact of release height and the mass of a cart on the kinetic energy transfer during a collision (DCI-PS3.A-M2, DCI-PS2.B-M2). Students optimize their solutions through a process of testing and redesigning (DCI-ETS1.A-M1, DCI-ETS1.B-M1) to eventually control the amount of gravitational potential energy in their system to achieve the best results with their transporter.

- In Unit: Fields and Interactions, the objectives include the following PEs: MS-PS2-3, MS-PS2-4, MS-PS2-5, MS-PS3-2, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, and MS-ETS1-4. All eight PEs are assessed through the analysis questions and activities identified in the Assessment Blueprint. For example, in Activity 7, analysis question 4 assesses PE-MS-PS2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. Students create an argument based on evidence to support or refute the claim (SEP-ARG-M3) that gravity can cause objects to repel one another (DCI-PS2.B-M2). Students also draw a model of a gravitational and magnetic system to show the magnitude and direction of forces (CCC-SYS-M2) to demonstrate forces acting on objects from the data table provided. The drawing also serves as evidence for their argument.

- A central practice in the Fields and Interactions unit is engaging in argument from evidence. Students are first introduced to this SEP in Activity 3, where they are asked to use evidence to support or refute a claim. In Activity 4, they develop the practice by using a claim, evidence, and reasoning framework, and their argumentation skills are assessed with the engaging in argument from evidence (ARG) Scoring Guide. In Activity 7, the pathway for PE-MS2-4 concludes with another assessment, also using the ARG Scoring Guide, that requires students to use a SEP and appropriate DCIs and CCCs to demonstrate three-dimensional performance on the assessment item. While progressing through this unit, students develop other supporting practices, such as analyzing and interpreting data, communicating concepts and ideas, constructing explanations, developing and using models, and designing engineering solutions.

- In Unit: Chemistry of Materials, Activity 8: What's in a State?, students explore how particles of substances (matter) interact when matter changes phases due to change in temperature. Students use syringes to investigate and explain how the behavior of particles causes the observable properties (CCC-CE-M2) of solids, liquids, and gases (DCI-PS1.A-M4). This activity includes use of a computer simulation to model (SEP-MOD-M5, SEP-MOD-M6) what happens to particles as they change state.

- In Unit: Chemistry of Materials, the objectives include the following PEs: MS-PS1-1, MS-PS1-3, and MS-PS1-4. All three PEs are assessed through the analysis questions identified in the Assessment Blueprint. For example, in Activity 10**,** analysis question 3 assesses PE-MS-PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. Students develop a model (SEP-MOD-M5) showing water molecules in all three states, and including particle motion and interactions in each state. The model also includes the cause-and-effect relationship (CCC-CE-M2) between changes of thermal energy on particle movement and state changes (DCI-PS3.A-M3).

Non-negotiable **2.PHENOMENON-BASEDINSTRUCTION:** Explaining phenomenon and designing solutions drive student learning.	**Required** **2a) Observing and explaining phenomena** and designing solutions provide the purpose and opportunity for students to engage in a coherent sequence of learning a majority of the time. Phenomena provide students with authentic opportunities to ask questions and define problems, as well as purpose to incrementally build understanding through the lessons that follow.

Justification with examples:

In *Issues and Science*, current and relevant issues are the unit storylines that capture students' interest that can range from personal to global in its implications. Students are eventually asked to make a decision about that issue – which means learning about the associated science. Issues give thematic continuity to the scientific investigations in every SEUP unit. These issues create personal connections for students and provide a source of motivation throughout the learning cycle. Most importantly, they enhance students' understanding of the role of scientific principles and evidence in making informed personal and societal decisions. Issues are revisited throughout the unit as students make connections and gather evidence toward making a decision.

Each unit begins with an introduction to the real-world relevant problem that will be explored throughout. Students read a brief scenario that frames the issue and asks for their initial thoughts and questions. Prior background knowledge or experience is not expected. As the unit progresses, the Teacher's Edition and Student Book continuously refer back to the real-world problem and has students apply their understanding. Students explore phenomena, collect and analyze data, develop knowledge, and apply what they've learned in order to make informed decisions on the issues surrounding each unit.

Each unit issue is not just an anchor for students to apply their learning, but also serves as a starting point for content engagement. The problems presented are not easily solved and require application of the three dimensions to propose solutions based on evidence. Relevant, timely real-world problems are selected to not only engage students, but to challenge their thinking and have them examine multiple sides of the highlighted problem before making a decision. Students engage in the work of actual scientists and engineers to further their scientific knowledge and solve problems.

The activities and investigations in *Issues and Science* require students to apply scientific evidence to and analyze the trade-offs involved in personal and societal decisions or designed solutions to problems. It's important to note that SEPUP curriculum materials do not advocate specific positions on issues, and the units do not promote teachers' or students' acceptance of any position. Instead, the materials aim to provide opportunities for students to build the knowledge, skills, and understanding to help them make their own informed decisions.

Each unit is centered on an anchoring phenomenon that relates to the issue being addressed across the unit. Because the anchoring phenomena are broad and the related issues are complex, each unit is divided into instructional sequences that typically comprise two to five activities. In each instructional sequence, students explore an investigative phenomenon, guided by a driving question. The SEPUP storyline, a coherent conceptual storyline for each unit that aligns to the NGSS, describes the unit's logical progression and connects the instructional sequences.

SEPUP storylines are built around the concepts and practices needed to explain phenomena and solve problems related to the issue under investigation. By answering the driving question for each investigative phenomena, students move through the storyline and deepen their understanding of how various science and engineering concepts and ideas are woven together across the entire unit. Each unit comprises several instructional sequences. The investigative phenomena that guide each sequence involve something that is puzzling or that instigates student questioning, launched by a driving question. The structure of activities has students usually "doing" first so they begin to develop their own understandings of phenomena and then read about it to make connections and expand their understanding.

