Great Minds PhD Science Grade 4

Great Minds PhD Science Grade 4 Executive Summary

Section 1. Science-Related Texas Essential Knowledge and Skills (TEKS) and English Language Proficiency Standards (ELPS) Alignment

Grade	TEKS Student %	TEKS Teacher %	ELPS Student %	ELPS Teacher %
Grade 3	100%	100%	100%	100%
Grade 4	100%	100%	100%	100%
Grade 5	100%	100%	100%	100%

Section 2. Instructional Anchor

- The materials are designed to strategically and systematically integrate scientific and engineering practices, recurring themes and concepts, and grade-level content as outlined in the TEKS.
- The materials anchor the learning in phenomena and problems as the key lever for driving learning and student mastery of disciplinary knowledge and skills.

Section 3. Knowledge Coherence

- The materials are designed to build knowledge systematically, coherently, and accurately.
- The materials provide educative components to support teachers' content and coherence knowledge.

Section 4. Productive Struggle

- The materials provide opportunities for students to engage in productive struggle through sensemaking that involves reading, writing, thinking, and acting as scientists and engineers.

Section 5. Evidence-Based Reasoning and Communicating

- The materials promote students' use of evidence to develop, communicate, and evaluate explanations and solutions.
- The materials provide teacher guidance to support student reasoning and communication skills.

Section 6. Progress Monitoring

- The materials include a variety of TEKS-aligned and developmentally appropriate assessment tools.
- The materials include guidance that explains how to analyze and respond to data from assessment tools.

- The assessments are clear and easy to understand.

Section 7. Supports for All Learners

- The materials provide guidance on fostering connections between home and school.
- The materials include listening, reading, writing, and speaking supports to help Emergent Bilinguals meet grade-level science content expectations.
- The materials include a variety of research-based instructional methods that appeal to a variety of learning interests and needs.
- The materials include guidance, scaffolds, supports, and extensions that maximize student learning potential.

Section 8. Implementation Supports

- The materials include year-long plans with practice and review opportunities that support instruction.
- The materials include classroom implementation support for teachers and administrators.
- The materials provide implementation guidance to meet variability in program design and scheduling.

Section 9. Design Features

- The visual design of materials is clear and easy to understand.
- The materials are designed to engage and support student learning with the integration of digital technology.
- The digital technology or online components are developmentally and grade-level appropriate and provide support for learning.

Section 10. Additional Information

- The publisher submitted the technology, price, professional learning, and additional language supports.

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Indicator 2.1

Materials are designed to strategically and systematically integrate scientific and engineering practices, recurring themes and concepts, and grade-level content as outlined in the TEKS.

1	Materials provide multiple opportunities for students to develop, practice, and demonstrate mastery of grade-level appropriate scientific and engineering practices as outlined in the TEKS.	M
2	Materials provide multiple opportunities to make connections between and within overarching concepts using the recurring themes.	M
3	Materials strategically and systematically develop students' content knowledge and skills as appropriate for the concept and grade level as outlined in the TEKS.	M
4	Materials include sufficient opportunities, as outlined in the TEKS, for students to ask questions and plan and conduct classroom, laboratory, and field investigations and to engage in problem-solving to make connections across disciplines and develop an understanding of science concepts.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials are designed to strategically and systematically integrate scientific and engineering practices, recurring themes and concepts, and grade-level content as outlined in the TEKS.

Materials provide multiple opportunities for students to develop, practice, and demonstrate mastery of grade-level appropriate scientific and engineering practices as outlined in the TEKS. Materials provide multiple opportunities to make connections between and within overarching concepts using the recurring themes. Materials strategically and systematically develop students' content knowledge and skills as appropriate for the concept and grade level as outlined in the TEKS. Materials include sufficient opportunities, as outlined in the TEKS, for students to ask questions and plan and conduct classroom, laboratory, and field investigations and to engage in problem-solving to make connections across disciplines and develop an understanding of science concepts.

Evidence includes but is not limited to:

Materials provide multiple opportunities for students to develop, practice, and demonstrate mastery of grade-level appropriate scientific and engineering practices as outlined in the TEKS.

- The materials provide multiple opportunities to develop grade-level appropriate scientific and engineering practices (SEPs), as outlined in the TEKS. To develop SEPs, students first make observations within lessons before they move into more complicated SEPs, such as planning and conducting a lab. For example, students study the formation of the Grand Canyon for their anchor phenomena. In Lesson 1, students examine photographs from Powell's 1871 expedition. Students record their observations and questions. In Lesson 2, students develop a model of the Grand Canyon's features. In Level 4, Module 2, Lessons 1–3, students make observations to generate questions about how windmills harness the wind. Teachers display two Piet Mondrian paintings and direct students to use the notice and wonder chart in their Science Logbook to record what they notice and wonder as they look at the windmills.

- Students practice using SEPs during investigations throughout modules. Students build on their knowledge through each lesson section as the SEP begins with observations, moving to models and investigations. Students get to practice and design several investigations throughout the middle of the Modules. For example, in Level 4, Module 2, Lesson 9, there is a purple box that guides students into a check for understanding on the topic: "Students develop and use a model to represent energy transfer before, during, and after a ball bearing collides with a catch." In Module 3, Lesson 12, students use a model to illustrate the process of the water cycle.
- The materials provide multiple opportunities to show mastery of grade-level appropriate SEPs. The modules increase the complexity of SEPs as the lessons progress. In the final lessons of each module, students engage in investigations with less teacher guidance before completing an Engineering Challenge or Science Challenge. For example, in Module 2, Lesson 10, students plan and conduct an investigation to gather evidence of a force that can cause a moving object to slow down and stop. For example, Module 2 contains an Engineering Challenge to address the Phenomenon Question, "How can we apply our knowledge of energy to solve a problem?" Students design a light for people in a flooded area.
- The materials outline how the students use SEPs to investigate grade-level appropriate content concepts with opportunities to repeat the practices throughout the year. For example, the Pacing Guide: Scope and Sequence for Level 4 provides a sequence from Level 4, Modules 1 to 3, of how SEPs are included in grade-level content and how they spiral throughout the year. For example, each program module contains a specific SEP scope and sequence with Science or Engineering Challenges. The challenge includes a set of lessons in which students apply their conceptual knowledge to solve a real-world problem through the process of investigation or engineering design.

Materials provide multiple opportunities to make connections between and within overarching concepts using the recurring themes.

- The materials identify overarching concepts using recurring themes and show how they connect within the materials and also provide multiple opportunities for students to use recurring themes in making connections between and within overarching concepts. Materials include Module Concept Statements that are a springboard for discussion about RTCs. For example, Module 1 utilizes the recurring theme of identifying and using patterns to explain the phenomenon of the formation of the Grand Canyon. In Lesson 19, students observe how soil and water interact in their model river system and use these observations as evidence of erosion and deposition. Students use a stream table to model a river and then add a dam to observe the effects of water flow. In Module 2, students make connections between two concept statements. 1) Energy is why things happen. Energy can transfer between objects through collisions and from place to place through water waves, electric currents, sound, thermal energy, and light. and 2) Energy transformation occurs when one phenomenon indicating the presence of energy changes into any other energy phenomenon. These statements connect to the recurring theme in Modules 1 and 2: patterns, cause and effect, systems, energy, and matter.
- The materials provide multiple opportunities to use RTCs in making connections between and within overarching concepts. The scope and sequence include specific information about when recurring themes are introduced and when they are spiraled back into the program. The Implementation Guide contains a chart indicating that Module 1 maintains the Earth and Space Science focus in grades 3, 4, and 5. In third grade, the anchoring phenomenon is the transformation of Surtsey. In fourth grade, students use the Grand Canyon features and

patterns to anchor their learning. In fifth grade, students investigate the landscape of the Chihuahuan Desert. Patterns and Cause/Effect relationships occur in all grade levels K-5. The Pacing Guide has a table that shows how overarching concepts are included in Modules 1– 3.

