**Issues and Science, Published by Lab-Aids**
Grade 7

- Earth's Resources
- Geological Processes
- Reproduction
- Evolution
- Chemical Reactions

**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** |
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| **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 8th 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.
    - Earth's Resources https://www.lab-aids.com/sites/default/files/2020-07/Earths%20Resources%203e%20NGSS%20and%20Common%20Core%20Correlations%20v3.1.pdf
    - Geological Processes https://www.lab-aids.com/sites/default/files/2020-07/Geological%20Processess%203e%20NGSS%20and%20Common%20Core%20Correlations%20v3.1.pdf
    - Reproduction https://www.lab-aids.com/sites/default/files/2020-07/Reproduction%203e%20NGSS%20%26%20Common%20Core%20Correlations%20v3.1.pdf
    - Evolution https://www.lab-aids.com/sites/default/files/2020-07/EVO%20NGSS%20and%20Common%20Core%20Correlations%20v3.1.pdf
    - Chemical Reactions https://www.lab-aids.com/sites/default/files/2020-07/REA%20NGSS%20and%20Common%20Core%20Correlations%20v3.1.pdf

- In Unit: Chemical Reactions, Activity 2: Evidence of Chemical Change, students determine what causes something to fizz, change color, or change temperature when you mix substances. Students conduct an investigation (SEP-INV-M2) to observe five combinations of chemicals to determine if there is evidence (CCC-PAT-M1) that a chemical change has occurred. Students record the evidence and compare substances (SEP-DATA-M7), before and after the investigation, to identify the signs that a chemical reaction has taken place (DCI-PS1.B-M1).

- In Unit: Chemical Reactions, Activity 12: Recovering Copper, students determine how chemical reactions can be used to clean up waste. Students test three metals to determine which can best reclaim copper from waste (CCC-EM-M1). Each metal is placed in a solution and observed for evidence of a chemical reaction, then tested for the presence of copper in the remaining solution (DCI-PS1.B-M1). Data is analyzed to identify which metal (SEP-DATA-M7) manufacturing companies should use to reclaim copper and the trade-offs of using that metal (SEP-ARG-M3).

- In Unit: Geological Processes, Activity 8: Beneath Earth's Surface, the three dimensional learning objective is found in the Teacher Edition in the NGSS Connections and NGSS Correlations section; in the Student Book it is presented as the guiding question, "What is beneath Earth's surface?" Students identify natural hazards caused by earthquakes and volcanic eruptions, use models to understand what happens during a volcanic eruption, identify patterns that are observed when locations of earthquakes and volcanoes are observed, and explain the use of GPS to understand Earth's surface. In order to build an understanding of how Earth's surface is broken into lithospheric plates that move, students read a passage and use the Listen, Stop, and Write strategy. Students then use the information from the passage to create a scaled drawing of the Earth's interior. Students use the information in the passage and their recorded main ideas to answer analysis questions and construct a scaled drawing of the Earth's interior (CCC-SF-M1) and surface (SEP-DATA-M1), then decide the best depth to store nuclear waste (DCI-ESS2.A-M1). Student understanding of the objectives is assessed through group discussions, individual answers to the analysis questions, and by revisiting the guiding question at the end of the lesson.

- In Unit: Geological Processes, Activity 6: Mapping Locations of Earthquakes and Volcanoes, students explain why earthquakes, volcanic eruptions, and their related hazards do not happen everywhere on Earth. Students access and collect data from a data visualization program. They analyze and interpret similarities and differences in data (SEP-DATA-M4, SEP-DATA-M7) to identify patterns (CCC-PAT-M4) in the distribution of major earthquakes and volcanic eruptions around the world. Students add data to a world map, which acts as the first step in understanding that the Earth's surface is broken into plates (DCI-ESS3.B-M1).

- In Unit: Earth Resources, Activity 8: Groundwater Formation, students engage in an activity to understand how groundwater moves and how aquifers form. Students explore the porosity of materials (CCC-SF-M2) as they collect data and develop models (SEP-DATA-M4, SEP-MOD-M5) for how groundwater is filtered and then extracted from aquifers. This activity helps students develop an understanding of the geological processes and how the process distributes the resources humans depend upon (DCI-ESS3.A-M1).

