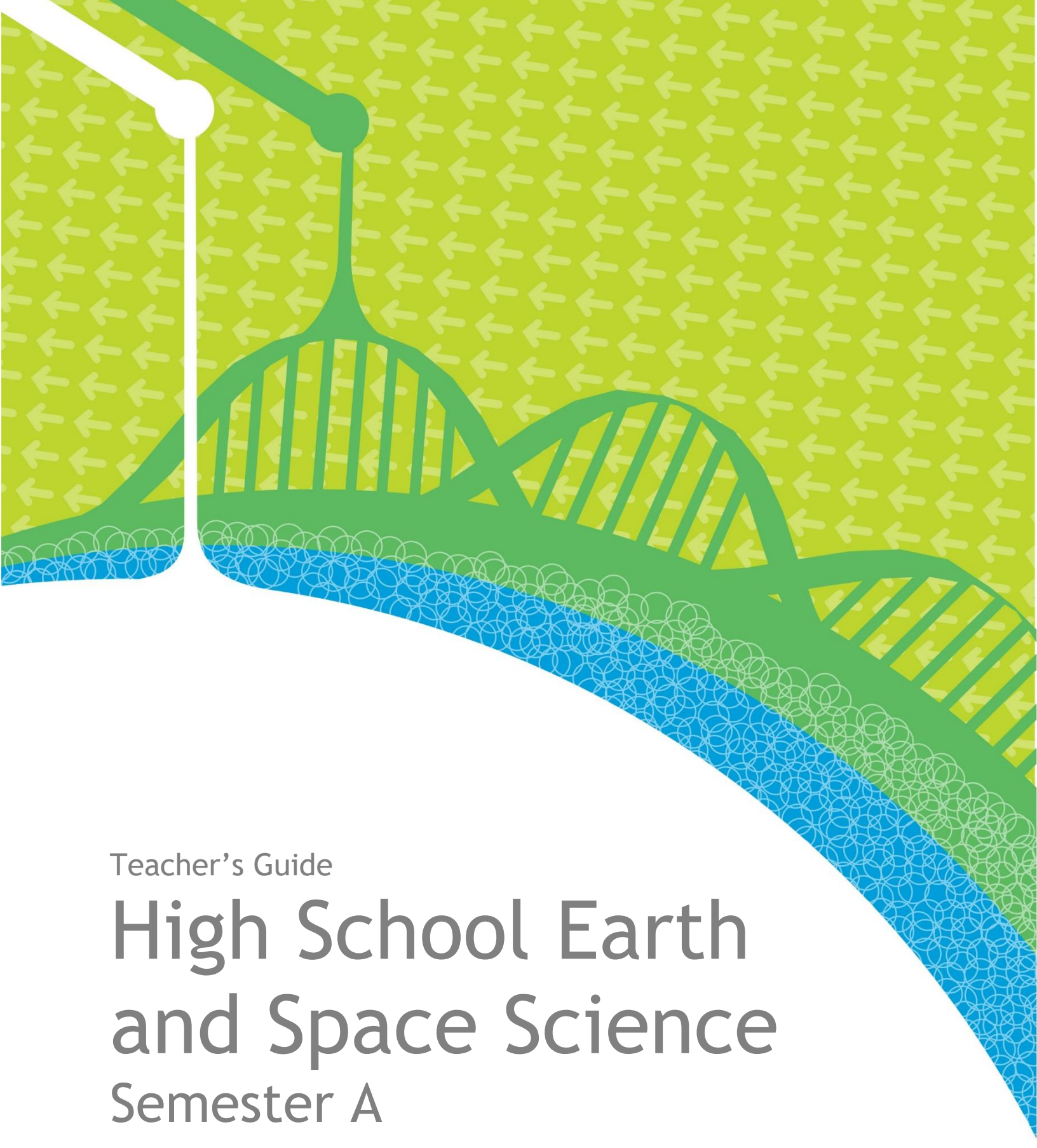

Teacher's Guide

High School Earth and Space Science

Semester A

Contents

Overview

Edmentum Courseware is developed to give instructors a variety of ways to engage different learning modalities and to give students an opportunity to experience a range of standards and objectives to ensure academic success.

Edmentum Courseware integrates online curriculum, learning activities, and supporting interactive activities. An array of assessment tools allows the instructor to correctly place students at the appropriate learning level, to evaluate strengths and needs, to create individualized learning goals, and to determine proficiency. Reports assist students in understanding where they need to focus to be academically successful as measured against objectives. Guidelines and tools are provided to track student progress and to determine a final course grade.

Edmentum Courseware gives instructors control over instructional choices for individual students as well as for the classroom. Instructors may use all of the components as sequenced or select specific activities to support and enhance instruction. Edmentum Courseware can be used in a variety of ways to increase student achievement.