Materials strategically and systematically develop students' content knowledge and skills as appropriate for the concept and grade level as outlined in the TEKS.

- The materials strategically (long-term goals) develop students' content knowledge and skills appropriate for the concept and grade level as outlined in the TEKS. The materials include an overview document that explains how the program is structured and builds on student knowledge across grade levels, modules, and lessons by tapping into students' curiosity about the world. The program presents content and concepts for students to make connections across units throughout the program.
- For example, in grade 4, Module 2, Concept 1, students explore energy transfer and learn that energy can be transferred between objects and by electric currents. In Lessons 12 and 13, students continue to explore the movement of energy through systems as they make observations at energy in systems stations. After they visit each station, students develop a model to show how energy moves through each system. They identify patterns and relationships in their observations to understand that energy transferred by light and sound may transform to produce new energy phenomena. With this new knowledge, students refine the anchor chart and anchor model before answering questions from the driving question board and selecting new questions to investigate.
- The materials are systematically designed to develop and build student skills and content knowledge using phenomena appropriate to the grade level as outlined in the TEKS. The Implementation Guide demonstrates the progression of TEKS in order of the progression of skills for grades 3–5, including a side-by-side comparison of concept lessons and phenomena. For example, Module 1 contains a module map that outlines the anchoring phenomenon and three key concepts of the module. Each concept outlines the phenomenon, student learning outcome in the lessons, and content standards/SEPs/RTC/ELPS. The student learning provides a lesson progression to show how each lesson builds upon the prior lesson and links back to the anchoring phenomenon. The module map provides the application of concepts for the End-of-Module seminar, assessment, and debrief. For example, materials utilize a content learning cycle with five stages: wonder, organize, reveal, distill, and know. Module 1 anchors learning by studying how the Grand Canyon's features were formed. Lessons 1–6 study the layers of rock. Lessons 7–12 develop the understanding that the process of breaking rock plays a role in shaping Earth's surface. In Lessons 13–18, students use an engineering design process to design a structure to protect a home from erosion. In Lessons 19–25, students develop an understanding of how humans impact the environment.
- The materials support teachers in developing student content concepts and skills by giving them resources and cues at varying points in lessons and units throughout the grade level. Materials contain a Teacher's Edition, Introduction, Background Knowledge, Prepare, and Teacher Notes that explain, describe, and make connections between the SEPs and the development of conceptual understanding. Content supports are provided to teachers through the Building Content Knowledge breakdown in the Teacher Guide. Each lesson contains support through ELD tips. Teacher notes that explain how students use the materials and content area connections for reading, math, social studies, and art. For example, in Module 3, Lesson 2, in the Learn section, there is a teacher note that guides teachers to record and post when students share prior knowledge throughout the module. In Module 3: Plants in the Environment, Lesson 2, a

teacher note is included with instructions to wait until later lessons to introduce the Focus Questions for Concepts 2 and 3.

Materials include sufficient opportunities, as outlined in the TEKS, for students to ask questions and plan and conduct classroom, laboratory, and field investigations and to engage in problem-solving to make connections across disciplines and develop an understanding of science concepts.

- The materials include opportunities for students to ask questions and plan and conduct investigations. Materials provide regular opportunities for students to raise questions about phenomena. In Module 2, materials direct teachers to ask students what they know about floods and briefly discuss recent floods, either locally or in other states. Teachers explain to students that there can be many problems associated with flooding but that they will focus on a problem related to energy. Teachers tell students to imagine that because of the flooding, electrical energy has stopped flowing into the homes. The students imagine that the people in the homes need light to gather supplies and ensure everyone is safe but that the batteries and flashlights in the homes have all been damaged by the flood. Students create a design and prototype to solve this problem.
- The materials include sufficient opportunities for students to engage in problem-solving to make connections across disciplines and develop an understanding of science concepts. The grade 4 energy unit opens with students reading about William Kamkwamba, a real boy who built a windmill to help his family. Reflecting on William's story, students organize their questions on a driving question board and draw a class consensus model of a windmill. Students revisit the driving question board and an anchor model throughout the module to build a coherent understanding of energy.
- The materials provide repeated opportunities for students to use grade-level appropriate SEPs across various contexts throughout the course. For example, lessons are grouped by focus questions in each module. At the start of each lesson group, a table shows the SEPs and the lessons they support. In Module 1, materials instruct teachers first to demonstrate a race between two students to clarify how to quantify speed before students design their investigation. One student stands at one end of the classroom, and when the teacher says "go," Student A runs to the teacher quickly (and safely) while Student B walks to the teacher slowly. The teacher tells the students that speed is the distance an object moves in a certain amount of time. When measuring and comparing speeds, the distance an object moves (i.e., across the room during the race) and the time it takes to travel that distance (i.e., how long it took the student to cross the room) must be considered. To quantify an object's speed, students can mark a start line and a finish line and use a stopwatch to measure how long it takes an object to travel from the start line to the finish line. In another module, students complete an engineering design challenge to design a structure to reduce erosion-related damage. The challenge requires students to use what they have learned from the previous lessons and apply them.

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Indicator 2.2

Materials anchor the learning in phenomena and problems as the key lever for driving learning and student mastery of disciplinary knowledge and skills.

1	Materials embed phenomena and problems across lessons to support students in constructing, building, and developing knowledge through authentic application and performance of scientific and engineering practices, recurring themes and concepts, and grade-level content as outlined in the TEKS.	M
2	Materials intentionally leverage students' prior knowledge and experiences related to phenomena and engineering problems.	M
3	Materials clearly outline for the teacher the scientific concepts and goals behind each phenomenon and engineering problem.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials anchor the learning in phenomena and problems as the key lever for driving learning and student mastery of disciplinary knowledge and skills.

Materials embed phenomena and problems across lessons to support students in constructing, building, and developing knowledge through authentic application and performance of scientific and engineering practices, recurring themes and concepts, and grade-level content as outlined in the TEKS. Materials intentionally leverage students' prior knowledge and experiences related to phenomena and engineering problems. Materials clearly outline for the teacher the scientific concepts and goals behind each phenomenon and engineering problem.

Evidence includes but is not limited to:

Materials embed phenomena and problems across lessons to support students in constructing, building, and developing knowledge through authentic application and performance of scientific and engineering practices, recurring themes and concepts, and grade-level content as outlined in the TEKS.

- The materials use phenomena as a central anchor that drives student learning across grade-level content in each discipline (earth/space, life, physical science). Materials include an anchoring phenomenon that students refer to throughout the module. Supporting phenomena are used in investigations that relate to the anchor phenomena. Students share related phenomena that they experience through guided questions in the lessons. Assessments include phenomenon-driven assessments where students explain the phenomena and solve problems. Students examine phenomena using science and engineering practices (SEPs) through the lens of recurring themes. Students develop content knowledge as they work to construct explanations of the phenomena and/or solve engineering problems. The phenomenon is the center of each module and lesson. The materials draw students back to the phenomena through anchor models and driving board questions. Throughout every lesson and activity, the focus is on understanding the phenomena driving the instruction. For grade 4, the anchoring phenomenon is "windmills at work." Students observe, create models, and analyze how windmills harness the wind. Then they understand how to know that energy is present by observing the indicators of the presence of energy. Students plan, conduct, analyze, and interpret what causes a moving

object to stop. By the end of the unit, students plan, start, and build generators to transform mechanical energy into electrical energy and can understand how windmills work.

- The materials embed thought-provoking phenomena and engineering problems that require nuanced and appropriate grade-level explanations. Materials provide opportunities for students to develop, evaluate, and revise their thinking as they figure out phenomena and define/solve problems. For example, in the Module 2 Engineering Challenge, students apply their knowledge of energy classification, transfer, and transformation, further building on their understanding of the Essential Question: How do windmills change wind to light? The story of William Kamkwamba shows students that anyone can be an engineer and solve problems in their community. In Lessons 21 through 26, students participate in an Engineering Challenge. Students imagine people are without power after a devastating flood in their town. They build a device to harness energy by using materials from the classroom. In Lesson 26, student groups present their devices to the class and summarize their design processes, including their struggles and successes.