A section in the Teacher's Edition called "Investigative Phenomena and Sensemaking" identifies phenomena students explore in the activity and the primary sensemaking opportunities, potential knowledge gaps that will be addressed, and how students' sensemaking will proceed as they move forward in the unit. The *Phenomena, Driving Questions, and Storyline* section of the Teacher Edition show how the different activities are organized around Driving Questions and the unit storyline. Multiple activities typically link to a Driving Question in the storyline and the associated content learning to address the associated performance expectation (PE); this typically ranges from two to six activities in the activity sequence, and these may be consecutive activities or distributed across the unit.

Issues and Science utilizes a Driving Questions Board (DQB) throughout each unit to support student sensemaking and the application of prior knowledge. In the first few activities of each unit, students use a Driving Questions Board to express their initial ideas and questions about the anchoring phenomenon or issue they are investigating. Throughout this discussion, students are encouraged to make connections to their own experiences and communities and to share any background knowledge they have that relates to the phenomena under investigation. Students' prior and alternate ideas surface during this initial sharing, providing the foundation on which they will build new knowledge. As the unit progresses, students confront their initial ideas with evidence as they revisit and revise their understanding. This routine promotes student ownership of the learning and allows for students to express their personal curiosities around a topic, making the subsequent investigations more meaningful for learners.

Phenomena and problems are found across the materials in life science, physical science, and earth and space science units. The materials frequently connect both phenomena and problems to grade-band appropriate DCIs both at the unit level and at the activity level. Within the materials, unit-level phenomena and/or problems are generally presented in activities near a unit's opening, while lesson-level phenomena and problems are presented in activities at punctuated points throughout each unit. Most phenomena and problems are presented to students through some combination of teacher demonstration, hands-on experience, image, video, maps, data, and/or discussion. These modes provide students with entry points or experiences to engage with the phenomenon or problem.

- All the units in *Issues and Science* have accompanying Storyline and Phenomena documents that help teachers understand the anchoring phenomenon for each unit, the progression of investigative phenomena within a unit, and how the activities are used to help students make sense of them. An example from the Waves unit can be found here: https://www.lab-aids.com/sites/default/files/2020-07/Waves%203e%20Storyline%20and%20Phenom%20v3.1.pdf

- In Unit: Chemistry of Materials, Activities 1-5: Exploring Materials, the challenge is to determine the best material for a new single-use drink container (aluminum, glass, or plastic). Students are introduced to the idea that scientists and engineers must consider different materials to use for a specific purpose. Students discuss the advantages and disadvantages of several different materials that can be used for a drink container. They analyze data before developing questions about the problem. Students discuss evidence and trade-offs and consider the physical and chemical properties of the materials (DCI-PS1.A-M2).

- In Unit: Fields and Interactions, Activity 1: Save the Astronaut!, the problem is a fictional astronaut is stranded in a gyrosphere on the moon. This problem is introduced to students by first asking them about problems they have solved in real life and then introducing the scenario of the astronaut. There is an illustration to accompany the scenario showing an astronaut in a gyrosphere. The illustration provides context for students who may not know what a gyrosphere looks like or why a solution that involves rolling would be viable. Students are challenged to build a device that will roll the gyrosphere to the moon base and rescue the stranded astronaut. Students list ideas they want to test and record their process as they build and test a model that represents rescuing a stranded astronaut in a gyrosphere.

- In Unit: Fields and Interactions, Activity 3: Gravitational Transporter, the problem is astronauts need to move supplies between areas of different elevations with limited electricity and no combustion engine. Students are challenged to design a transport system using only gravitational force to move an object from the higher elevation to the lower elevation. As students work on their designs, they investigate how energy is transferred, and how a system of objects may contain stored (potential) energy, depending on their relative positions (DCI-PS3.A-M2).

- In Unit: Fields and Interactions, Activity 8: Static Electricity, students manipulate the location of objects and observe how particles change location in relation to the location of the object. They review observations from their static electricity explorations, identify evidence that supports the idea that electrical forces attract and repel, and ask questions about the cause of the strength of forces between positive and negative particles based on their observations.

- In Unit: Force and Motion, Activity 1, the phenomenon is some vehicles and driving behaviors decrease the chances and/or reduce the effects of car crashes. Students engage in a series of activities across the unit allowing them to collect and analyze data about what makes vehicles safer, as well as how driving behaviors impact the likelihood of a collision. Students explore multiple variables including how the mass of a vehicle can influence a collision, how speed can affect car and driver safety, the relationship between mass and speed on a vehicle's braking distance, and how stopping distance can be influenced by distracted drivers. Ultimately, students use the qualitative and quantitative data to create a car and driver safety system to help drivers keep a safe distance between vehicles and avoid collisions. Students collect and analyze data about the impact of mass and speed on an object's kinetic energy (CCC-EM-M3) in order to determine the mathematical relationships between kinetic energy, mass, and speed (DCI-PS3.A-M1, DCI-PS3.C-M1). Students construct graphs (SEP-DATA-M1) of the relationships to show patterns in these relationships (CCC-PAT-M4).

- In Unit: Force and Motion, Activity 15: Designing a Car and Driver Safety System, the challenge is for students to design a car and driver safety system to alert drivers to changes in various factors so they can stop their vehicles at a safe distance from the car ahead of them. Students use what they learned in prior activities about mass, speed, force, and stopping distance (DCI-PS2.A-M2) to create a model of a driver safety system and then share their model with the class.