- In Unit: Evolution, Activity 1: The Full Course, students build knowledge of how humans have changed the way species look or behave. They learn how natural selection leads to certain traits in a population becoming more predominant than others (DCI-LS4.B-M1) by using a simulation to model (SEP-MOD-M5) antibiotic resistance in bacteria. Using colored disks to represent level of antibiotic resistance, students roll a die to determine whether or not the person has taken their antibiotic. Students graph their result, analyze their collected data (SEP-DATA-M7), share their results, and look for patterns (CCC-PAT-M3). Following a class discussion, students use their data to support an explanation (SEP-CEDS-M2) for how bacteria can differ and what happens to the bacterial population after exposure to antibiotics.

- In Unit: Evolution, Activity 15: Bacteria and Bugs: Evolution of Resistance, students build understanding of how humans have changed the way species look or behave. Students read about four types of organisms that have developed resistance to chemical control methods (SEP-INFO-M1) and identify a cause and effect relationship between human activity and the evolution of resistance (CCC-CE-M2). They then use this to apply principles of natural selection to explain bacterial antibiotic resistance as they make sense of how humans influence evolution through natural selection (DCI-LS4.B-M1).

| Non-negotiable<br>**2.PHENOMENON-BASEDINSTRUCTION:**<br>Explaining phenomenon and designing solutions drive student learning. | Required<br>**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. |
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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 Evolution unit can be found here: https://www.lab-aids.com/sites/default/files/2020-07/EVO%20Storyline%20and%20Phenom%20v3.1.pdf

- In Unit: Chemical Reactions, Activity 8: Chemical Batteries, the challenge is to improve the design of a chemical battery. Before beginning their design, students are provided information about how to build a battery, how the battery releases chemical energy, and what observations should be made to indicate a chemical change and energy transformation (DCI-PS1.B-M3). Students are then asked to modify the design to improve the battery so it can turn a motor as fast as possible and last at least five minutes. Students test and evaluate their designs (ETS1.B-M2).

- In Unit: Chemical Reactions, Activity 10: Developing a Prototype, the challenge is to develop a prototype for a hand warmer. Students observe a demonstration of a hand warmer in a plastic bag and are then asked, "Why might this not be the best hand warmer design?" The demonstration and discussion questions provide students with a shared experience about hand warmers before they are asked to modify and improve the design. Students design, test, and evaluate their designs, then compare characteristics of other designs as they brainstorm future improvements.

- In Unit: Chemical Reactions, Activity 12: Recovering Copper, the problem is that manufacturing processes can produce chemical waste. Students learn that the reaction used to produce a circuit board produces manufacturing waste. Students are challenged to find the best metal to help them recover copper metal from a waste solution they collected when producing a circuit board. Students use various metal solutions to replace the copper in solution and recover the copper metal. They look for evidence of chemical change and observe patterns in the precipitate. Students apply results as evidence to explain which metal is best to recover the copper.

- In Unit: Earth's Resources, Activities 2, 4, 6, 13, and 14, the phenomenon is that humans affect the availability of natural resources drives student learning. In Activity 2, students are introduced to the phenomenon when they read about population and consumption; this provides a connection to the anchoring phenomenon by focusing on how an increase in human population affects consumption of resources. In Activity 4, students compare changes in consumption of natural resources over a 10-year period across eight countries and use the data to support a claim about how increased population and resource consumption affects earth (SEP-ARG-E4). In Activity 6, students learn how copper is mined and extracted, and the impact the mining and use of this resource has on the environment (DCI-ESS3.C-M2, CCC-CE-M2). In Activity 13, students learn human use of a variety of resources (mining copper, burning fossil fuels, removing groundwater, and growing food) impact the environment and the availability of the resource. In Activity 14 students apply their learning and make recommendations on actions a community should take regarding use or preservation of its natural resources.

- In Unit: Earth's Resources, Activity 14: The Rockford Range Decision, the problem is that a town is deciding which resource to mine, and needs to balance the community's need for natural resources with conservation of the environment. Students determine the benefits and trade-offs of mining different materials in the fictitious town of Rockford. As students analyze the positive and negative effects of mining different resources and the impact on the environment, they learn how humans rely on earth's resources and how human consumption of those resources can negatively impact the environment (DCI-ESS3.A-M1, DCI-ESS3.C-M2).