Materials intentionally leverage students' prior knowledge and experiences related to phenomena and engineering problems.

- The materials provide opportunities to leverage students' prior knowledge and experiences related to phenomena and engineering problems, ensuring that connections are made to previous science TEKS while allowing students to communicate their experiences outside of school. For example, each module is broken into lesson sets that build to support student content knowledge. In Module 1, the lesson sets start with identifying that the rock layers in the Grand Canyon tell the story of Earth's past, then the processes of breaking rock into smaller pieces (weathering) and develop the understanding that humans use natural resources to generate electricity and that their use can impact the environment in different ways. These lessons build for the essential question, "How did the Grand Canyon's features form?" In Lesson 2, there is a check for understanding box for teacher support. The box asks teachers to use students' prior knowledge of how models can be used to show relationships between phenomena, objects, and processes.
- The materials provide some guidance for teachers and students to address potential areas of misunderstanding adequately. For example, grades 3–5 materials provide a teacher guidance section at the beginning of each unit, such as an Introduction and Building Content Knowledge section, to help teachers gauge where some students may have inaccurate or inadequate prior knowledge. This section also informs teachers of the necessary prerequisite content and skills students will need to be successful in the unit. Such teacher guidance materials prepare teachers to provide accurate explanations of scientific content and concepts, as well as respond to students who may have gaps or misconceptions in their prior knowledge.

Materials clearly outline for the teacher the scientific concepts and goals behind each phenomenon and engineering problem.

- The materials clearly outline the scientific concepts and learning goals behind each phenomenon and engineering problem corresponding to content concepts across the grade level. The materials provide an Anchor Phenomenon with a corresponding Essential Question for each module. For example, Module 1 has the Anchor Phenomenon of "Formation of the Grand Canyon's Features" and the Essential Question, "How did the Grand Canyon's features form?" For example, Module 2 has the Anchor Phenomenon "Windmills at Work" and the

Essential Question, “How do windmills change wind to light?” Module 3 has the Anchor Phenomenon “Carnivorous Plants in Big Thicket National Preserve” and the Essential Question, “Why are some plants in Big Thicket National Preserve carnivorous?” The materials break down each module into three concepts made of lessons that have their own focus questions and provide an answer for the teacher. Materials also provide the goal of answering the Essential Question through the Applications of Concepts, which includes an Engineer Challenge where students apply what they have learned as guided by the Anchor Phenomenon.

- The materials clearly outline the student learning goal(s) behind each phenomenon or engineering problem. For example, in grades 3–5, materials provide a “Building Content Knowledge” section that outlines overarching learning goals for each phenomenon or engineering problem addressed. Materials give a causal explanation of the phenomena or engineering problem. The explanation unpacks the meaning of the scientific idea so teachers can understand how to help students reconstruct the idea. The section also includes a breakdown of each Concept, Engineering Challenge. The Module Map lists the Anchor phenomena, concepts, and student learning or (goals) for each lesson. For example, grade 4 includes a lesson on how a windmill harnesses wind. Materials clearly outline the following lesson goals: “Model how windmills transfer and transform energy and explain that energy makes things happen when it is transferred and transformed will explain how weathering of rock forms components of soil.”

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Indicator 3.1

Materials are designed to build knowledge systematically, coherently, and accurately.

1	Materials are vertically aligned and designed for students to build and connect their knowledge and skills within and across units and grade levels.	M
2	Materials are intentionally sequenced to scaffold learning in a way that allows for increasingly deeper conceptual understanding.	M
3	Materials clearly and accurately present grade-level-specific core concepts, recurring themes and concepts, and science and engineering practices.	M
4	Mastery requirements of the materials are within the boundaries of the main concepts of the grade level.	M

Meets | Score 6/6

The materials meet the criteria for this indicator. Materials are designed to build knowledge systematically, coherently, and accurately.

Materials are vertically aligned and designed for students to build and connect their knowledge and skills within and across units and grade levels. Materials are intentionally sequenced to scaffold learning in a way that allows for increasingly deeper conceptual understanding. Materials clearly and accurately present grade-level-specific core concepts, recurring themes and concepts, and science and engineering practices. Mastery requirements of the materials are within the boundaries of the main concepts of the grade level.

Evidence includes but is not limited to:

Materials are vertically aligned and designed for students to build and connect their knowledge and skills within and across units and grade levels.

- The materials connect new learning to previous and future learning within and across grade levels. The Implementation Guide provides Horizontal and Vertical Alignments tables for teachers to see how the TEKS, SEPs, and RTCs are structured horizontally and vertically throughout the materials. For example, Level 4, Module 1, Earth Features, includes the horizontally aligned content strands: Force, Motion, and Energy (7 & 8), Earth & Space (9, 10, and 11), and Organisms and Environments. According to the Horizontal and Vertical Alignment table, Module 1 includes all the Science and Engineering Practices TEKs except for 4.2C and 4.4B. The alignment document for Module 1 includes Recurring Themes and Concepts patterns, cause/effect, systems, and stability/change. Materials display vertical alignment of standards in the same chart.
- Materials provide Teacher Notes that explain how students build and connect knowledge. For example, in Module 1, Lesson 8, a Teacher Note is provided stating that in Level 3 students studied that weathering is the process of breaking down rock and that in Level 4, Module 1, students build on the definition to include forces. In Module 3, students are introduced to the term *acquired traits*. A Spotlight on Knowledge and Skills relates the identification of acquired traits to the learning that will take place in Level 5 when students learn about instincts and learned behavioral traits.

- The materials present content in a way that builds in complexity within and across units and grade levels. Materials include a TEKS Content Development Progression table in the Implementation Guide to provide information on standards addressed within each module in each grade level. For example, Module 1 in third grade covers Earth Changes, where students learn that weathering is the breaking down of rock. Module 1 in fourth grade covers Earth Features, and students learn that weathering includes forces. Module 1 in fifth grade covers Earth Processes, where students learn that the force of weathering, erosion, and deposition create landforms.
- The Teacher's Guide provides a Spotlight on Knowledge and Skills throughout lessons to explain how a lesson activity develops students' understanding of content, concepts, and practices throughout the year and across grade levels. For example, in Level 4, Module 2, the sidebar note, Spotlight on Knowledge and Skills, describes the vertical progression of students' knowledge related to the weather, mentioning how in Level 1, students used changes in nature to describe the seasons, and how in Lesson 4, Level 4, students use day length and temperature to predict patterns of the seasons. Module 3, Plants in the Environment, Lesson 17 has a sidebar, Spotlight on Knowledge and Skills, explaining how in the next lesson, "students build on their new understanding of decomposers to explore the cycling of matter in an environment (4.12B)." In Lesson 18, students begin the lesson by watching a time-lapse video of leaf litter decomposition. Students then read about fungi and add a decomposer into their model of a food web.

Materials are intentionally sequenced to scaffold learning in a way that allows for increasingly deeper conceptual understanding.