- In Unit: Waves, Activity 14: Blocking Out Ultraviolet, the phenomenon is sunscreen looks like other types of lotion, but lotion allows more ultraviolet light to pass through. Students observe this phenomenon firsthand in Part A of the activity, where they compare whether sunscreen and lotion will block ultraviolet light from reaching a test strip. Students then design an experiment to determine whether sunscreen blocks the ultraviolet light by absorbing or reflecting the light. Students conduct their experiment and discuss whether the results help them determine the actual results of using sunscreen on skin.

Non-negotiable (only reviewed if Criteria 1 and 2 are met) **3.ALIGNMENT & ACCURACY:** Materials adequately address the Louisiana Student Standards for Science.	**Required** **3a)** The majority of the Louisiana Student Standards for Science are incorporated, to the full **depth of the standards**.
Required **3b)** Science content is **accurate**, reflecting the most current and widely accepted explanations.	

Please see the correlations document included for with this submission.

Non-negotiable (only reviewed if Criteria 1 and 2 are met) **4.DISCIPLINARY LITERACY:** Materials have students engage with authentic sources and incorporate speaking, reading, and writing to develop scientific literacy.	**Required *Indicator for grades 4-12 only** **4a)** Students regularly engage with **authentic sources** that represent the language and style that is used and produced by scientists; e.g., journal excerpts, authentic data, photographs, sections of lab reports, and media releases of current science research. Frequency of engagement with authentic sources should increase in higher grade levels and courses.
Required **4b)** Students regularly engage in **speaking and writing** about scientific phenomena and engineering solutions using authentic science sources; e.g., authentic data, models, lab investigations, or journal excerpts. Materials address the necessity of using **scientific evidence** to support scientific ideas.	
Required **4c)** There is **variability** in the tasks that students are required to execute. For example, students are asked to produce solutions to problems, models of phenomena, explanations of theory development, and conclusions from investigations.	
4d) Materials provide a coherent sequence of authentic science sources that build scientific **vocabulary** and knowledge over the course of study. Vocabulary is addressed as needed in the materials, but not taught in isolation of deeper scientific learning.	

Justification with examples:

Lab-Aids' philosophy is that students need to do science to learn science, and this is reflected in each of our programs. Students continually engage in labs and investigations that require them to collect empirical evidence to make sense of core ideas. This evidence is often required when answering an analysis question to help support or refute a claim. There are 11 different types of activities that students will engage in throughout *Issues and Science:* Talking it Over, Investigations, Laboratories, Readings, Role Plays, Modeling, Projects, View and Reflects, Computer Simulations, Problem Solving, and Field Studies. As students engage in each of these types of activities they engage in the Science and Engineering Practices through the context of Disciplinary Core Ideas and bring out the bigger ideas of Crosscutting Concepts.

Wherever possible, students explore a concept by gathering data firsthand or through direct experience. Students frequently manipulate scientific tools to investigate a specific problem or design a solution. For example, they might gather data from an experiment that tests the solubility and malleability of various elements or use a microscope to make observations about a sample of nematodes. Some lab activities encourage students to plan and conduct their own Investigations.

A key component of *Issues and Science* is the multimodal nature of the program, where students are writing, illustrating, and engaging in discourse daily. Part of this is facilitated through daily use of a science notebook. Here, students often are asked to record their prior knowledge, evidence collected from activities, notes from readings, and reflect upon their learning with writing and illustrations. The notebook becomes a record of how students' thinking progresses over time and changes with new experiences and evidence. It a powerful resource and tool for students to construct explanations in a variety of formats.

Various forms of group interaction have students interacting on a regular basis in whole group, groups of four, pairs, and individually. Sentence starters are provided to help facilitate student discussions. Additionally, there are Writing Frames that guide students in constructing explanations with evidence if needed and a Writing Review allowing for peers to review and provide constructive feedback in a structured manner.

Students frequently encounter text they have trouble understanding. A number of strategies that help students improve reading comprehension can be implemented before, during, and after the reading. Support for literacy has been developed using nationally known strategies – Talking Drawings, Anticipation Guides, Three-Level Reading Guides, Writing Frames, Intra-Act, Discussion Webs, and more-- to support student reading comprehension, student writing, and student oral presentation. The Literacy Support section of the *Issues and Science Teacher Resource Guide* describes this process and walks teachers through various strategies embedded within activities throughout each unit. This section explains each strategy and then accompanying tables identify where each activity is located. This support is not just a template, rather a fully developed, ready-to-go strategy available for immediate use. Many activities additionally list extensions that can be completed by students who want to explore a topic on a deeper level.

Throughout each unit, multiple instructional strategies are suggested to support teachers in anticipating student misconceptions and background knowledge. These strategies support student literacy with reading, writing, and group discussion. Some of the strategies include:

- *Anticipation guides*: Pre Reading exercises help students activate their background knowledge about a topic and generate curiosity about the material they will learn. An Anticipation Guide has students answer a set of prompts before reading, and after reading, students discuss how their predictions compared to the information in the reading. The value of an Anticipation Guide is in the discussion that occurs before and after the reading. Before reading, students discuss their predictions and reasons for them. During this discussion, the teacher gleans information about the depth of students' existing knowledge of and misconceptions about a topic.

- *Stop to think questions*: "Stopping to Think" questions are embedded in readings to focus students' attention on important ideas in the section of text they have just read. The questions may require students to identify the main idea of a previous paragraph or synthesize ideas presented in two or more preceding paragraphs. Because some questions require interpretation and application of knowledge, students will not always find answers by skimming and searching the text. "Stopping to Think" questions give students "think time" to summarize, interpret, or apply what they have just read. The suggested stopping points in the reading where the questions appear break the text into manageable chunks of information to summarize. Students may also use the questions to predict what might come next in the reading.