- In Unit: Reproduction, Activities 2, 4, and 5, phenomenon is that an orange-tailed "critter" and a blue-tailed critter produce only blue-tailed offspring, but the second generation contains both blue- and orange-tailed offspring. In Activity 2, students are introduced to this phenomenon through observations of the "critter" populations. In Activity 4, students are provided which allele is dominant and which is recessive and then model the probability of inheritance of dominant or recessive alleles (SEP-MOD-M5) using a coin toss. Students relate the random assortment of alleles to the tail color of the "critters" (CCC-CE-M2). In Activity 5 students are provided the genotypes for each "critter" and information about allele dominance. Students use Punnett squares to explain the first generation and then complete a second Punnett square to explain the second generation (DCI-LS3.A-M2).

- In Unit: Reproduction, Activity 11: Plant-Animal Interactions, the phenomenon is butterflies and hummingbirds visit different flowers. The phenomenon is presented as an observation by Joe, along with a picture of different flowers. Students are provided information cards and pictures of four different plants and four different animals to learn about different structures and reproductive traits. Students use the information in the cards as evidence to support an argument for determining which plants butterflies and hummingbirds visit.

- In Unit: Evolution, Activity 5: Mutations, the phenomenon is that the Hemoglobin S mutation causing sickle cell can be viewed as positive for survival or negative. Students are presented with the alleles and phenotypic expression along with maps showing the distribution of Hemoglobin S and malaria transmission zones. Students identify how the sickle cell mutation (single allele) can result in increased survival or resistance to sickle cell anemia and how the distribution of individuals carrying the gene are resistant to malaria (DCI-LS3.A-M1, DCI-LS3.A-M2, DCI-LS3.B-M2, DCI-LS4.B-M1, DCI-LS4.C-M1).

- In Unit: Evolution, Activity 6: Mutations and Evolution, the phenomenon is that sickle cell frequency varies across the world based on changes in the environment. The phenomenon is initially presented with a map in Activity 5, showing the frequency and distribution of the Hemoglobin S mutation. In this activity, students use a computer simulation to observe how the chance of getting malaria and quality of health care impacts the percentage of genotype and malaria frequency over multiple generations. Students then determine how changes in the environment affect the frequency of sickle cell traits in populations.

- In Unit: Evolution, Activity 15: Bacteria and Bugs: Evolution of Resistance, the phenomenon is house mice, weeds, mosquitos, and plasmodium have developed chemical resistance over time. The materials elicit prior learning from Activity 1 by asking students to recall information where bacteria develop resistance to antibiotics when a person does not finish their medication. Students apply prior learning when comparing all four examples and explaining how evolution can account for the chemical resistance in all four organisms.

- In Unit: Geological Processes, Activity 1: Storing Nuclear Waste, the problem is presented as a challenge to find the best location to build a nuclear waste storage facility. The materials provide a picture of a nuclear power plant and maps showing the locations of nuclear plants and population density. They also provide background text about nuclear waste.

- In Unit: Geological Processes, Activity 18: Evaluating Site Risk, the problem is that the United States needs to decide where they should build a long-term nuclear waste storage facility. To solve this problem students evaluate historic landslide and earthquake maps of the United States (DCI-ESS3.C-M1), as well as, maps of nuclear reactor sites and population density as they consider four potential sites and recommend which would be the best location to store nuclear waste.

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<tr><td>Non-negotiable (only reviewed if Criteria 1 and 2 are met)<br>3.ALIGNMENT & ACCURACY:<br>Materials adequately address the Louisiana Student Standards for Science.</td><td>Required<br>3a) The majority of the Louisiana Student Standards for Science are incorporated, to the full depth of the standards.</td></tr>
<tr><td colspan="2">Required<br>3b) Science content is accurate, reflecting the most current and widely accepted explanations.</td></tr>
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Please see the correlations document included for with this submission.