- The materials include a progression of concrete and then representational before abstract reasoning when presenting concepts that allow for increasingly deeper conceptual understanding. Lessons move through a learning cycle starting with observing a phenomenon and generating questions. Students develop an original explanation and create questions. Then students explore the question through investigation, which allows for a concrete experience. Students move to a representational understanding when they then apply evidence and reasoning to revise the explanation of the phenomenon. Students utilize abstract reasoning when they then apply knowledge to explain a different phenomenon.
- The materials sequence instruction in a way that activates or builds prior knowledge before explicit teaching occurs that allows for increasingly deeper conceptual understanding. Materials provide a Building Content Knowledge section within each Module Overview that explains how students build an understanding of concepts with increasing depth throughout the module. For example, in Module 3, the Building Content Knowledge section shows that in Concept 1 students begin by activating prior knowledge from previous grades by discussing what plants need to survive. In Lesson 1, students then apply that knowledge to explain and discuss the differences between plant structures and their environments.
- In Level 4, Module 2, students begin their learning by activating prior knowledge about the wind. Through the use of discussing their experiences with wind, lessons introduce movement and energy. Module 2 also uses anchor charts to allow students to build and demonstrate their deeper understanding throughout. In Lesson 5, the anchor chart is created to capture students' initial understanding of energy. Materials direct teachers to create an anchor chart to record students' knowledge of energy, leaving space for the class to add new knowledge in future lessons. In Lesson 18, evidence of how students' understanding of energy has deepened throughout Module 2 is demonstrated with the final anchor chart update. Materials direct

teachers to update the anchor chart to summarize students' progress in their exploration of the windmill and how it works. Teachers are to focus on students' new understanding that the device behind the windmill is a generator that transforms the spinning motion caused by the wind into electrical energy.

Materials clearly and accurately present grade-level-specific core concepts, recurring themes and concepts, and science and engineering practices.

- The materials clearly present grade-specific core concepts, recurring themes and concepts, and science and engineering practices. Materials use the 7E (Elicit/Engage, Explore, Explain, Elaborate/Extend, Evaluate) instructional model for sequencing science instruction. The Engage/Elicit Phase captures students' interest in learning through activities such as teachers asking open ending questions activating learning and identifying problems. Materials separate Explore phases into an Organize and a Reveal section. In Organize, students represent the natural world by using models, constructing explanations, and proposing solutions. In Reveal, students plan and conduct investigations. During Explain, students represent the natural world using models, construct and evaluate explanations, propose solutions, and communicate the results. In Elaborate/Extend, students ask questions and identify problems, construct and evaluate explanations and propose solutions communicating results. In Evaluate, students reflect on their new science concepts and students evaluate the accuracy of student ideas and what they have learned.
- The materials accurately present core concepts, recurring themes and concepts, and science and engineering practices (SEPs). Across lessons, units, and grade levels, materials are free from scientific inaccuracies. Materials present scientific content that is current and reflects the most current and widely accepted explanations. For example, in Module 2, student materials state that friction is a complex contact force that occurs at the atomic scale. At this level, friction is used to help students understand that multiple forces can act on an object and that together these forces can explain the object's motion. In grade 4, students deepen their understanding of friction by conducting an investigation to find out what causes an object to slow down and stop as the object moves across different materials. In Module 2, Lesson 1, students are given the idea of a basic understanding before defining work, however, a Teacher Note is provided giving the common definition of work for the teacher to know before it is explicitly taught.

Mastery requirements of the materials are within the boundaries of the main concepts of the grade level.

- The materials include specific learning targets for each grade level. For example, materials provide a scope and sequence document that outlines when learning targets are introduced, developed, and mastered within the program. Each module has a module map to highlight specific skills addressed in each lesson. Materials highlight learning targets to support teacher facilitation.
- The materials clearly define the boundaries of content that students must master for the grade level. Materials that identify the objectives used are all TEKS from grade 4. The materials provide unit objectives for each unit and student learning objectives for each lesson. For example, in Module 1, Spotlight Lessons on Mixtures and Solutions, a Spotlight on Knowledge and Skills is provided explaining how in Level 4 students do not need a quantitative understanding of density, but they do need an understanding of *higher density* and *lower density.* In Module 3,

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Earth and Space Spotlight, Lesson 3, students predict yearly patterns in how day length changes, but do not move into the Level 5 exploration of Earth's rotation causing the day/night cycle.

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Indicator 3.2

Materials provide educative components to support teachers' content and knowledge coherence.

1	Materials support teachers in understanding the horizontal and vertical alignment guiding the development of grade-level content, recurring themes and concepts, and scientific and engineering practices.	M
2	Materials contain explanations and examples of science concepts, including grade-level misconceptions to support the teacher's subject knowledge and recognition of barriers to student conceptual development as outlined in the TEKS.	M
3	Materials explain the intent and purpose of the instructional design of the program.	M

Meets | Score 6/6

The materials meet the criteria for the indicator. Materials provide educative components to support teachers' content and knowledge coherence.

Materials support teachers in understanding the horizontal and vertical alignment guiding the development of grade-level content, recurring themes and concepts, and scientific and engineering practices. Materials contain explanations and examples of science concepts, including grade-level misconceptions, to support the teacher's subject knowledge and recognition of barriers to student conceptual development as outlined in the TEKS. Materials explain the intent and purpose of the instructional design of the program.

Evidence includes but is not limited to:

Materials support teachers in understanding the horizontal and vertical alignment guiding the development of grade-level content, recurring themes and concepts, and scientific and engineering practices.

- The materials include guiding documents that support teachers in understanding how new learning connects to previous and future learning across grade levels. The materials contain a scope and sequence that showcases which skills and standards students should have mastered in previous grades, and how learning will progress in the subsequent grades. Materials provide a Horizontal and Vertical Alignment chart separated by content standards, Scientific and Engineering Practices, and Recurring Themes and Concepts. A TEKS Content Development Progression chart also provides a vertical progression for teachers. In Earth and Space Spotlight, Lesson 1, materials guide students to recall that in Kindergarten, students predicted day and night patterns. In grade 1, students developed an understanding of yearly seasons, and in the current lessons, students build on the knowledge of patterns as they analyze seasonal and moon phase data to predict future events.
- The materials include guiding documents that explain how content and concepts increase in depth and complexity across lessons and units within the grade level. Each module lists out the objectives being addressed and places in bold the parts of the content or entire contents that will be mastered in the module. For example in 4.8A, students conduct descriptive investigations to explore the patterns of forces of an object in Module 1, but this concept is mastered in

Module 2 when students' investigations explore gravity, friction, and magnetism in contact or at a distance of an object.

- The Teacher Edition of the Modules includes a Spotlight on Knowledge and Skills in the sidebars of the lessons explaining how the materials increase in complexity across the grade level. The vertical alignment of knowledge related to deposition is described in the Spotlight Lessons on Mixtures and Solutions in Module 1, Lesson 6; “In Level 1, students observe salt water and recognize that it contains salt. They compare freshwater and saltwater bodies on Earth (1.10C, 1A). In the Earth Features Module, students learned that sediment is weathered rock carried away by erosion. Deposition occurs when sediment settles in a new area, such as the ocean floor (4.10B, 1A).”

Materials contain explanations and examples of science concepts, including grade-level misconceptions to support the teacher's subject knowledge and recognition of barriers to student conceptual development as outlined in the TEKS.

- The materials include background information for teachers that provides explanations and examples of science concepts. Modules provide explanations of concepts for teachers in the Additional Reading For Teachers. Each module provides a list of other resources that can support the teacher’s understanding such as websites and books being listed. The Additional Reading for Teachers section of the Module 1 Overview lists various texts to support teachers’ pedagogical and subject knowledge. Additional reading includes 2 referenced books: *Uncovering Student Ideas in Earth and Environmental Science: 32 New Formative Assessment Probes* by Page Keeley and Laura Tucker (2016) and *Understanding Earth* by John P. Grotzinger and Thomas H. Jordan (2014).
- The materials identify common grade-level misconceptions students may have about the science concepts. The Addressing Misconceptions section of the Implementation Guide describes how the curriculum guides teachers in addressing misconceptions. Module 1, Earth Features, lists three common misconceptions. Next to the misconceptions in the chart are developed understandings. One common misconception is that fossil fuels can form over a human lifetime. The developed understanding states that fossil fuels form over millions of years.
- The Teacher Edition contains embedded instructional supports and sidebar notes with additional information for teachers that address misconceptions. In Module 1, Lesson 4, a teacher sidebar note states that students will likely have misconceptions about the time it takes for significant changes to occur in a landscape. For example, in Lesson 3 of Level 4, Module 2, the Teacher Note section includes information that students may use the word *power* during the discussion in the lesson. The materials provide clarity for the teacher that power and energy are not the same.
- The materials include supports for teachers to develop their own understanding of more advanced, grade-level concepts. Teacher Notes in the Teacher Edition contain information that supports teachers' understanding of more advanced grade-level concepts. For example, Module 1, Lesson 5 includes information for Teachers to further understand Palo Duro Canyon, describing its size and geological features and comparing it to the Grand Canyon, allowing teachers to better understand the lesson. In Module 3, Plants in the Environment, there is a sidebar Teacher Note that provides teachers with additional information about the characteristics of apple trees.