- *Talking drawings*: Talking Drawings appear in when students are asked to construct diagrams to visually communicate their ideas about a concept. After completing an activity or activities, they adjust the picture to represent their new understanding. The strategy asks students to explain how their diagram, and thus their understanding, has changed. When constructing a Talking Drawing both before and after an activity, students experience the reflective process by which skilled science learners incorporate new conceptual understanding with previously held ideas. Scientists create diagrams to describe concepts and hypotheses, and they go back and refine those models as necessary. This draw-and explain strategy is also helpful to visual learners.

The approach to vocabulary in *Issues and Science* is that it needs to be used in context for it to be meaningful. In the Teacher's Edition, the beginning page of every activity lists relevant vocabulary that will either be introduced in that activity and/or used by students as they engage in the activity. There is also a section in each Teacher Resource book that walks the teacher through how to help develop academic vocabulary with students as well as two graphic organizers. In the student book, vocabulary is often introduced in the introduction, within a reading section, or comes out after a lab to help make meaning of what students discovered.

To read about all the literacy strategies embedded within *Issues and Science* units, look at the Teacher Resources binder and Teacher's Editions.

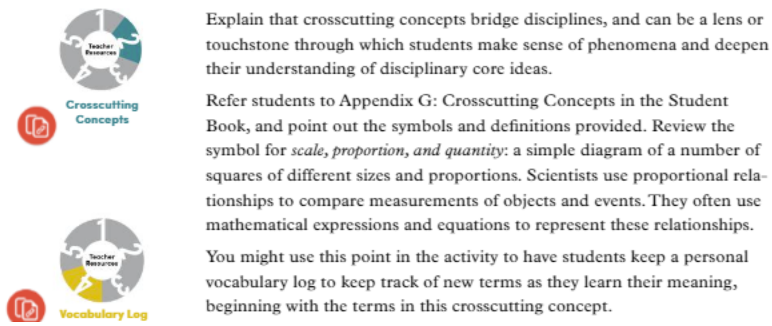
Throughout these learning experiences, students work collaboratively with their peers and engage one another in discourse about the science and issues that underlie the activity. This coupling of concrete experiences and peer-led discussion provides students with structured opportunities to share their thinking and to practice using scientific language. Throughout the program, students are communicating their ideas in a variety of ways, including posters, presentations, proposals, and reports. These assessments ask students to target their responses to a wide range of audiences, such as community planners, scientists, city council members, and other community stakeholders.

- In the unit Force and Motion, students conduct an investigation using a system model to provide evidence that the change in a vehicle's speed results in a change in the braking distance. Then, students plan and carry out their own investigations with the system model. They use evidence to determine that a change in an object's mass results in a change in the braking distance. Students use their evidence from the investigation to support or refute explanations about factors affecting braking distance. Students then define specific criteria and constraints for safety solutions related to braking distance.

- In the Waves unit, students are introduced to the concept of noise-induced hearing loss. They analyze fictitious profiles and develop a list of strategies to reduce the risk of noise-induced hearing loss. Then students investigate a method of sound transmission through a cord. Using this telephone model, they compare the transmission of sound as analog and digital signals. In the next activity, students read about the technology of digital hearing aids that receive sound waves and manipulate them for the user.

- In Chemistry of Materials, students brainstorm and discuss what they know about the properties of aluminum, glass, and plastic as materials for producing single use drink containers. They discuss their current understanding of the advantages and disadvantages of each material and develop a list of questions needed to decide which is better for single-use drink containers. They then examine four graphs of data on the materials to help inform their choice. Students gather information from text and visual resources on aluminum, glass, and plastic. They evaluate the sources of information for point of view and bias, and use the information to inform a debate about which material is the best choice for a reusable drink container

- Example Vocabulary Log entry from Force and Motion *Teacher's Edition* Activity 2 Measuring and Graphing Speed. Additional support for vocabular instruction can be found in the *Teacher Resources*.



Explain that crosscutting concepts bridge disciplines, and can be a lens or touchstone through which students make sense of phenomena and deepen their understanding of disciplinary core ideas.

Refer students to Appendix G: Crosscutting Concepts in the Student Book, and point out the symbols and definitions provided. Review the symbol for *scale, proportion, and quantity*: a simple diagram of a number of squares of different sizes and proportions. Scientists use proportional relationships to compare measurements of objects and events. They often use mathematical expressions and equations to represent these relationships.

You might use this point in the activity to have students keep a personal vocabulary log to keep track of new terms as they learn their meaning, beginning with the terms in this crosscutting concept.

5.LEARNING PROGRESSIONS:	**Required**
The materials adequately address Appendix A: Learning Progressions. They are coherent and provide natural connections to other performance expectations including science and engineering practices, crosscutting concepts, and disciplinary core ideas; the content complements the Louisiana Student Standards for Math.	**5a)** The overall organization of the materials and the development of disciplinary core ideas, science and engineering practices, and crosscutting concepts are coherent within and across units. The **progression of learning** is coordinated over time, clear, and organized to prevent student misunderstanding and supports student mastery of the performance expectations.

<u>Justification with examples:</u>

The learning activities within *Issues and Science* combine the exploration of Disciplinary Core Ideas with authentic Science and Engineering Practices to make the knowledge more meaningful and students better equipped to meet the many challenges facing today's society. During the process of unit development, SEPUP has created Learning Pathway models to map the integration of the 3 dimensions within the unit. Each instructional unit bundles several Performance Expectations (PEs); therefore, an activity may be part of several intertwined Learning Pathways. By the time that students reach the activity that incorporates the assessment related to the Performance Expectation, they will have interacted with the core ideas, practices, and crosscutting concepts multiple times in their learning journey. To view an example of a Learning Pathway, visit http://sepuplhs.org/pathways.html .