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<tr><td>Non-negotiable (only reviewed if Criteria 1 and 2 are met)<br>4.DISCIPLINARY LITERACY:<br>Materials have students engage with authentic sources and incorporate speaking, reading, and writing to develop scientific literacy.</td><td>Required *Indicator for grades 4-12 only<br>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.</td></tr>
<tr><td colspan="2">Required<br>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.</td></tr>
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| **Required**<br>**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.

- ESS3.B-M1. In Unit: Geological Processes, Activity 3: Modeling Landslides, students access and collect data from a data visualization program. Then they analyze and interpret data in order to look for patterns in the distribution of major earthquakes and volcanic eruptions around the world. Students add data to a world map which acts as the first step in discovering that the Earth's surface is broken into plates.

- DATA-M4. In Unit: Geological Processes, Activity 6: Mapping Locations of Earthquakes and Volcanoes, students access and collect data from a data visualization program. Students then analyze and interpret data in order to look for patterns in the distribution of major earthquakes and volcanic eruptions around the world. Students add data to a world map which acts as the first step in discovering that the Earth's surface is broken into plates.

- ESS2.A-M1. In Unit: Geological Processes, Activity 8: Beneath Earth's Surface, students make predictions about the Earth's interior including initial drawings of their understanding. They read and analyze informational text focusing on layers of the Earth noting differences in properties and temperature, and how these processes are the result of energy flowing and matter cycling from the Earth's hot interior. Students create a scaled drawing/model of layers to help analyze and predict the best location for storing nuclear waste.

- MOD-M4. In Unit: Geological Processes, Activity 17: Enough Resources for All, students connect previous knowledge from a groundwater aquifers activity to a modeled aquifer game scenario in which students are provided real aquifer data. Students use this model to analyze and interpret the data as they construct explanations using graphs they create based on given data. Students construct their explanations after identifying patterns and cause and effect relationships.

- ESS3.A-M1. In Unit: Earth's Resources, Activity 2: World Resource Consumption, students read passages detailing the consumption of copper, petroleum, and freshwater, followed by a passage on consumption and world population growth. Each passage includes images and maps identifying the locations of global deposits for each resource. Various graphs are included illustrating world population growth over time and global consumption of each of the resources.

- ESS3.C-M2. In Unit: Earth's Resources. Activity 4: Per Capita Consumption, students identify changes in mineral, energy, and groundwater resources over time. Students use population data to calculate the per capita consumption from eight different countries. Students then analyze this data to support an argument about whether increases in human populations and per capita consumption of natural resources lead to negative impacts on Earth.

- LS4.C-M1. In Unit: Evolution: Activity 1: The Full Course, students engage in an activity modeling how antibiotics affect the size and resistance of bacteria over time. Students collect and graph data of bacteria response to the antibiotic either taken as prescribed or not taken as prescribed. Finally, students reflect on their activity and its connection to evolution. This phenomenon is becoming a health risk for many people across the world.

- LS4.A-M1. In Unit: Evolution, Activity 9: Fossil Evidence, students examine sets of fossils and identify unique features of each. They read a passage that describes how scientists find and date fossils before examining four simulated drill cores to detect patterns in the fossil record. They use evidence from the drill cores to list the fossils that they examined in chronological order and determine the relative ages of the fossils.

- LS4.B-M2. In Unit: Evolution, Activity 16: Manipulating Genes, students research technologies that are being used to change the traits of organisms to make them more useful or desirable. They consider the impact of these technologies on society and other organisms.

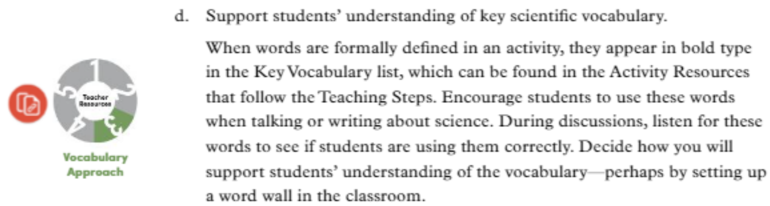
- LS1.B-M4. In Unit: Reproduction, Activity 7: Do Genes Determine Everything?, students test the effect of an environmental factor on the color trait of *Nicotiana* seeds. Data is analyzed to determine the effect of a chosen environmental factor on the phenotype of the seeds.