Course Components

Learning Activities

Four basic types of learning activities form the building blocks of active learning for this course: Lessons, Unit Activities, Course Activities, and Online Discussions.

- **Lessons.** Each lesson in this course contains an interactive tutorial and an associated mastery test. Each tutorial includes one or more Lesson Activities that constitute mini-projects associated with the tutorial.
    - **Tutorials.** Tutorials provide direct instruction, video instruction, and interactive checks of understanding. Students check their understanding and practice their skills with a wide variety of technology-enhanced practice interactions, including drag-and-drop interactions, graphic interactions, matching questions, multiple-response questions, and fill-in-the-blank questions.
    - **Lesson Activities.** Lesson Activities are embedded within each tutorial. These focused mini-projects allow students to develop new learning in a constructivist way or to apply learning from the tutorial in a significant way. Lesson Activities are designed to be an authentic learning and assessment tool.
- **Unit Activities.** Similar to Lesson Activities, Unit Activities at the end of each unit constitute one or more small projects, but their purpose is to deepen understanding of key unit concepts and tie them together. Each Unit Activity includes a simple rubric. The teacher versions include both a rubric and modeled sample answers. Unit Activities are teacher graded.
- **Course Activities.** Course Activities are similar to Unit Activities in scope but may be found at any point in the course, either to prepare the student for new learning or to act as a performance-based activity required for a learning objective. Like Unit Activities, Course Activities include simple rubrics, and sample answers are available for teachers. Course Activities are teacher graded.
- **Online Discussions.** Online discussion with instructors and other students is a key activity, based on 21st-century skills, that allows for higher-order thinking about terminal objectives. An online threaded discussion mirrors the educational experience of a classroom discussion. Instructors can initiate a discussion by asking a complex, open-ended question. Students can engage in the discussion by responding both to the question and to the thoughts of others. Each unit in a course has one predefined discussion topic; instructors may add more discussion topics. A rubric for grading discussion responses is included in this guide.

Tools

The following tools are available to assist students as they work through a course. Clicking an icon opens access to the tool. Clicking again closes the tool:

- **Resources (tutorials).** Students can access key tools and references designed to support their learning.
- **Dictionary (tutorials).** Students can see a definition in English or Spanish for any text that they enter or copy and paste into the provided text field.
- **Text to Speech (tutorials and mastery tests).** Students can play audio narration for any text they enter or copy and paste into the provided text field.
- **Translate (tutorials).** Students can see a translation to another language for any text they enter or copy and paste into the provided text field.
- **Calculator (tutorials).** A calculator is available as a ready alternative to a handheld calculator.
- **Math Tools (tutorials).** Students can access a Graph tool to plot *x*-*y* functions and data and a Data Plot tool to plot box plots and histograms.

Assessment and Testing

Best practices in assessment and testing call for a variety of activities to evaluate student learning. Multiple data points present a more accurate evaluation of student strengths and needs. These tools include both objective and authentic learning tools.

- **Objective Assessments**. A targeted learning objective is associated with each lesson in this course. Each lesson objective is assessed through objective assessments at three different points during the course: at the end of the specific lesson, at the end of the unit, and at the end of the semester. In addition, pretests based on these objectives are available at the beginning of each unit, if desired by the teacher.

  All objective assessments are taken online. Assessment items are presented in over a dozen technology-enhanced item formats, parallel to those found in many state standard assessments. Typical item formats include multiple choice, multiple select (more than one answer), drag-and-drop matching, graphic placement, and text fill-in.

  - **Mastery tests** at the end of each lesson provide the instructor and the student with clear indicators of areas of strength and weakness.
  - **Unit pretests** are optional assessments, typically designed for credit recovery use. If a student shows mastery of a lesson's objective (80% proficiency), the student may be automatically exempted from that lesson

in the upcoming unit. Typically, teachers do *not* choose to employ exemptive pretests for first-time credit courses.

- **Unit posttests** help instructors track how well students have mastered the unit's content.
- **End-of-semester tests** assess the major objectives covered in the course.

By comparing the unit pretest results against unit posttest and end-of-semester test results, the instructor can gain a simple picture of student progress in mastering the lesson objectives for the course.