Great Minds PhD Science Grade 4

Materials explain the intent and purpose of the instructional design of the program.

- The materials provide a rationale for the instructional design of the program. Materials explain why materials are designed the way they are. Materials highlight key features of the instructional design. In the Implementation Guide within the section Foundations, the materials provide a rationale designed to build knowledge coherently and engagingly. The materials offer students “deep conceptual knowledge and rigorous problem-solving experiences as they engage with new science content.” This “helps students apply knowledge to new situations and to see connections.” The Knowledge section of the Implementation Guide outlines how knowledge builds in the materials. In each module, students participate in investigations, discussions, and activities that build enduring scientific understanding and competence. “Across modules and levels, students revisit fundamental science concepts, developing a deeper understanding of those concepts and applying them to make sense of new phenomena.”
- The materials provide a framework explaining the main intent or goals of the program. Materials provide a Teacher’s Guide that thoroughly describes the program's instructional approaches and references the researched-based strategies present in each unit. Specific supports for each unit can be found in the Unit Overview for each unit. The Implementation Guide explains its foundation. “The mission of PhD Science Texas is to help teachers provide their students with a science education that is as limitless as science itself. To achieve this goal, students rigorously engage in learning that builds their coherent understanding of scientific knowledge.”
- In each module, students participate in investigations, discussions, and activities that build enduring scientific understanding and competence. Each module contains a storyline such as the Grand Canyon for Level 4, Module 1. Students actively engage in a learning cycle of asking questions and sharing initial ideas about phenomena, investigating those questions, developing evidence-based explanations, and applying their knowledge to explain different phenomena in new contexts.

Great Minds PhD Science Grade 4

Indicator 4.1

Materials provide opportunities for students to engage in productive struggle through sensemaking that involves reading, writing, thinking, and acting as scientists and engineers.

1	Materials consistently support students' meaningful sensemaking through reading, writing, thinking, and acting as scientists and engineers.	M
2	Materials provide multiple opportunities for students to engage with grade-level appropriate scientific texts to gather evidence and develop an understanding of concepts.	M
3	Materials provide multiple opportunities for students to engage in various written and graphic modes of communication to support students in developing and displaying an understanding of scientific concepts.	M
4	Materials support students to act as scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials provide opportunities for students to engage in productive struggle through sensemaking that involves reading, writing, thinking, and acting as scientists and engineers.

Materials consistently support students' meaningful sensemaking through reading, writing, thinking, and acting as scientists and engineers. Materials provide multiple opportunities for students to engage with grade-level appropriate scientific texts to gather evidence and develop an understanding of concepts. Materials provide multiple opportunities for students to engage in various written and graphic modes of communication to support students in developing and displaying an understanding of scientific concepts. Materials support students to act as scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle.

Evidence includes but is not limited to:

Materials consistently support students' meaningful sensemaking through reading, writing, thinking, and acting as scientists and engineers.

- The materials identify specific sensemaking behaviors of students. For example, materials identify sensemaking behaviors in the Introduction of the Implementation Guide. "Materials allow students to discover and understand the world in which they live, to solve problems, and to apply knowledge in different contexts. The PhD Science® Texas curriculum is designed to build knowledge in a coherent and engaging way. Students gain deep conceptual knowledge and rigorous problem-solving experiences as they engage with new science content. The curriculum's coherence helps students apply knowledge to new situations and to see connections among different contexts." Materials in the Implementation Guide provide a table titled Research Says, Students Need, and PhD Science Responds. These two quotes come from the column titled PhD Science Responds: "Students are given opportunities to develop and drive investigations and to apply scientific processes in new contexts through Science Challenges or Engineering Challenges," and "Connections with other content areas in lessons signal

opportunities for students to practice grade-appropriate English language arts skills, mathematics skills, and skills from other content areas."

- The materials consistently provide learning activities that support students' meaningful sensemaking. For example, students study the formation of the Grand Canyon in Module 1. Students complete hands-on activities such as investigating how natural materials weather rock. Students work together to answer the focus questions about the Grand Canyon's features. Students continually refer back to and update their module anchor chart.
- For example, materials present a picture of a flooded street from Hurricane Harvey in Module 2, Lesson 21, and ask students what they notice. Students observe the flooded street, and the materials instruct teachers to ask, "How can we apply our knowledge of energy to solve a problem?" Students create possible problems that need to be solved and the tools needed to solve the problems. From these ideas and questions, they apply what they have learned about energy transfer and transformation to design a device that transforms energy from an available form into the desired form.
- For example, in Module 3, Lesson 1, students are introduced to a terrarium and use the model to make observations and record their observations. Student groups then discuss their observations. The teacher guides the class discussion by asking the following: "How are the plants similar?" " How are the plants different?" and "What do you notice about the terrarium environment?"

Materials provide multiple opportunities for students to engage with grade-level appropriate scientific texts to gather evidence and develop an understanding of concepts.

- The materials provide opportunities for students to engage in purposeful and targeted activities with grade-level appropriate scientific texts. For example, in Module 2, Lesson 2, after students make a paper windmill, students are introduced to *The Boy Who Harnessed the Wind*. Students read and observe how a boy built a windmill to help his village. Materials instruct students "that after William learned about windmills, he gathered materials from his village and built a large working windmill on his own that generated electricity for the people of the village to use." Students brainstorm materials needed to build a windmill, construct a physical windmill, and draw in their log book.
- In Module 3, Lesson 17, students read an adaptive article about fungi, and they follow along as the teacher reads aloud pages from the article. Students then record in their science logbook three things they learned, two questions they have, and one connection to something they know.
- Students engage with scientific texts, including activities such as pre-reading and vocabulary, to help them develop an understanding of concepts. For example, students learn vocabulary through investigations, models, explanations, and class discussions. The Implementation Guide provides terminology routines such as Act It Out, Concept Maps, Frayer Model, images, link up, morpheme matrix, and signal unknown words. For example, in Module 1, Lesson 1, students listen to the teacher read aloud from E*xploration of the Colorado River of the West and Its Tributaries* while they examine photographs. In Module 1, Lesson 13, students listen to a read-aloud from *Who Were the Wright Brothers?* to set them up for their engineering design process.
- In Module 2, Lesson 2, before students began to read *The Boy Who Harnessed the Wind (Kamkwamba and Mealer 2012)*, the materials instruct the teacher to display the back and front covers of the book. Materials provide students with time to observe the covers silently and then ask, "What do you think the book is about? Why do you think that?"

- In Module 3, Lesson 16, students read the food web article, *Life in the Food Chain,* and look for information about the source of energy in a food web. Students Think-Pair-Share to discuss the source of the energy that flows from producers through a food web.
- The materials provide multiple opportunities for students to engage with scientific texts to gather evidence and develop an understanding of concepts. For example, in Module 2, Lesson 6, Spotlight Lessons on Earth and Space, students analyze field notes from scientists about nightjars and compare the information to the topic phenomenon, moon phases. The teacher asks students, "How are the patterns you observe similar to the patterns you observed in earlier lessons?"
- In Module 3, Lesson 15, the teacher reads to students some pages from the book *Trout Are Made of Trees*. As the teacher reads, she pauses to review the organisms that are mentioned and to emphasize what the organisms are doing. Students reflect on how the organisms interact and begin to develop a food chain.

Materials provide multiple opportunities for students to engage in various written and graphic modes of communication to support students in developing and displaying an understanding of scientific concepts.