- LS1.B-M2. In Unit: Reproduction, Activity 10: Animal Behavior, students create an argument explaining how a specific trait increases the probability of an organism successfully reproducing.

- PS1.B-M1. In Unit: Chemical Reactions, Activity 1: Producing a Circuit Board, students design a circuit board and etch the design with acidified copper chloride using a masking technique. They consider the trade-offs of a product producing hazardous waste. Students work to conceptualize properties of matter and chemical change as they test their circuit boards and observe the changes that occur in the solution of copper chloride before and after its use as they consider its disposal. Students gather evidence of chemical change in the solution.

- PS1.B-M3. In Chemical Reactions, Activity 2, Evidence of Chemical Change, students conduct an investigation and analyze results to identify evidence that a chemical change has taken place.

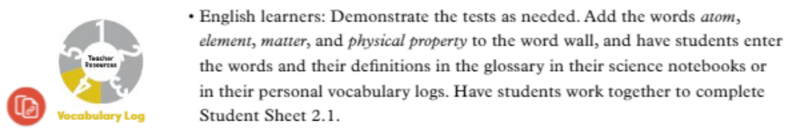
- Example vocabulary guidance from Chemistry of Materials *Teacher's Edition*




d. Support students' understanding of key scientific vocabulary.

When words are formally defined in an activity, they appear in bold type in the Key Vocabulary list, which can be found in the Activity Resources that follow the Teaching Steps. Encourage students to use these words when talking or writing about science. During discussions, listen for these words to see if students are using them correctly. Decide how you will support students' understanding of the vocabulary—perhaps by setting up a word wall in the classroom.

Activity 2 Investigating Elements




• English learners: Demonstrate the tests as needed. Add the words *atom*, *element*, *matter*, and *physical property* to the word wall, and have students enter the words and their definitions in the glossary in their science notebooks or in their personal vocabulary logs. Have students work together to complete Student Sheet 2.1.

| **5.LEARNING PROGRESSIONS:** 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. | **Required** **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. |
|---|---|

Justification with examples:

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 Pathways specific to the Reproduction unit, please visit
  https://sepuplhs.org/images/MS-LS3-1.jpg
  https://sepuplhs.org/images/MS-LS3-2new.jpg
  https://sepuplhs.org/images/MS-LS1-4.jpg
  https://sepuplhs.org/images/MS-LS1-5.jpg

- DATA-M4. In Unit: Geological Processes, Activity 6: Mapping Locations of Earthquakes and Volcanoes, students access and collect data from a data visualization program. Students then analyze and interpret data in order to look for patterns in the distribution of major earthquakes and volcanic eruptions around the world. Students add data to a world map which acts as the first step in discovering that the Earth's surface is broken into plates.

| 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 63-65 in the digital *Teacher’s Edition* for Evolution (Activity 3 A Meeting of the Minds) or pages 151-152 in the digital *Teacher’s Edition* for Chemical Reactions (Activity 8 Chemical Batteries).
- 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*.

<table>
<tr>
<td>7. USABILITY:<br>Materials are easily accessible, promote safety in the science classroom, and are viable for implementation given the length of a school year.</td>
<td>Required<br>7a) Text sets (when applicable), laboratory, and other scientific materials are readily accessible through vendor packaging.</td>
</tr>
<tr>
<td colspan="2">Required<br>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.</td>
</tr>
</table>

Justification with examples:

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](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 the unit From Cells to Organisms, Activity 7 Investigating the Cell Membrane, Safety note in Student Book (digital page 54)

**SAFETY**

Wear chemical splash goggles, protective gloves, and a lab apron when using Lugol's solution. Do not touch the solution or bring it into contact with your nose or mouth. Be careful not to get Lugol's solution on your skin or clothing as it may leave a stain. Wash your hands after completing the laboratory activity.

- From Body Systems, Activity 10 Gas Exchange, Safety note in *Teacher's Edition* (digital page 161)

**SAFETY NOTE**

Students will blow through a straw into chemicals. Make sure that they do not inhale through the straw! They should breathe in through their nose and exhale through their mouth. If they accidentally swallow liquid, make sure that they rinse out their mouth thoroughly and drink plenty of water.