- **Authentic Learning Assessment**. Of the basic learning activity types described above, four are designed to help exercise and assess higher-level thinking skills: Lesson Activities, Unit Activities, Course Activities, and Online Discussions. These learning activities allow students to develop deep understanding and at the same time provide data for the teacher to assess knowledge development. The following comments address the use of these learning activities for assessment purposes.
  - **Lesson Activities** immerse the student into one or more in-depth problems that center on developing a deep understanding of the learning objective. They also provide a tool for assessing identified inquiry skills, STEM skills, and 21st-century skills. The Lesson Activities in this course are self-checked by the student; however, it is also possible for teachers to review and grade this student work.
  - **Unit Activities and Course Activities** are similar to Lesson Activities in style and purpose, but are typically more in-depth and time intensive. Unit Activities enable students to demonstrate depth of knowledge and a more integrative understanding of the unit's objectives. Course Activities often address learning standards that require a performance task of some sort. Some of the Unit Activities and Course Activities are teacher graded. These activities allow the instructor to score work on a scale of 0 to 100. A 100-point suggested rubric is provided to the student and the teacher for this purpose.
  - **Online Discussions** encourage students to reflect on concepts, articulate their thoughts, and respond to the views of others. In this way, they help teachers assess students' critical-thinking skills, communication skills, and overall facility with critical concepts. Each unit in this course has one predefined discussion topic. Instructors can customize the course, however, to add more discussion topics. Online Discussions may use any rubric the instructor sets. A suggested rubric is provided below for reference.

Online Discussion Rubric				
	D/F 0–69 Below Expectations	C 70–79 Basic	B 80–89 Proficient	A 90–100 Outstanding
Relevance of Response	The responses do not relate to the discussion topic or are inappropriate or irrelevant.	Some responses are not on topic or are too brief or low level. Responses may be of little value (e.g., yes or no answers).	The responses are typically related to the topic and initiate further discussion.	The responses are consistently on topic and bring insight into the discussion, which initiates additional responses.
Content of Response	Ideas are not presented in a coherent or logical manner. There are many grammar or spelling errors.	Presentation of ideas is unclear, with little evidence to back up ideas. There are grammar or spelling errors.	Ideas are presented coherently, although there is some lack of connection to the topic. There are few grammar or spelling errors.	Ideas are expressed clearly, with an obvious connection to the topic. There are rare instances of grammar or spelling errors.
Participation	The student does not make any effort to participate in the discussion.	The student participates in some discussions but not on a regular basis.	The student participates in most discussions on a regular basis but may require some prompting to post.	The student consistently participates in discussions on a regular basis.

Course Implementation Models

Edmentum Courseware gives instructors the flexibility to define implementation approaches that address a variety of learning needs. Instructors can configure the courses for individual students to work on their own at their own pace or for students working together concurrently in a group. Furthermore, the courses can be delivered completely online (that is, using a virtual approach) or can include both face-to-face and online components (that is, using a blended approach).

Depending on the learner grouping and learning approach, instructors can choose to take advantage of peer-to-peer interaction through Online Discussions. Similarly, if students have prior knowledge of the concepts taught in certain lessons, instructors can decide to employ unit pretests to assess students' prior knowledge and exempt them from taking the lessons. Note, however, that this feature is primarily designed for credit-recovery purposes. For first-time credit, students are typically not allowed to "test out" of course lessons. Following are two common implementation models for using Edmentum Courseware, along with typical (but not definitive) implementation decisions.

- **Independent Learning**
  The student is taking the course online as a personal choice or as part of an alternative learning program.

Learner grouping	independent learning
Learning approach	blended or virtual
Discussions	remove from learning path
Unit pretests	students do not take pretests

- **Group or Class Learning**
  The online course is offered for a group of students. These students may not be able to schedule the specific course at their local school site, or they may simply want the experience of taking an online course.

Learner grouping	group interaction
Learning approach	blended or virtual
Discussions	use; additional discussion questions may be added
Unit pretests	students do not take pretests

Earth and Space Science, Semester A, Overview

Learning Standards in Content and Practice

High School Earth and Space Science, Semester A, is a course based on the Next Generation Science Standards (NGSS). The content in the course covers all three facets described by NGSS: disciplinary core ideas, science and engineering practices, and crosscutting concepts. Science is sometimes referred to as the crossroads for several different disciplines: science, English language arts (ELA), and mathematics. To support this idea, the course addresses three Common Core standards—Reading in Science and Technical Subjects (RST), Writing in History, Social Studies, Science, and Technical Subjects (WHST), and the Standards for Mathematical Practice (MP). The course also addresses a subset of the Common Core Standards for Mathematics as identified by NGSS. Finally, the course content is validated, enriched, and aligned based on a careful review of state science learning standards.

English and Language Arts (ELA)

Success in science depends on strong reading, writing, and presentation skills and a strong grasp of scientific terms. To this end, the course includes a robust glossary of words that students can access through the resources menu and through hyperlinks on glossary words within a lesson. At times, students pause to analyze root words and prefixes so they can draw parallels between familiar terms. Writing exercises are varied. Students will write responses to open questions in labs, analyze science and technology articles, and reflect on their personal experiences with science. In one activity, for example, students research and describe several technologies developed by NASA that have helped society, and they form an opinion about the reciprocal relationship that NASA has with the public.