- The materials provide opportunities for students to communicate thinking on scientific concepts in written and graphic modes. For example, in Module 1, Lesson 7, students use a clay rock model to model a canyon. Students use a plastic knife to cut away parts of the model to represent a canyon. Students then compare their clay model to a photograph. Students use a science logbook to develop models, record observations, make predictions, record, and analyze data, and write their claims.
- In Module 2, Lesson 5, students use their logbook to identify patterns of the moon and make a prediction. Students write about what patterns they notice about the appearance of the Moon. Students then draw a prediction about what they think the Moon will look like on the first day of the next month.

Materials support students to act as scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle.

- The materials provide students with authentic engagement and perseverance of concepts through productive struggle while they act as scientists and engineers. In Module 1, Lessons 1-2, students act as scientists by using models to explain how the land in the Grand Canyon has changed over time. In Lessons 3-4, students act as scientists by completing investigations of land samples. Students update their models as they learn about rock layers. Students share their observations as a class and create a common list of samples and components.
- Materials in Module 2, Lesson 10, provide a video, *Trouble at the Postage Stamp (Golf Channel 2016),* to demonstrate that the surface of a golf course is usually made up of different materials designed to challenge players. Students discuss how the ball is affected by the material it rolls on. Students use these materials as they work in groups to plan and conduct their investigations about the force that causes a moving marble to slow down and stop. The teacher works with the students to select a testable question to frame the investigation. After the investigation, students analyze data to make sense of the effect of friction on moving objects.
- In Module 3, Lesson 8, students observe two photographs of soybean plants. Students discuss an organism's needs to survive. Students then design an investigation to identify how available

resources in an environment affect the way a plant grows and survives. Students conduct an investigation to compare a plant grown without one resource to a plant grown with all resources. The teacher guides students with questions about variables to investigate and how to record data for the investigation.

- The materials support students as "practitioners" while they are figuring out (sensemaking) and productively struggling. In Module 2, Lesson 7, students work in groups to explore a given set of materials. Students plan an investigation in which they vary the amounts of energy given to a ball bearing and compare the ball bearing's speeds. Students work in their groups to explore and brainstorm investigation plans, explain why their test will be fair, and how they can guarantee reliable results with precise measurements.
- The materials create *transfer* opportunities for students to take what they have learned and use it flexibly in new situations. For example, in Module 2, Lessons 16-18, students apply knowledge from earlier lessons in the module to determine how energy is transferred and transformed in the windmill phenomenon. Student groups build a simple generator and make observations to explain how the generator plays a role in both energy transfer and transformation.
- In Module 3, Lesson 20, students revisit the Phenomenon Question: "How do the available resources in an environment affect the way a plant grows and survives?" Students analyze the data they collected from Lesson 8, radish plant investigation. Students reflect on how they can use the data collected to answer their group's investigation question. Students identify the characteristics of their model in their Science Logbook that indicate a healthy plant and the characteristics that indicate an unhealthy plant. The class develops a table comparing the results of each group's investigation.

Great Minds PhD Science Grade 4

Indicator 5.1

Materials promote students' use of evidence to develop, communicate, and evaluate explanations and solutions.

1	Materials prompt students to use evidence to support their hypotheses and claims.	M
2	Materials include embedded opportunities to develop and utilize scientific vocabulary in context.	M
3	Materials integrate argumentation and discourse throughout to support students' development of content knowledge and skills as appropriate for the concept and grade level.	M
4	Materials provide opportunities for students to construct and present developmentally appropriate written and verbal arguments that justify explanations to phenomena and/or solutions to problems using evidence acquired from learning experiences.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials promote students' use of evidence to develop, communicate, and evaluate explanations and solutions.

Materials prompt students to use evidence to support their hypotheses and claims. Materials include embedded opportunities to develop and utilize scientific vocabulary in context. Materials integrate argumentation and discourse throughout to support students' development of content knowledge and skills as appropriate for the concept and grade level. Materials provide opportunities for students to construct and present developmentally appropriate written and verbal arguments that justify explanations to phenomena and/or solutions to problems using evidence acquired from learning experiences.

Evidence includes but is not limited to:

Materials prompt students to use evidence to support their hypotheses and claims.

- The materials provide opportunities for students to develop how to use evidence to support their claims. For example, in Module 1, Lesson 2, students develop an anchor model as a class. Students share what important features they should include in the model. The teacher's instructions say to call on students to justify their agreement or disagreement with classmates using evidence from their observations of photographs.
- In Module 2, Lesson 24, during the Engineering Challenge, students use data and observations as evidence to propose solutions and use evidence to improve the design of their device. Students use their knowledge, test results, and feedback from the other groups to improve their devices. Students discuss their improvements and record their improvements and answer questions in their Science Logbook.
- In Module 3, Lesson 21, students complete an evidence reasoning chart in their Student Logbook to support their claim from Lesson 20. The student reads assigned articles and uses both information from the article and information from their investigation to record evidence to support their claim.
- The materials specifically prompt students to use evidence when supporting their claims. In Module 1, students make a claim in Lesson 4 as to which layer in the Grand Canyon formed first.

The teacher's instructions provide question prompts for the class such as, “What evidence supports or refutes your claim about which layer is the oldest? What evidence supports or refutes your claim about which layer is the youngest?”

- In Module 2, Lesson 5, Spotlight Lessons on Earth and Space, students gather evidence about claims through the practice of developing and using scientific models. Students use Moon calendar models, photos, and notes taken by a garden to collect evidence to support a prediction about when most Peruvian cactus flowers will open.
- In Level 4, Module 2, Lesson 6, after energy stations students share, and revisit the class prediction about the relationship between energy and speed. Materials instruct teachers to ask, “Were your results what you expected? What evidence did you gather to evaluate our prediction?”
- In Module 3, Lesson 20, materials prompt student groups to review their models from the radish plant investigation, and develop a claim about how the condition they tested affects plant characteristics and affects how a plant makes food and grows. Materials include a sidebar note to guide the teacher in providing a sentence frame to support any student that needs guidance developing their claim.

Materials include embedded opportunities to develop and utilize scientific vocabulary in context.

- The materials include opportunities to develop and use vocabulary *after* having a concrete or firsthand experience to which they can contextualize new terms. In Module 1, Lesson 3, materials say to explicitly teach the term *rock layer*. Students notice different stripes on a photograph of the Grand Canyon. Students then trace four layers of the Grand Canyon on a copy of the Grand Canyon as an example of rock layers. Materials direct teachers to “lead a class discussion that reveals the six layers shown in the following annotated photograph. To guide this discussion, project the rock layer photograph, and ask questions such as these: How would you describe this layer? Do you see any differences in this layer? As the class identifies each layer, trace the layer on the projected photograph. When the class has identified all six layers, label the layers A through F from top to bottom. Instruct students to record these layers on the photograph in their Science Logbook.” Students then read about rock layers to learn more about them.
- In Module 2, Lesson 15, teachers display a working circuit from the previous lesson. Materials prompt students to share what they know so far about the electrical circuit and the way the circuit transfers and transforms energy. Students get into groups and explore circuits. Teachers inform students that the coin, the paper clip, and the steel wool are *conductors* of electrical energy and explain that a *conductor* is a material through which energy travels easily.
- In Module 3, Lesson 3, materials provide students the opportunity to investigate plant characteristics during an outdoor schoolyard excursion. Students then observe plant characteristics of tree photographs. After a class discussion about student observations, the teacher explains that the characteristics of an organism are called *traits*.
- The materials present scientific vocabulary using multiple representations. Starting in Module 1, Lesson 4, students learn about *fossil fuels*. The teacher explicitly states what fossil fuels are and explains what they are and then provides examples of fossil fuels. Students read about fossil fuels in the text. Students then categorize examples of fossil fuels. Students identify how fossil fuels are different from solar and wave power. Students see where fossil fuels are found on a map in Lesson 25.