Make sure that students wear chemical splash goggles while working with chemicals. Students should not touch the chemicals or bring them into contact with their nose or mouth. Have them thoroughly wash their hands after completing the activity.

| | |
|---|---|
| **8. ASSESSMENT:**<br>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. | **Required**<br>**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. |
| **Required**<br>**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. | |

<u>Justification with examples:</u>

*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:

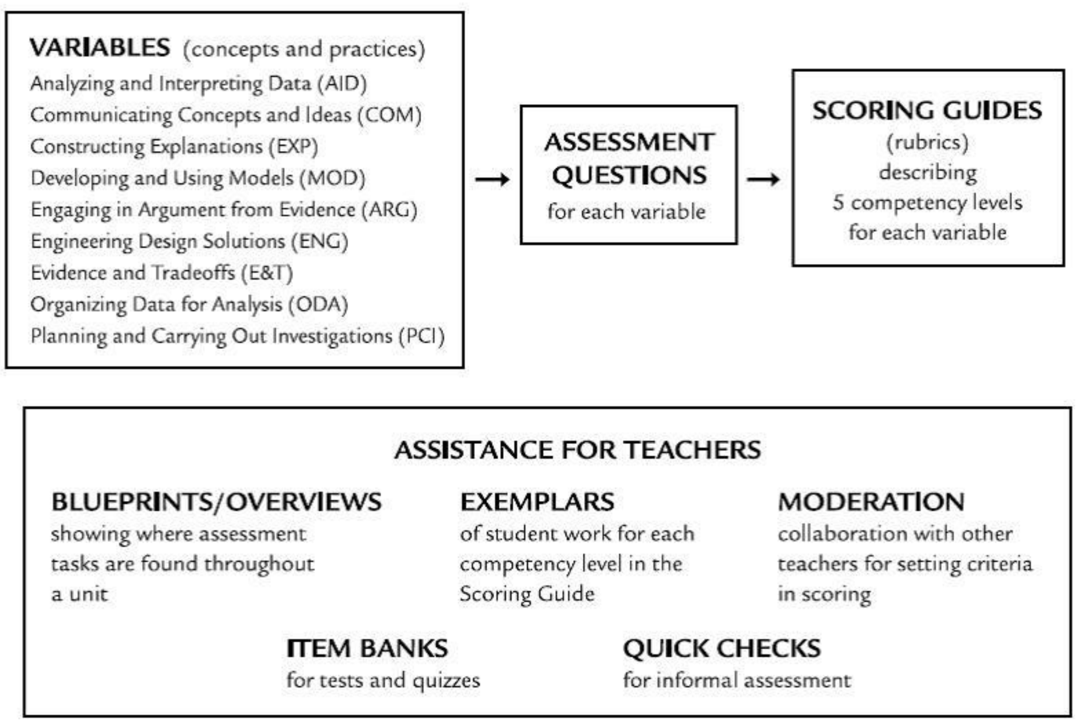
- Formative assessments typically occur during the learning process, as students are acquiring new knowledge. They are especially useful in ensuring that students are learning specific concepts and practices. Teachers can use these assessments to inform and adjust their instruction, with the aim of helping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

**COMPONENTS 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 Evolution unit Activity 1 The Full Course example Quick Check in the *Teacher's Edition*

5. (ODA QUICK CHECK) Students graph the results of their simulations.

   a. (MATHEMATICS) Distribute Student Sheet 1.1, "Bacteria Graph."

   Have students use this Student Sheet to complete Procedure Step 7. In addition, point out the "Scatterplot and Line Graphing Checklist" in Appendix C in the Student Book, and review it with your class as necessary. While the Next Generation Science Standards (NGSS) expect students to be proficient at making this kind of graph by the end of fifth grade, some students may need reminding or the additional scaffolding provided on this Skill Sheet.

Quick Checks

- Sample student response from Earth's Resources Activity 11 Fossils Over Time Quick Check:

4. (EXP QUICK CHECK) How is evidence from rock strata used to organize Earth's history?