Inquiry, Labs, and Direct Interaction

Every state has science learning standards that focus on inquiry-based learning and inquiry skills. Additionally, some states have standards related to the amount of student time focused on inquiry activities or on laboratories.

These terms are sometimes loosely used, so for clarity Edmentum employs the definition of *laboratory* published in America's Lab Report: Investigations in High School Science (National Research Council, 2006, p. 3):

> "Laboratory experiences provide opportunities for students to interact directly with the material world (or with data drawn from the material world), using the tools, data collection techniques, models, and theories of science."

This means, for instance, that a field investigation in biology, geology, meteorology, climate, or astronomy is a "lab" even though it's done outside of a laboratory and even

though it doesn't involve a classical experiment, in which the scientist can (or should) act on the system being observed.

Also by this definition, a lab doesn't require "direct interaction" with the material world. Analyzing an online NOAA map of recent earthquakes or of ocean temperatures or analyzing real-world data from a population count parallels the life work of many scientists around the world. Direct interaction is critical to scientific learning, but laboratories using collected real-world data sets are also valuable, especially when the collection effort is beyond the capability of individual scientists, let alone a high school student.

Course Design – Inquiry and Labs

Edmentum science courses provide students with extensive and meaningful inquiry and lab experiences through Lesson Activities, Course Activities, and Unit Activities.

- *Lesson Activities*: Every science lesson contains one or more inquiry-oriented investigation (Lesson Activity) that can be accomplished within the flow of a lesson—anytime, anywhere. Many of these investigations employ powerful multivariate online simulations. That's great for in-lesson inquiry skills and thinking, but a simulation that doesn't employ actual real-world data does not qualify as a lab. Other lesson activities qualify, though, using real-world data sets, such as the online activities that employ NOAA resources mentioned above.
- *Course Activities:* These true laboratory experiences occasionally employ collected real-world data sets but more typically involve direct interaction with real-world phenomena through experiment, engineering design, or field investigation. In one activity, for example, students initiate a chemical reaction to model gases emitted by a volcano and predict the effect the gases have on the surrounding air temperature.
- *Unit Activities:* Unit Activities are typically projects that enable students to connect concepts and skills together. These activities are often STEM design projects that link science, math, and engineering. Or they are research and communication projects that link STEM concepts or issues to ELA research and communication skill standards. The design projects fit into the NRC's definition of laboratory. The research and communication projects typically do not.

Taken all together, Edmentum science courses focus a significant amount of student time and student thought into scientific inquiry:

- About 50% of student time is focused on inquiry activities.
- About 40% of student time is focused on activities that qualify as laboratory work.
- About 30% of student time is devoted to "direct interaction" investigations.

4E × 2 Inquiry Model

A significant portion of the learning in this course is inquiry-based science upheld by a 4E × 2 model for instruction: Engage, Explore, Explain, and Extend (4E), with Reflection and Assessment (× 2) threaded throughout. Students complete hands-on Course Activities (Explore) before studying the concepts within a lesson (Explain). In this way, students develop their own understanding of the material before any formal presentation. Course Activities also offer students the chance to apply what they've learned from the lab setting to real-world applications (Extend).

In addition to labs, engagement and exploration also take place in Lesson Activities as students interact with new concepts. Students dissect science articles leveled to their reading ability; interpret video content, maps, and real-world data; and perform simple investigations. With respect to reflection, students often begin a lesson by reflecting on what the new content means to them through warm-up questions. Students also do checks for understanding within lessons as a way to form their own thoughts and opinions on a topic.

STEM Integration

The content in this course adheres to STEM (science, technology, engineering, and mathematics) principles and 21st-century skills. Students experience science in the real world through sections on science in the news and careers in science, which are integrated into some lessons. The course emphasizes 21st-century skills, such as critical thinking and problem solving, through various activities and unit discussion questions that serve as authentic learning and assessment tools. In one activity, for example, students graph global temperature trends and interpret multiple points of view to conclude whether they believe human actions have strongly influenced climate change. In various Lesson Activities, students analyze and draw conclusions about scientific relationships.

Specialized Science Lab Materials

In this course, students complete teacher-graded labs in the Course Activities and Unit Activities. Appendix B of this document provides a list of lab materials needed for both semesters of the course so that schools, teachers, and students can prepare to have the materials on hand. Appendix C supplies a list of lab materials by individual activity for this semester of the course.

Many labs are kitchen-sink investigations or field activities that employ household materials, such as scissors, ruler, modeling clay, measuring cups, or gloves. At the high school level, though, rigorous science preparation requires that students have experience with quantitative methods and with the tools and materials of laboratory science, such as electronic balances, graduated cylinders, microscopes, and scientific specimens. State standards often explicitly require this kind of experience in high school science.