Engineering standards and performance expectations are integrated throughout units where called for by the NGSS. Many units integrate scientific principles and engineering practices into specific activities; in other units, the issue focuses on designing a solution to a problem, and the engineering standards are prevalent throughout. All four engineering performance expectations are addressed in all content areas and within grade levels for the suggested integrated sequence.

Each unit comprises several instructional sequences. The investigative phenomena that guide each sequence involve something that is puzzling or that instigates student questioning, launched by a driving question. The storyline is built around the science and engineering concepts needed to explain phenomena and solve problems related to the issue under investigation. By answering the driving question for each investigative phenomenon, students move through the storyline and deepen their understanding of how various science and engineering concepts and ideas are woven together across the entire unit. By the last activity in an instructional sequence, students are prepared to answer the driving question and explain the corresponding investigative phenomenon. Instructional sequences often correspond to an NGSS performance expectation. Students will complete a summative assessment for that performance expectation, either immediately upon completion of the sequence or later in the unit. After completing all the instructional sequences in a unit, students can explain the anchoring phenomenon for the entire unit and apply their conceptual understanding to offer solutions to the unit issue.

Issues and Science uses real data sets when possible, making connections to math practices and providing opportunities for students to engage with the necessary skills to work with large data sets and numbers. *Issues and* Science units also integrate the CCSS in ELA and Mathematics, as specified in the NGSS. The CCSS are embedded in numerous activities and often include strategies designed to support diverse learners.

- For a Learning Pathway specific to the waves unit, please visit https://sepuplhs.org/images/MS-PS4-2_new.jpg. In the Waves unit, this pathway starts in Activity 3, where students read about the nature of sound transmission, and culminates in Activity 13, where students model selective transmission and absorption of light. Along the way, students carry out an investigation that reflects sound and light waves, design and carry out an experiment on light refraction, and investigate the structure and function of devices that depend on selective transmission, such as windows and sunglasses.

- In Unit: Fields and Interactions, Activity 1: Save the Astronaut!, students record the detailed procedure they used to save an astronaut who needs to return to the Moon base. Students then trade their procedure with others to determine if the other student's procedures can be followed to save the astronaut. MATH-M3.

- DATA-M7. In Unit: Fields and Interactions, Activity 3: Gravitational Transporter, students create a system model to collect and analyze data regarding the impact of release height and mass of a cart to the kinetic energy transfer during a collision. Students optimize their solutions through a process of testing and redesigning to eventually control the amount of gravitational potential energy in their system to achieve the best results with their transporter.

- In Unit: Force and Motion, Activity 8: Force, Mass, and Acceleration, students perform an experiment to investigate the relationships among distance, speed, and acceleration. They graph results and determine an equation that relates force, acceleration, and mass. MATH-M4.

6.SCAFFOLDING AND SUPPORT: Materials provide teachers with guidance to build their own knowledge and to give all students extensive opportunities and support to explore key concepts using multiple, varied experiences to build scientific thinking.	**Required** **6a)** There are separate **teacher support** materials including: scientific background knowledge, support in three-dimensional learning, learning progressions, common student misconceptions and suggestions to address them, guidance targeting speaking and writing in the science classroom (e.g. conversation guides, sample scripts, rubrics, exemplar student responses).
6b) Appropriate suggestions and materials are provided for **differentiated instruction** supporting varying student needs at the unit and lesson level (e.g., alternative teaching approaches, pacing, instructional delivery options, suggestions for addressing common student difficulties to meet standards, etc.).	

Justification with examples:

The instructional materials in *Issues and Science and Science* incorporate flexible approaches and features for differentiated instruction, with the overarching goal of addressing students' varying learning needs and providing the support students need as they move toward more self-directed learning.

In *Issues and Science,* classroom supports for differentiated instruction are embedded in each activity and identified in Strategies for Teaching Diverse Learners in the *Teacher's Edition*. These modifications take different forms, depending on the goals of the activity. For example:

- For students with lower literacy levels, teachers can use optional Student Sheets with pre-constructed data tables, graphic organizers, and/or Science Skills Student Sheets.
- For students who are not yet prepared to design their own scientific investigation, the *Teacher's Edition* may provide a sample lab procedure.

- For students who are ready to be more independent, the *Teacher's Edition* incorporates suggestions to reduce teacher guidance.

Additional differentiation support can be found in Section 4 of the *Teacher Resources* titled "Comprehensive Teacher Support".

The *Teacher's Edition* for each unit contain a variety of sections outlining other program features. Each activity has a section called Investigative Phenomena and Sensemaking that outlines where students are in the learning progression for the content and which phenomena are being used to drive that learning at that point. Another section called Background Information provides scientific background knowledge for teachers relevant to the activity beyond what is covered in the lesson.

Potential student misconceptions are addressed in the Teaching Steps for an activity as well as in the use of several instructional strategies found throughout the units. For example, one embedded literacy strategy is the use of Anticipation Guides. From page 52 of the *Teacher Resources*: "The value of an Anticipation Guide is in the discussion that occurs before and after the reading. Before reading, students discuss their predictions and the reasons for them. During this discussion, the teacher gleans information about the depth of students' existing knowledge and their misconceptions about a topic. The post-reading discussion on how students' answers have changed allows teachers to formatively assess what students gained from the reading." Additional support about addressing student misconceptions can be found in the *Teacher Resources* starting on page 69 under the section "Eliciting Students' Prior Knowledge".

Scoring guide rubrics are provided throughout the program to help teaches assess how students are progressing in the Science and Engineering Practices. The rubrics can be applied to assess student work as part of an activity procedure or analysis. Blueprints are provided in each *Teacher's Edition* for where the rubrics can be used, and sample student work for a level 4 response is proved. The *Teacher Resources* includes sample work at all levels from one question for each of the practices. Sample student responses are also provided for all analysis questions at the end of each activity. For more information about the Scoring Guides please see the section on assessment.