   **SAMPLE LEVEL 4 RESPONSE**

   *Fossils found in layers of rock provide evidence of life on Earth. Younger fossils are usually in strata closer to the surface, and older fossils are in lower strata. By comparing the strata and fossils from different areas, scientists can determine the relative age of lots of the life that has lived on Earth. The appearance and disappearance of different groups of organisms in the fossil record are then used to divide the history of the Earth into different time periods.*

- Example item bank correlation from *Teacher's Edition* of Geological Processes

## ITEM BANK NGSS CORRELATIONS

### GEOLOGICAL PROCESSES

| Item number | Supports activiy | NGSS Support |
|---|---|---|
| 1 | 12, 13 | ESS2.B |
| 2 | 10, 11 | ESS2.A, ESS2.B, ESS3.B |
| 3 | 13 | ESS2.B |
| 4 | 10, 11, 13 | ESS1.C, ESS2.A, ESS2.B |
| 5 | 7, 12, 13 | ESS1.C, ESS2.A, ESS2.B |
| 6 | 10, 11, 13 | ESS1.C, ESS2.B |
| 7 | 15 | ESS2.A |
| 8 | 16, 17 | ESS3.A |
| 9 | 17 | ESS3.A |
| 10 | 2, 5, 15 | ESS2.A |
| 11 | 15 | ESS2.A |
| 12 | 10, 11 | ESS2.A, ESS2.B |
| 13 | 8, 10, 11 | ESS2.A, ESS3.B |
| 14 | 15 | ESS2.A |
| 15 | 14 | ESS2.A, Energy and Matter |
| 16 | 5, 10, 11, 13 | ESS 1.C, ESS2.A |
| 17 | 4, 7 | ESS2.A, ESS 3.B, Connections to Engineering, Technology and Applications of Science |
| 18 | 2, 17 | ESS2.C, ESS3.A |
| 19 | 2, 4 | ESS2.A |
| 20 | 2, 4 | ESS2.A, ESS3.B |
| 21 | 15 | ESS2.A |
| 22 | 10, 11 | ESS1.C, ESS2.A |
| 23 | 10, 11, 13 | ESS2.A, ESS1.C, Developing and Using Models, Stability and Change |
| 24 | 10, 11, 13 | ESS2.A, ESS1.C, Developing and Using Models, Stability and Change |
| 25 | 10, 11, 13 | ESS2.A, ESS1.C, Developing and Using Models, Stability and Change |
| 26 | 4, 7, 8, 9, 11 | ESS2.A, ESS3.B, Stability and Change |
| 27 | 4 | ESS2.A, ESS3.B, Connections to Engineering, Technology and Applications of Science |

- From Reproduction unit Activity 3 Reproduction example of an Analysis Question that uses the Developing and Using Models (MOD) Scoring Guide as described in the *Teacher's Edition* with Sample Student Response

3. (MOD ASSESSMENT) Prepare a diagram to model and explain the similarities and differences between asexual and sexual reproduction as follows:

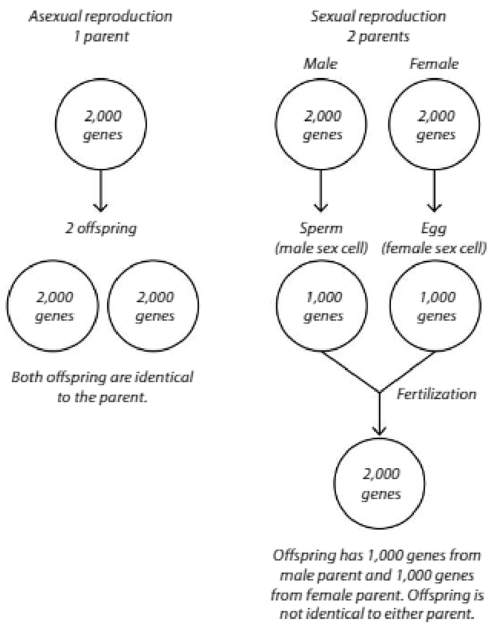
   a. Work with your group to draw a diagram that compares what happens at the cellular level in asexual and sexual reproduction.

   b. Be sure to label all the parent and offspring cells.

   c. Assume that most of the cells in the parents' bodies have 2,000 genes. Label the number of genes in each cell that you drew for item 3a.

   d. Write a brief paragraph explaining your diagram.