To address this learning need, four of the course labs require students to employ specialized scientific tools and materials:

- Testing Hypotheses (semester A)
- Rocks and Minerals (semester B)
- Weathering and Erosion (semester B)
- Human Interactions (semester B)

Each of these labs are called out in Appendix C with the following note, in bold:

> **** Special lab materials required.***
> ***(Edmentum Earth and Space***
> ***Science Kit or school lab materials)***

Schools and teachers can carry out these special materials labs in a variety of ways:

- In a blended learning course, labs are typically scheduled on a regular basis in a school laboratory with standard laboratory materials.
- In an in-building credit recovery situation, these labs can be carried out in a school lab with the oversight of the supervising science teacher.
- In a completely virtual learning situation, a school can either package up a lab kit for student use (containing the italicized materials listed in Appendix B) or they can purchase an economically-priced lab kit from Ward's Science that contains all these materials. These kits are largely reusable. Non-reusable items (disposable gloves, test strips, etc.) can be replenished by purchasing refill kits.

*See **Appendix D** for information on these single-student kits, provided exclusively by Ward's Science.*

As a final note, some learning environments, such as corrections facilities, might prohibit access to various science lab materials. In such cases, teachers can opt to remove any of the special-materials labs listed above from the learning path while still retaining full coverage of the NGSS standards. These activities enrich students' science experience and support NGSS standards, but the NGSS standards supported in these special materials labs are sufficiently addressed elsewhere in the course.

Lab Time Management
A student's active time for setup, data collection, and analysis in a lab activity is generally on the order of 3 to 5 hours. Many labs can be completed in one sitting, over several hours. Some labs, however, require students to make a series of observations over several days (e.g., plant growth, daily weather readings, moon phases).

For all labs, students will need to plan ahead by ensuring they have the materials they need, designating a work area, noting the duration of the lab, and identifying the time of day the lab needs to take place.

Lab Safety
For safety purposes, all labs require adult supervision. Students and teachers must always follow the safety instructions outlined in Appendix A of this document. Edmentum assumes no liability for personal injury, death, property damage, equipment damage, or financial loss resulting from the instruction included in this course.

In the spirit of protecting our planet and the people who live here, it's important that students follow proper disposal methods for materials used during experiments.

The Course Activities and Unit Activities employ these icons to help students and teachers throughout an experiment:

- Safety: gives safety instructions to avoid injury, death, or damage to equipment or property.
- Time: gives an estimated total time (duration) and active time spent on an experiment.
- Materials: gives the materials and equipment needed to complete the experiment.
- Disposal: gives instructions to properly and safely dispose of lab materials.

Pacing
Edmentum offers automatic pacing for this course. When creating a new class assignment or updating an existing assignment, you can enable automatic pacing by defining start and end dates for course administration. The following pacing guide may also be used as a reference.

Curriculum Contents and Pacing Guide

This section provides a brief summary of the course units in the semester. This semester is divided into three units spread over 90 days. The Unit Pacing Guide provides a general timeline for presenting each unit. It is designed to fit your class schedule and is adjustable. The guide is based on a typical 180-day school year with 90 days per semester.

The pacing guide lists the title and the primary content objective of each lesson. For more information about each lesson and activity, consult this coverage spreadsheet, which correlates lessons with NGSS and Common Core standards. Notice that column A lists the standards and column B gives the total number of lessons or other activities that address that standard. Across the top of the spreadsheet, you'll find the title of each lesson, Course Activity, and Unit Activity by unit. In the cells beneath the titles, the number 1 indicates that the NGSS or Common Core standard of a given row is addressed in that title.

Each tab of the spreadsheet serves a different purpose. The first tab lists the primary objectives of Earth and Space Science, Semesters A and B. The second and third tabs give the NGSS performance expectations and the disciplinary core ideas, respectively. The fourth tab lists the NGSS science and engineering practices. Finally, the fifth tab outlines the Common Core ELA standards (RST, WHST, SL) and Common Core Math standards, including the eight Common Core Mathematical Practices (MP).

Unit 1: Studying Earth and Space Science

Summary

In this unit, students will explore some of the practices and tools used by Earth and space scientists. They'll describe the scientific method, which is effective in testing scientific claims. They'll also apply the steps of the scientific method in a hands-on experiment to test a hypothesis. Finally, they'll study how scientists communicate scientific data and conclusions with one another and with the public, and they'll learn the important roles that modeling and mathematics have in science.