- In Level 4, Module 2, Lesson 8 , materials introduce the term *system* to students. In the sidebar, there is a teacher note that prompts the teacher to guide students in creating a Frayer model to better understand the term.
- In Module 3, Lesson 13, after exploring water movement, the teacher facilitates an Act It Out routine in which groups work together to act out what happens to water in Big Thicket. The teacher then explains to students that they acted out the water cycle and provides the meaning of the water cycle. Students then work in their Science Logbook and explain how water moves in the water cycle through Big Thicket.
- The materials provide opportunities for students to apply scientific vocabulary within context. In Module 1, Lesson 25, students explain how and why human use of energy resources varies. Students must use their understanding of fossil fuels in this lesson to consider what could happen if natural resources such as fossil fuels were no longer available to use.
- In Module 2, Lesson 9, the class discusses how a ball bearing collision investigation helps answer the Focus Question: “What is energy and how does it transfer from place to place?” Students add key conceptual understandings to the anchor chart and revisit the anchor model to apply this new knowledge about the transfer of energy to the windmill phenomenon. Students identify where energy transfer takes place in the anchor model. Teachers explain that energy must move from the windmill to the light through the wires and electric currents transfer this energy through the wires. Teachers explain that the term *electrical energy* is used to describe this type of energy.

Materials integrate argumentation and discourse throughout to support students’ development of content knowledge and skills as appropriate for the concept and grade level.

- The materials provide opportunities for students to develop how to engage in the practice of argumentation and discourse. For example, in Module 1, students engage in argumentation in lesson 2 as they determine what features to include in the class anchor model. Students justify their agreements or disagreements with evidence from their observations.
- In Lesson 3 of Level 4, Module 2, materials invite students to review their windmill models (Lesson 2 Activity Guide) and consider the wind farm images to develop a class anchor model. Teachers ask students to share their models by naming the specific parts they drew and encourage them to identify common components across models. As students agree on certain components, the teacher draws them on chart paper to develop a class anchor model.
- In Module 3, Lesson 10, students discuss with a partner statements about weather and climate. Students discuss weather and climate cards to determine what category the statement on the card belongs in.
- The materials integrate argumentation and discourse within stages of the learning cycle. In Module 1, Lesson 7, students participate in a Think-Pair-Share to determine which material at each station creates a force and which material represents a rock. Students then fill out the first two columns of the tables in their Science Logbook to indicate the role of each material for each station.
- In the Socratic Seminar at the end of each module, students synthesize their knowledge, discuss their ideas, and present evidence to support or refute claims. In Module 1, Lesson 26, students will explain how Earth's processes shape some of Earth's features in the Socratic Seminar using all the observations and evidence they have collected through the module.
- In Module 2, Lesson 8, students determine the appropriate use of the blank bar graph in their Science Logbook. As they agree on how to create the graph, students fill in the blank headings and choose an appropriate scale.

- In Module 2, Lesson 26, during the Share stage of the engineering design process, students tell others about their design solutions. Groups share their diagrams and demonstrate their devices during their presentations. Students write one piece of feedback on a sticky note or a half sheet of paper to identify one strength or one idea for improvement for that group's presentation.
- In Level 4, Module 3, Plants in the Environment, Lesson 22, materials provide the opportunity for a student-led conversation. The teacher presents the following Essential Question for student discussion: "Why are some plants in Big Thicket National Preserve carnivorous?" Students discuss the question in the Socratic Seminar. "Students respond to each other directly, with minimal teacher facilitation. Students can remind one another of conversation norms."

Materials provide opportunities for students to construct and present developmentally appropriate written and verbal arguments that justify explanations to phenomena and/or solutions to problems using evidence acquired from learning experiences.

- The materials provide instruction for how to construct and present a verbal or written argument to problems using evidence acquired from learning experiences. For example, in Module 1, Lesson 4, students make a claim about which rock layer in the Grand Canyon formed first. After making a claim, students form expert groups where they look at their model from the previous lesson. Each group takes turns laying their layer on the model. Teachers ask, "What evidence supports or refutes your claim about which layer is the oldest? What evidence supports or refutes your claim about which layer is the youngest?"
- In Module 2, Lesson 25, groups continue improving their device. Groups work on a presentation for sharing their final device with the class. Students rejoin their engineering groups and agree on a final design to present to the class. Students finalize their devices If students need to test their devices, they should record notes and test results in the Improve section of their Science Logbook (Lesson 21 Activity Guide B). In Lesson 26, Students use their final diagram, graphic organizer, data table, and prototype to communicate which materials are insulators and conductors of electrical energy, as well as how their device uses forces, transfers energy, and transforms electrical energy into light. Students also explain the advantages of using renewable resources in their design. Students listen to their peers' explanations of their designs and provide feedback related to strengths and opportunities for improving those designs.
- In Teacher Edition: Level 4, Module 3, Plants in the Environment, Lesson 21, materials provide opportunities for students to record in their Student Logbook their evidence and reasoning to support a claim on a radish plant investigation. Students then present to the class using their model and evidence and reasoning information.
- The materials provide opportunities for students to justify explanations of phenomena and solutions to problems using written and verbal arguments to problems using evidence acquired from learning experiences. For example, in Module 1, Lesson 26, students complete a Socratic seminar about the formation of the Grand Canyon's features. Students first complete a quick write, and then draw a line below their responses. At the end of the seminar, students revisit their responses to see how their thoughts have changed. At the end of the seminar, students are allowed to change their answers to the essential question based on the class discussion.
- In Module 2, Lesson 19, materials invite students to share their revised models with the class by describing new components and labels. As students share new components, other students use nonverbal signals to show whether they agree that the new component accurately represents how the windmill system works. Teachers call on students to justify their agreement or disagreement with evidence. If most students agree with the addition of a component and can justify the addition, they draw it on the anchor model. Teachers continue asking students what

is missing from the anchor model and adding those components until everyone is satisfied that the anchor model successfully explains the windmill phenomenon.

- In Module 3, Lesson 20, students use their observations and plant model recording to explain Phenomenon Question: “How do the available resources in an environment affect the way a plant grows and survives?” Students record in their Science Logbook a summary of how the plant in the investigation changed and provide a claim and evidence and reasoning to justify their response to the Phenomenon Question.
- The materials provide criteria for developmentally appropriate arguments to explain a phenomenon or defend a solution to problems using evidence acquired from learning experiences. In Module 1, Lesson 26, the Check for Understanding box provides directions for teachers to listen to correct evidence that supports the Essential Question. Materials provide a list of evidence that the teacher can check off as they listen to the Socratic seminar. If students miss some evidence there are tips for addressing the misconceptions.

Great Minds PhD Science Grade 4

Indicator 5.2

Materials provide teacher guidance to support student reasoning and communication skills.

1	Materials provide teacher guidance on anticipating student responses and the use of questioning to deepen student thinking.	M
2	Materials include teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context.	M
3	Materials provide teacher guidance on preparing for student discourse and supporting students in using evidence to construct written and verbal claims.	M
4	Materials support and guide teachers in facilitating the sharing of students' thinking and finding solutions.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials provide teacher guidance to support student reasoning and communication skills.

Materials provide teacher guidance on anticipating student responses and the use of questioning to deepen student thinking. Materials include teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context. Materials provide teacher guidance on preparing for student discourse and supporting students in using evidence to construct written and verbal claims. Materials support and guide teachers in facilitating the sharing of students' thinking and finding solutions.

Evidence includes but is not limited to:

Materials provide teacher guidance on anticipating student responses and the use of questioning to deepen student thinking.