The Teacher's Edition also features a section within each lesson plan called Materials and Advanced Preparation. This section outlines exactly what is needed from the materials kits and any additional prep like the mixing of chemicals or ordering of live specimens that needs to be done to complete the activity.

- For an example of the Background Information Section in the *Teacher's Edition*, please visit pages 103-104 in the digital *Teacher's Edition* for Chemistry of Materials (Activity 6 Modeling Molecules) or page 58 in the digital *Teacher's Edition* for Waves (Activity 2 Making Sound Waves).

- Please see Appendix E (Literacy Strategies) in the back of any student book for sample literacy supports including oral presentation guidelines, written report guidelines, and conversation starters for developing communication skills.
- Please see the Literacy Strategies section starting on page 45 of the *Teacher Resources* for additional teacher supports:
    - Reading supports begin on page 45
    - Writing supports begin on page 52
    - Oral supports begin on page 55
- The "Strategies for Diverse Learners" section can be found after the "Build Understanding" section of each lesson plan for every activity within all *Teacher's Editions*.

7. USABILITY: Materials are easily accessible, promote safety in the science classroom, and are viable for implementation given the length of a school year.	**Required** **7a)** Text sets (when applicable), laboratory, and other scientific materials are **readily accessible** through vendor packaging.
Required **7b)** Materials help students build an understanding of standard operating procedures in a science laboratory and include **safety** guidelines, procedures, and equipment. Science classroom and laboratory safety guidelines are embedded in the curriculum.	

<u>Justification with examples:</u>

Student books are available in print as well as digital formats. Each unit has a hardcover printed *Student Book*. *Teacher's Editions* and the *Teacher Resources* are printed and assembled into tabbed 3-ring binders. The *Teacher's Edition* and *Teacher Resources* are also available as digital assets as well.

All materials kits come with SDS sheets that are also included in the digital portal. Refill sheets for the materials packages for each unit are available on the Lab-Aids portal as well as on the website. For an example, please visit https://www.lab-aids.com/3eRefills. The *Teacher's Edition* and *Student Books* include safety notes as part of the procedure for an activity as needed.

Unit overviews provide estimated lengths for each activity based on 50-minute class periods. The length of instructional time was a result of the field testing that occurred during unit development. Using these outlines and the correlations for Louisiana, we estimate that Issues and Science will take 30 instructional weeks for 6th grade, 35 weeks for 7th grade, and 32 weeks for 8th grade.

- Please see Appendix B "Science Safety Guidelines" in the back of any Student book for more information and the safety contract. The safety contract is also available as part of the *Teacher Resources*.
- From Chemistry of Materials, Activity 3 Physical and Chemical Properties of Materials, Safety note in Student Book (digital page 24)

SAFETY

Wear safety eyewear. If a material does not bend easily, do not use more force because you could break or tear it. Watch out for sharp edges. Be careful to avoid spills on skin or clothing. If hydrochloric acid gets on your skin or clothing, immediately flush the area with running water and inform your teacher.

- From Waves, Activity 2 Making Sound Waves, Safety note in Teacher's Edition (digital page 45)

SAFETY NOTE

Develop a classroom safety plan. Review any safety materials provided by your district. Select the safety contract and guidelines that you will use in this course—either developing your own, using those provided by your district, or using Student Sheet 2.2, "Guidelines for Safety in the Science Classroom." Copy the materials for each student. Students can find "Science Safety Guidelines" in Appendix B: Science Safety in the Student Book.

In Part A, make sure that students are away from people and objects when they are spinning the whirly tubes around. In Part B, remind students to handle the springs with care and never to let go suddenly when the spring is under tension. If released when tension is being applied, the spring can move rapidly and unpredictably and could scratch someone. Students should wear safety goggles as recommended to protect their eyes from such an event.

<table>
<tr><td>8. ASSESSMENT:
Materials offer assessment opportunities that genuinely measure progress and elicit direct, observable evidence of the degree to which students can independently demonstrate the assessed standards.</td><td>Required
8a) Multiple types of formative and summative assessments (performance-based tasks, questions, research, investigations, and projects) are embedded into content materials and assess the learning targets.</td></tr>
<tr><td colspan="2">Required
8b) Assessment items and tasks are structured on integration of the three dimensions and include opportunities to engage students in applying understanding to new contexts.</td></tr>
</table>

Justification with examples:

Issues and Science includes a research-based assessment system based on a system first developed by SEPUP and the Berkeley Evaluation and Assessment Research Group (BEAR) at the University of California Graduate School of Education. Studies show that students in classrooms where the SEPUP Assessment System was used as part of a yearlong SEPUP course scored better on post-assessments than did students in classrooms where this assessment system was not used (Wilson & Sloane, 2000). In Classroom Assessment and the National Science Education Standards (National Research Council, 2001), the SEPUP assessment system is presented as a strong example of a system that can be used for both formative and summative assessment.