Day	Activity/*Objective*	Type
1 day: 1	**Syllabus and Student Orientation** *Review the Student Orientation and Course Syllabus at the beginning of this course.*	Course Orientation
3 days: 2–4	**Introduction to Earth and Space Science** *Identify responsible practices used by Earth and space scientists, and apply the physical tools they use.*	Lesson
3 days: 5–7	**The Scientific Method** *Describe the scientific method and explain why it is effective in testing scientific claims.*	Lesson
4 days: 8–11	**Testing Hypotheses** *Apply the concepts of the scientific method to test a hypothesis.*	Course Activity
4 days: 12–15	**Analyzing and Communicating Scientific Information** *Apply the tools used to effectively communicate scientific data and conclusions, including models, reports, and graphs.*	Lesson
5 days: 16–20	**Unit Activity and Discussion—Unit 1**	Unit Activity/ Discussion
1 day: 21	**Posttest—Unit 1**	Assessment

Unit 2: The Universe

Summary
Students will begin this unit by building a scale model that depicts the size of the solar system and the planets within it. Then they'll analyze dominant theories about the formation of the universe to describe how stars, galaxies, and terrestrial objects came into being. In a related activity, they'll use coordinate systems to locate and compare celestial objects in space and terrestrial objects on Earth. Students will also create a model using real-time data to describe the oceans' tides and learn how the patterns are linked to the Sun-Earth-Moon system. Near the end of the unit, they'll compare the planets in our solar system and explain their behavior using Kepler's and Newton's laws for planetary motion.

Day	**Activity/***Objective*	Type
4 days: 22–25	**The Hierarchy and Scale of the Universe** *Create a model that accurately conveys the organization and scale properties of the universe.*	Course Activity
4 days: 26–29	**The Formation of the Universe** *Create a conceptual model of how the universe may have initially formed from the big bang and explain the observational and experimental evidence that supports this theory.*	Lesson
3 days: 30–32	**Coordinate Systems** *Use coordinate systems to locate terrestrial and celestial objects.*	Course Activity
4 days: 33–36	**The Formation and Life Cycles of Celestial Objects** *Explain how the uneven distribution of matter across the universe after the big bang led to the formation of stars, galaxies, and terrestrial objects.*	Lesson
4 days: 37–40	**The Formation and Nature of the Solar System** *Compare objects in the solar system, including their formation and their gravitational interactions.*	Lesson
4 days: 41–44	**Tides** *Create a model for tidal motion based on scientific data and the structure of the Sun-Earth-Moon system.*	Course Activity
4 days: 45–48	**The Sun-Earth-Moon System** *Construct a model for the Sun-Earth-Moon system and use it to explain relevant phenomena.*	Lesson
4 days: 49–52	**The Planets** *Compare the planets in terms of composition, structure, and behavior and explain their behavior using Kepler's and Newton's laws for planetary motion.*	Lesson

Day	Activity/*Objective*	Type
5 days: 53–57	**Unit Activity and Discussion—Unit 2**	Unit Activity/ Discussion
1 day: 58	**Posttest—Unit 2**	Assessment

Unit 3: The Precambrian Earth

Summary

This unit begins with an activity that demonstrates how Earth's early oceans and life-forms coevolved with the atmosphere. Students will then look at the emergence of the first life on Earth, how the layers of Earth formed, and how the fossil record has contributed to the historical timeline of Earth's development. They'll use a variety of dating methods to construct an accurate history of Earth, and they'll model Earth as an interaction of several subsystems (biosphere, atmosphere, hydrosphere, and geosphere) that exchange matter and energy.

Day	Activity/*Objective*	Type
4 days: 59–62	**The Formation of the Atmosphere and Oceans** *Model how Earth's atmosphere and oceans formed as the result of physical and chemical processes in the planet's interior.*	Course Activity
4 days: 63–66	**The Formation of Earth** *Model how the early Earth separated into layers and how the atmosphere and oceans formed and stabilized.*	Lesson
4 days: 67–70	**The Coevolution of Life and Earth** *Explain how life on Earth was able to form and be preserved in the fossil record and model how the emergent biosphere affected other subsystems.*	Lesson
4 days: 71–74	**The Fossil Record** *Construct a history of the biosphere based on information from the fossil record.*	Course Activity

Day	**Activity/***Objective*	Type
4 days: 75–78	**Determining Earth's History** *Apply a variety of dating methods to construct an accurate history of Earth.*	Lesson
4 days: 79–82	**Earth's Subsystems** *Model Earth as an interaction of several subsystems that exchange matter and energy.*	Lesson
5 days: 83–87	**Unit Activity and Discussion—Unit 3**	Unit Activity/ Discussion
1 day: 88	**Posttest—Unit 3**	Assessment
1 day: 89	**Semester Review**	
1 day: 90	**End-of-Semester Exam**	Assessment