**SAMPLE LEVEL 4 RESPONSE**




*The diagram shows that asexual reproduction involves only one parent producing identical offspring with identical genes to the parent. In sexual reproduction, sex cells with half the normal number of genes are produced by each of two parents. These sex cells combine during fertilization to result in an organism with half of its genes from each parent.*

- Sample scoring guide (Developing and Using Models):

## DEVELOPING AND USING MODELS (MOD)

**When to use this Scoring Guide:**
This Scoring Guide is used when students develop their own models or use established models to describe relationships and/or make predictions about scientific phenomena.

**What to look for:**

- Response accurately represents the phenomenon.
- Response includes an explanation of relevant disciplinary core ideas and crosscutting concepts represented by the model or a prediction based on the relationships between ideas and concepts represented by the model.

| Level | Description |
|---|---|
| Level 4<br>Complete and correct | The student's model* completely and accurately represents the components, relationships, and mechanisms of the phenomenon, AND the student uses it to develop a complete and correct explanation or prediction. |
| Level 3<br>Almost there | The student's model completely and accurately represents the components, relationships, and mechanisms of the phenomenon AND includes a mostly correct use of the model to create an explanation or prediction. |
| Level 2<br>On the way | The student's model represents components of the phenomenon AND includes a partially correct representation of the relationships or mechanisms associated with the phenomenon. |
| Level 1<br>Getting started | The student's model represents components of the phenomenon BUT provides little or no evidence of the relationships or mechanisms associated with the phenomenon. |
| Level 0 | The student's response is missing, illegible, or irrelevant. |
| x | The student had no opportunity to respond. |

* A model can be a diagram, drawing, physical replica, diorama, dramatization, storyboard, or any other graphical, verbal, or mathematical representation. It may include labels or other written text as required by the prompt.

- In Unit: Geological Processes, the objectives include the following PEs: MS-ESS2-1, MS-ESS2-2, MS-ESS2-3, MS-ESS3-1, and MS-ESS3-2. All five PEs are assessed through the analysis questions identified in the Assessment Blueprint. For example, in Activity 17, analysis question 4 assesses PE-MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. In this activity students connect previous knowledge from a groundwater and aquifers activity (DCI-ESS2.C-M1, DCI-ESS3.A-M1) to a modeled aquifer game scenario in which students are provided real aquifer data from the United States. Students use this model to analyze and interpret the data as they construct explanations (SEP-MOD-M5, SEP-DATA-M4, SEP-CEDS-M3) using graphs they create based on the given data. Students construct their explanations after identifying patterns and cause and effect relationships (CCC-PAT-M2, CCC-PAT-M3, CCC-PAT-M4, CCC-CE-M2). Analysis question 4 then asks students to construct a response to a friend who claims that "we don't need to consider the location of aquifers when choosing a site to store nuclear waste."

- In Unit: Earth's Resources, the objectives include the following PEs: MS-ESS1-4, MS-ESS3-1, and MS-ESS3-4. All three PEs are assessed through the analysis questions identified in the Assessment Blueprint. For example, in Activity 14, analysis question 3 assesses PE-MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. Students use maps of specific locations to construct a scientific explanation (SEP-CEDS-M3) to explain how the uneven resource distribution of groundwater, minerals, and petroleum is a result of past geological processes and present human action (DCI-ESS3.A-M1, CCC-CE-M2).

- In Unit: Reproduction, the objectives include the following PEs: MS-LS1-4, MS-LS1-5, MS-LS3-1, and MS-LS3-2. All four PEs are assessed through the analysis questions identified in the Assessment Blueprint. The PE MS-LS1-4 is assessed in Activities 10 and 11. For example, in Activity 10, analysis question 1 assesses PE-MS-LS1-4: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. Students incorporate all three dimensions within this analysis question and are asked to create an evidence-based argument from the investigation (SEP-ARG-M3) within the activity. Their argument must explain how that specific trait increases the probability (CCC-CE-M3) of an organism successfully reproducing (DCI-LS1.B-M2).