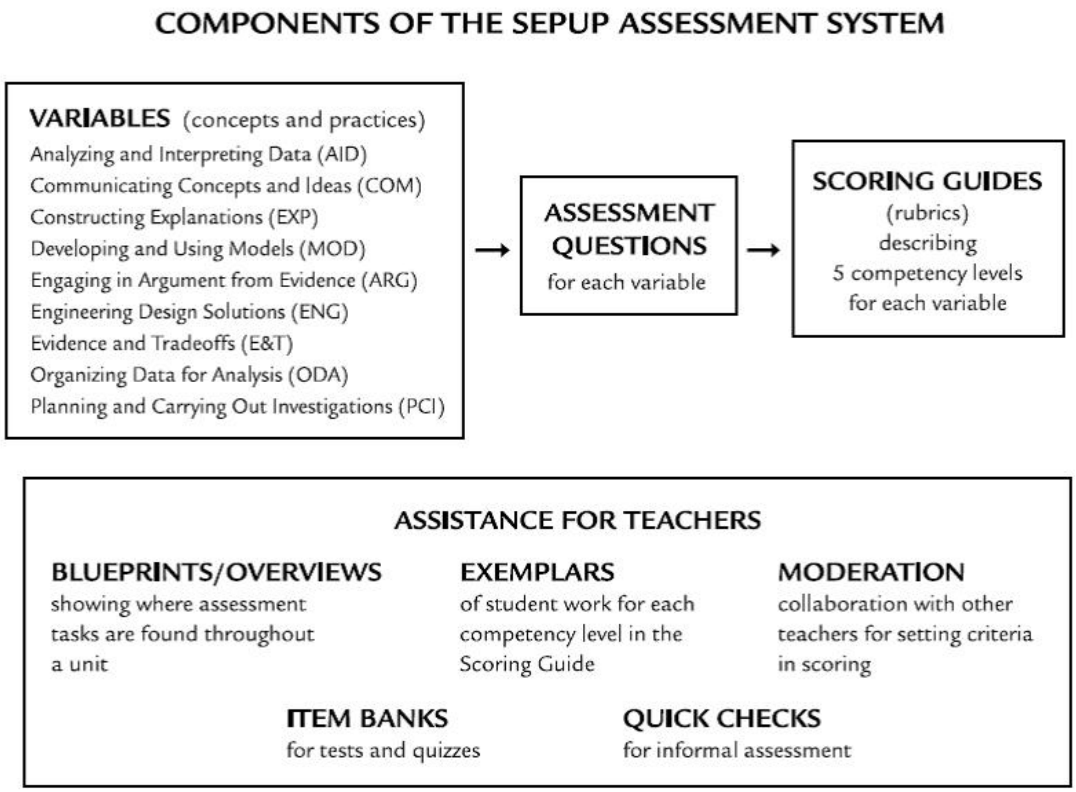
The SEPUP Assessment System incorporates both formative and summative assessments. Assessment tasks are embedded in Issues and Science and are an integral part of the learning activities:

- Formative assessments typically occur during the learning process, as students are acquiring new knowledge. They are especially useful in ensuring that students are learning specific concepts and practices. Teachers can use these assessments to inform and adjust their instruction, with the aim of helping to enhance student learning.

- Summative assessments occur at the end of a learning period, such as at the end of a learning sequence, unit, or grade band. They can provide evidence of students' integrated learning of the DCIs and CCCs and can also be used as evidence of their use of the SEPs and CCCs across multiple units. In this way, summative assessments can be used to inform future instruction.

Quick Checks are embedded tasks that can be used as checkpoints of students' learning along one, two, or three dimensions. When Quick Checks appear in an activity, they are integrated into the Teaching Steps.

The following diagram shows the different elements of the SEPUP assessment system.



The nine assessment variables, listed in the first box, define the Science and Engineering Practices that students are expected to learn. Each of these variables is complemented by a Scoring Guide with which to measure students' achievements according to five competency levels.

The SEPUP Scoring Guides are formatted as holistic scoring rubrics. However, they are easily converted to analytic scoring guides by adding criteria specific to each embedded assessment question. The nine Scoring Guides are used from unit to unit of Issues and Science for teachers to closely monitor students' growth and encourage their progression from novice to expert on each variable. When a scoring guide is suggested in the *Teacher's Edition*, student exemplars are also included. Scoring guides can be seen in the Assessment section of the *Teacher Resources* as well as in the *Teacher's Edition* when one is suggested.

These performance rubrics help teachers and students track their skill development with the Science and Engineering Practices. They provide a foundation for schools to translate the results into standards-based grading with evidence of student proficiency. Professional development around the implementation of the SEPUP assessment system models the practice of moderation, where teachers are tasked to evaluate the same work and compare results. This process develops a sense of how the rubrics are to be used as an evaluation tool and can be modeled with students for self-assessment as well.

Issues and Science includes analysis questions at the end of each lesson that have been identified as summative assessment opportunities include suggested student answers. Analysis questions are scaffolded with later questions requiring more thought and effort. Throughout the *Teacher's Editions*, specific analysis questions are highlighted with dot icons that emphasize which dimension or dimensions (DCIs, SEPs, and CCCs) are being assessed. Sample answers are provided for all analysis items.

Additionally, *Issues and Science* comes with an accompanying item bank of analysis items. The item banks provided for each unit contain questions in a format similar to the state or district tests that many students take. Some teachers use the item banks for pre- and post-assessments for each unit or chapter to measure students' growth. The questions also provide supplementary assessment opportunities. The item banks focus on key content and process skills in the unit and include multiple-choice questions, short-answer questions, and questions requiring an extended response. Our portal has the ability for teachers to design additional questions in a variety of online formats, including drag and drop, audio recorded, and multiple select. Each item bank has an accompanying page in the *Teacher's Edition* that correlates the questions to the three dimensions. Answers to all item bank items are provided.

- From the Fields unit Activity 8 Static Electricity example Quick Check in the *Teacher's Edition*

7. Students complete the Analysis items.

   a. (COM QUICK CHECK) Students ask any questions they still have about how different materials generate static electricity.

   Analysis item 1 provides an opportunity for a formative assessment of students' ability to communicate concepts and ideas, known as a Quick Check. Students should formulate questions about different materials that could be used to generate static electricity and then communicate how their questions could be answered in a scientific investigation. Have students share their questions, proposed experiments, and hypotheses in their groups. Allow a few groups to share one of their questions.