Appendix A: Safety Notes and Disclaimer

Each Course Activity and Unit Activity that includes a lab/experiment component will highlight key safety guidelines indicated by the safety icon (⚠). In addition to adhering to those guidelines, students should follow these general safety practices:

- Work slowly and safely at all times, and abide by the safety notes and icons.
- Pay attention and be alert at all times. Limit any distractions.
- Keep your hands away from your nose, eyes, mouth, and skin. Wash your hands before and after experiments.
- If you don't understand something, ask a teacher or an adult before proceeding.
- Wear the required protective gear.
- Adult supervision is required for all activities involving an experiment/lab component.
- Do not perform experiments that have not been approved. Follow the procedure.
- Follow good housekeeping practices. Keep your work area clean.
- Abide by all disposal instructions and icons to protect yourself and our planet.
- Report any problems or complications to an adult.

Note: Edmentum assumes no liability for personal injury, death, property damage, equipment damage, or financial loss resulting from the instruction included in this course.

Appendix B: Course Lab Materials (Semesters A and B)

Household Materials – Basic
The italicized materials listed below are available as a convenience in the *Edmentum Earth and Space Science Kit*

- paper or poster board (standard letter size: 8.5 inches x 11 inches)
- pen, pencil, or fine-tip marker
- scissors
- ruler with English and metric scales
- toilet paper
- paper towels
- plastic spoon
- plastic bowl
- rubber band
- aluminum foil
- string, fishing line, or dental floss (at least 2 meters or 6 feet)
- sticky notes, or paper and tape
- 2 soft rags
- squeezable water bottle with sport cap
- 2 large glass beakers, glasses, or jars (250 to 500 milliliters or 8 to 16 ounces)
- large, transparent glass or plastic container (such as a pitcher)
- small, transparent glass beaker or jar (such as a baby food jar)
- small glass or jar (250 milliliters or 6 to 8 ounces)
- measuring cup (able to measure ¼ cup)
- measuring spoons: 1 teaspoon and 1 tablespoon
- 2 one-gallon jugs or pitchers
- bucket or trash can
- water from a natural water source such as a pond, stream, or well
- tap water
- distilled water (at least 100 milliliters, or about 4 ounces)
- white vinegar (at least 100 milliliters, or about 4 ounces)
- baking soda
- dry bar of soap
- sand
- 2 rocks (at least 1.5 inches or 4 centimeters in size.)
- calculator (optional)

- *iron nail*

Household Materials – Less Common

The italicized materials listed below are available as a convenience in the *Edmentum Earth and Space Science Kit*

- stopwatch (could be a mobile app or on a computer)
- lamp with 150-watt incandescent bulb (or access to a sunny area)
- apron
- compass used to draw circles (optional)
- paintbrush, 1 inch or less in width
- plastic paint tray liner (or a stream table)
- 2 empty plastic soda bottles (2 liters each)
- modeling clay
- copper penny (dated 1982 or older)
- wooden blocks (approximately 2 inches thick)
- 4 to 5 toy building blocks or game pieces (anything that resembles a tiny model house)

- *disposable gloves*
- *safety goggles*
- *small magnet*
- *magnetic compass*
- *2 thermometers, continuous measurement; must measure up to 120° Fahrenheit (50° Celsius)*
- *2 cups dry plaster of Paris*
- *petroleum jelly*
- *food coloring*

Specialized Science Materials

All materials listed below are available in the *Edmentum Earth and Space Science Kit.*

- *scale with at least 0.1 gram accuracy*
- *magnifying hand lens*
- *graduated cylinder, 100 or 250 milliliters*
- *limestone chips (50 grams total)*
- *mineral kit (including apatite, calcite, fluorite, graphite, gypsum, magnetite, feldspar, microcline, pyrite, quartz, and talc)*
- *porcelain streak plate*
- *glass streak plate*
- *water quality test kit, including test strips for pH and total alkalinity, total hardness, nitrate/nitrite, nitrite-nitrogen, iron (Fe+2/Fe+3), copper (Cu+1/Cu+2), free and total chlorine*
- *4 2-ounce plastic jars* (may use clear, clean glass baby food jars)
- *a bivalve shell* (may use a “household” item to fossilize, such as a leaf or a chicken bone)
- *binoculars (optional)*

Appendix C: Lab Materials by Activity (Semester A)