Quick Checks

Sample student response:

1. (COM QUICK CHECK) In this investigation, you tested only a few materials. Think about another material that might be able to generate static electricity. Write down a scientific question about that material. How would you investigate it in your science class or at home?

   I wonder if glass would be able to generate static electricity. My hypothesis is that the glass will be able to hold charge when rubbed with a nylon cloth. The way I would test that is to use the electroscope to measure both materials. I would use the same rubbing cloth, same number of rubs on the cloth, and same distance from the electroscope. The only variable that I would change is the material.

- Example item bank correlation from *Teacher's Edition* of Solar System and Beyond

ITEM BANK NGSS CORRELATIONS

SOLAR SYSTEM AND BEYOND

Item number	Supports activity	NGSS
1	6, 7, 8, 9	ESS1.B
2	2, 3, 4, 5	Patterns, Nature of Science
3	2, 3, 4, 5	Patterns, Nature of Science
4	5	ESS1.A, ESS1.B, Systems and System Models
5	5	ESS1.A, ESS1.B, Systems and System Models
6	2, 3, 4	Nature of Science
7	2, 3, 4, 5	ESS1.A, Patterns, Nature of Science
8	6, 7, 8, 9	ESS1.A, Patterns, Nature of Science
9	6, 7, 8, 9	ESS1.A, Patterns, Nature of Science
10	6, 7, 8, 9	ESS1.A, Patterns, Nature of Science
11	6, 7, 8, 9	ESS1.A, Patterns, Nature of Science
12	6, 7, 8, 9	Nature of Science
13	10	ESS1.A
14	13	ESS1.B
15	13	ESS1.B, Scale, Proportion, Quantity
16	14	ESS1.B
17	16	ESS1.B
18	11, 12	Scale, Proportion, Quantity
19	11, 12	Scale, Proportion, Quantity
20	15	ESS1.B
21	1, 10, 13, 16, 17	Connections to Engineering
22	10, 13	ESS1.B, Scale, Proportion, Quantity
23	15, 16	ESS1.A, ESS1.B, Analyzing and Interpreting Data
24	14	ESS1.B, Analyzing and Interpreting Data
25	15, 16	ESS1.B
26	10, 13, 15, 16	ESS1.B
27	10, 11, 12	Scale, Proportion, Quantity
28	6, 7, 8, 9	ESS1.A, ESS1.B, Systems and System Models, Developing and Using Models

SOLAR SYSTEM AND BEYOND T-45

- From Force and Motion unit Activity 3 Speed and Kinetic Energy example of question that uses Scoring Guide as described in the *Teacher's Edition*

BUILD UNDERSTANDING

4. (AID ASSESSMENT) Students identify the relationship between speed and kinetic energy.

    a. Let students know that they will be assessed on Analysis item 2.

    If you have not already done so, display or distribute the AID Scoring Guide, and review the levels as needed. A sample Level 4 response can be found in the Sample Responses to Analysis.

    b. Briefly discuss and summarize the main result as a class. (optional)

    Teacher's Note: Students do not identify the relationship quantitatively in this activity; they will do so in a subsequent activity.

    Students should be able to point out that the data show a clear relationship between speed and block movement because as the cart started higher on the ramp, the block moved farther. Assuming that the block distance reflects the amount of kinetic energy that was transformed, and that a higher release height results in faster speed, students can conclude that there is a relationship between the increased speed of the cart and kinetic energy. Sample data can be found on the sample student response to Student Sheet 3.2 at the end of this activity.

Sample student response:

SAMPLE RESPONSES TO ANALYSIS

1. According to your data from Part A, what is the effect of release height on speed?

    Students' responses will likely vary. A sample response is shown here:

    The speed of the cart went from 123 cm/s to 82 m/s to 56 m/s as the height was decreased from Notch A to B to C. So, the greater the release height, the greater the speed.

Sample scoring guide:

ANALYZING AND INTERPRETING DATA (AID)

When to use this Scoring Guide:
This Scoring Guide is used when students analyze and interpret data that they have collected or that has been provided to them.

What to look for:

- Response describes patterns and trends in data.
- Response interprets patterns and trends, using relevant crosscutting concepts and disciplinary core ideas, to describe possible causal, relationships.

Level	Description
Level 4 Complete and correct	The student analyzes the data with appropriate tools, techniques, and reasoning. The student identifies and describes patterns in the data, and interprets them completely and correctly to identify and describe relationships. When appropriate, the student • makes distinctions between causation and correlation. • states how biases and errors may affect interpretation of the data.
Level 3 Almost there	The student analyzes the data with appropriate tools, techniques, and reasoning. The student identifies and describes patterns in the data BUT incorrectly and/or incompletely interprets them to identify and describe relationships.
Level 2 On the way	The student analyzes the data with appropriate tools, techniques, and reasoning. The student identifies and describes, BUT does not interpret, patterns and relationships.
Level 1 Getting started	The student attempts to analyze the data BUT does not use appropriate tools, techniques and/or reasoning to identify and describe patterns and relationships.
Level 0	The student's analysis is missing, illegible, or irrelevant to the goal of the investigation.
x	The student had no opportunity to respond.

- In Unit: Fields and Interactions, the objectives include the following PEs: MS-PS2-3, MS-PS2-4, MS-PS2-5, MS-PS3-2, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, and MS-ETS1-4. All eight PEs are assessed through the analysis questions and activities identified in the Assessment Blueprint. For example, in Activity 7, analysis question 4 assesses PE-MS-PS2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. Students create an argument based on evidence to support or refute the claim (SEP-ARG-M3) that gravity can cause objects to repel one another (DCI-PS2.B-M2). Students also draw a model of a gravitational and magnetic system to show the magnitude and direction of forces (CCC-SYS-M2) to demonstrate forces acting on objects from the data table provided. The drawing also serves as evidence for their argument.