Unit	Activity Name	Task	Equipment List
1	Course Activity: Testing Hypotheses **** Special lab materials required. (Edmentum Earth and Space Science Kit or school-provided lab materials)***	Task: Disappearing Rocks	Italicized items may be found in the *Edmentum Earth and Space Science Kit's* bags labeled "Testing Hypotheses" and "Common Materials." • *limestone chips (50 grams total)* • *4 small plastic jars* (may use clear, clean glass baby food jars) • *scale with at least 0.1 gram accuracy* • *graduated cylinder, 100 or 250 milliliters* • *disposable gloves* • *safety goggles* • 4 sticky notes or small pieces of paper and tape • white vinegar (at least 100 milliliters) • distilled water (at least 100 milliliters) • baking soda • small spoon • 2 soft rags • pen, pencil, or fine-tip marker
2	Course Activity: Hierarchy and Scale of the Universe	Task 1: Comparing and Scaling Planet Sizes	• 4 pieces of paper or poster board (8.5 inches x 11 inches) • scissors • pencil or pen • ruler • compass used to draw circles (optional) • calculator (optional)
		Task 2: Comparing and Scaling Planet Distances	• toilet paper • pencil or pen • an object and location to represent the Sun • calculator (optional) • large working space, such as a hallway

Unit	Activity Name	Task	Equipment List
2	Course Activity: Coordinate Systems	Task 1: Terrestrial Coordinate Systems	none
		Task 2: Celestial Coordinate Systems	Italicized items may be found in the *Edmentum Earth and Space Science Kit's* bag labeled "Common Materials." • *magnetic compass* • *binoculars (optional)*
3	Course Activity: The Formation of the Atmosphere and Oceans	Task 1: Evolution of the Atmosphere	Italicized items may be found in the *Edmentum Earth and Space Science Kit's* bag labeled "Common Materials." • *2 thermometers to take continuous measurements for 30 minutes; must measure up to 120°Fahrenheit (50°Celsius)* • *disposable gloves* • *safety goggles* • stopwatch (could be a mobile app or on a computer) • measuring cup (able to measure ¼ cup) • measuring spoon: 1 tablespoon • small glass or jar (250 milliliters or 6 to 8 ounces) • 2 empty plastic soda bottles, 2 liters each • baking soda (1 tablespoon) • white vinegar (1/4 cup) • lamp with 150-watt incandescent bulb (or access to a sunny area) • 3 sticky notes • apron

Unit	Activity Name	Task	Equipment List
3	Course Activity: The Fossil Record	Task 1: Fossil Formation	Italicized items may be found in the *Edmentum Earth and Space Science Kit's* bag labeled "The Fossil Record." • *dry plaster of Paris (about 2 cups)* • *petroleum jelly (enough to coat the object being fossilized)* • *a bivalve shell* (may use a "household" item to fossilize, such as a leaf or a chicken bone.) • paintbrush, 1 inch or less in width • plastic bowl • small plastic spoon • ruler with English and metric scales • tap water (about 2/3 cup) • enough modeling clay to make a 12-centimeter circle that's about 3 centimeters deep

Appendix D: Edmentum Lab Kits

Economically priced single-student lab kits containing all the specialized science materials for this course are provided exclusively by Ward's Science.

Find out more, order kits online, or call Ward's Customer Service (800-962-2660).

Edmentum Earth and Space Science Kit (470229-778)

Common Materials

- POCKET SCALE 10.5OZ CAP. X .01G 1
- BIFOCAL ACRYLIC MAGNIFIER 3X/6X 1
- BINOCULARS PRISMATIC 8 X 21 1
- GRADUATED CYLINDER 250ML PP WIDE MOUTH 1
- COMPASS MAGNETIC 40 MM DIAMETER 1
- FOOD COLORING PK 4/.3 OZ BTL-RYBLUG 1
- GOGGLES SAFETY INDIRECT VENT UNCOAT 1
- NITRILE GLOVES PURPLE MED 2
- NITRILE GLOVES PURPLE LRG 2

Testing Hypotheses

- ROCK LIMESTONE CHIPS 4OZ BAG (APX 270) 1
- JAR 2OZ PET 4
- CAP 48MM FOR 2OZ 4

Formation of the Atmosphere and Oceans

- THERMOMETER METAL-BACK -40 TO 110C 2

The Fossil Record

- PLASTER OF PARIS 1.5 LB CAN (4 CUPS) 1
- SHELL SCALLOP 5-6CM (PECTEN) 3
- PETROLEUM JELLY (PETROLATUM) 4 OZ 113 G. 1

Rocks and Minerals

- MINERAL COLLECTION 1 (10SPEC/6EA) 1
- STREAK-PLATES WHITE 1
- PLATE STREAK GLASS 1
- NAIL IRON 2 LONG 1
- MAGNET 1

Human Interactions

- SCIENCE FAIR 9-WAY WATER TEST KIT 1

Edmentum Earth and Space Science Refill Kit (470229-782)

- SCIENCE FAIR 9-WAY WATER TEST KIT 1
- ROCK LIMESTONE CHIPS 4OZ BAG (APX 270) 1
- NITRILE GLOVES PURPLE MED 2
- NITRILE GLOVES PURPLE LRG 2