- The materials provide teachers with possible student responses to questions and tasks. For example, in Module 1, Lesson 6, materials include questions in the lesson in bold text and the possible student responses in italic text. At the end of Lesson 6, materials prompt the teacher to have students record new questions they have and add them to the driving question board. Three sample questions are provided. Materials instruct the teacher to draw attention to student questions related to the process that shows rock layers to lead to the next lesson in the module.
- In Module 2, Lesson 7, materials instruct teachers to have student groups begin analyzing the data by working through the Reflection Questions section in their Science Logbook. While groups discuss and record their responses to these questions, the teacher visits each group to guide reflection as necessary. The materials provide the teacher with questions and possible responses. For the question, "What patterns do you notice in your data?" the materials provide the possible student response, "The ball with the most energy took the least time to reach the finish line, and the ball with the least energy took the most time. The more energy we gave a ball, the faster it moved."

- Module 3, Lesson 13 materials provide Think-Pair-Share time for students to respond to questions about a photograph of the water movement model. Materials provide the following questions: “Where in the model does evaporation happen? When did you observe condensation and precipitation in the model?” Materials provide the following examples of students' responses: “Evaporation happens when some of the water in the container turns into a gas. Some of the water drops fell to the bottom of the container like precipitation.”
- The materials provide teacher responses to possible students’ responses, including how to build on students’ thinking. For example, in Module 1, Lesson 5, the teacher asks, “How has the environment of the Grand Canyon changed over time?” The materials provide three sample student responses. The Check for Understanding box has an example of evidence that students should provide to ensure they understand the concept. If students do not meet the evidence then the material provides a Next Steps suggestion that states, "If students need support to describe the types of changes that have occurred in the Grand Canyon region, prompt them with questions such as these: What do you remember about the rocks and fossils found in the Grand Canyon? What might those fossils tell you about what the environment looked like in the past?"
- In Module 2, Lesson 7, students analyze data to determine whether it supports their prediction for the relationship between energy and speed. Materials provide teacher responses if students need support with identifying patterns in the data, such as, “When did the ball have the most energy? When did the ball move the fastest?” Teachers support students by identifying how their data show the cause-and-effect relationship between energy and speed, by revisiting the investigation set-up. Teachers demonstrate releasing the ball from the lowest height and then ask students what should be changed to make the ball move faster. Materials instruct the teacher to prompt students to explain how they know the ball needs to be released higher.
- The materials provide support for teachers to deepen student thinking through questioning in the use of Socratic Seminars. For example, in Module 1, Lesson 26, students participate in a Socratic Seminar using the guiding question, “How did the Grand Canyon’s features form?” Teacher materials provide four questions to spur additional conversation for students such as the following question: “How do wind, water, and gravity affect the movement of weathered rock during erosion in the Grand Canyon?”
- In Module 2, Lesson 7, materials instruct the teacher to revisit the racing demonstration from the Launch. Two students act out another racing scenario: Student A runs quickly across the room, and Student B walks slowly. Stand at the finish line and have students imagine Student A and Student B both accidentally bump into you. Materials provide teachers with the following questions to deepen student thinking: “What would happen if Student A bumped into me? What would happen if Student B bumped into me? Why would I get hurt in the first scenario but not in the second?” The teacher explains that the relationship between energy and speed could have important implications in a collision.
- In Module 3, Lesson 1, while exploring the Big Thicket environment, materials provide the questions, “How is the Big Thicket environment similar to the terrarium environment?” and “How is the Big Thicket environment different from the terrarium environment?” Materials provide the following examples of student responses: “The plants can survive in both environments. In Big Thicket, plants get what they need from nature. In the terrarium, we give the plants what they need.” Materials provide further questions to deepen student thinking using the question, “Why might it be helpful to have the terrarium in the classroom?”

Great Minds PhD Science Grade 4

Materials include teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context.

- The materials provide embedded supports for the teacher in how to introduce and scaffold students' development of scientific vocabulary. For example, in Module 1, Lesson 1, materials include explicit instruction for the term *canyon*. Teacher instructions state, "Inform students that they are about to embark on a new adventure to study the Phenomenon Question: What can we discover in an unknown canyon? Explain to students that a canyon is a deep valley with steep sides." A sidebar note provides differentiation for students between a valley and a canyon. The materials state, "Students may bring up the term valley. If students do, briefly discuss the differences between a valley and a canyon. Canyons are narrow with steep sides. Valleys are wider and have less steep sides. Consider having students use these terms with examples during discussions."
- In Module 2, Lesson 9, the teacher explains that energy must move from the windmill to the light through the wires and that electric currents transfer this energy through the wires. The materials explain that the term *electrical energy* is used to describe the type of energy. Materials provide a sample anchor model for teachers so that they can update the anchor chart to include that energy can also transfer from place to place through electric currents in wires.
- In Module 3, Lesson 3, materials provide a sidebar note for the teacher to help scaffold the vocabulary term *traits*. Materials include the following: "Students may be more familiar with animal traits. Consider asking students which traits people can use to identify different dog breeds."
- The materials provide guidance for the teacher on how to support students' use of scientific vocabulary in context. For example, in Module 1, Lesson 26, students make a relationship map to show connections among key terms learned throughout the module. Materials provide the following directions for teachers: "Remind students that during the seminar they should incorporate science terminology learned during the module. Tell students they can refer to their relationship map from this lesson's Launch, the anchor chart, the anchor evidence organizer, and other classroom resources to support their discussion."
- Module 3, Lesson 10 materials provide embedded support for the teacher to scaffold the vocabulary term *climate*. Materials guide the teacher to "consider asking students about the climates of well-known locations such as tropical regions or deserts."

Materials provide teacher guidance on preparing for student discourse and supporting students in using evidence to construct written and verbal claims.

- The materials provide teacher supports to prepare for student discourse. For example, in Module 1, Lesson 1, students write what John Wesley Powell observed when he explored the Grand Canyon. Students mimic his observations and evidence collecting. Then students see pictures of the present-day Grand Canyon and record what they notice and wonder. The teacher asks students to share their observations and questions about the photographs. The teacher records the observations on the class Notice and Wonder chart. There are Next Steps suggestions for teachers if students need support with observation or questions such as having students focus their attention on things like the holes and cracks in the canyon walls or the river with large boulders.
- In Module 2, Lesson 27, materials guide teachers through a Socratic Seminar discussion. Materials instruct students to write an initial response to the Essential Question, "How do

windmills change wind to light?" in their Science Logbook. When students finish they draw a line below their response. At the end of the seminar, students will revisit this response to see how their thoughts have changed.

- The materials provide teacher questions for supporting student discourse and the use of evidence in constructing written and verbal claims. For example, in Module 1, Lesson 6, students use fossil evidence to identify past environments. First, students look at a photograph of a dinosaur track and are asked to make observations and ask questions about the image. A teacher sidebar note instructs teachers to not reveal details to allow students to wonder and ask questions. Next, students complete a table that includes fossil names. Students add the type of environment the fossils lived in and provide evidence for their claim. Sample responses are listed for the teacher. A sidebar note includes a reference to Lesson 3 if students are struggling to recall information. After, students share where they think each organism lived.
- In Module 2, Lesson 11, materials include teachers asking students to closely observe the ground in the photograph as they Think-Pair-Share in response to the following questions: "What do you notice about the materials that make up the surface of the golf course? Why do you think golf courses use different surface materials?"
- In Module 3, Lesson 21, materials provide teacher guidance on prompting students to discuss with their group evidence of the claim they developed. Materials prompt teachers to circulate and listen for students to identify evidence that supports their group's claim. Materials prompt the teacher to ask students to add evidence that supports their claim to the first column of the graphic organizer.
- The materials provide guidance that teachers can use to provide feedback to students while engaging in discourse. For example, in Module 1, Lesson 5, students explain changes in canyon landscapes. The Lesson Launch asks students to "think about the environment of the present-day Grand Canyon as they share responses to the following prompt in a Whip Around. What types of organisms do you think might survive in different areas of the Grand Canyon?" Sample student answers are provided to the teacher. Materials provide a sentence to tell the students what their next steps will be in the lesson. Next, students read a passage. Materials provide instructions for the teacher to lead discourse. A series of questions and student sample responses are provided that go along with the passage. The Check for Understanding provides Next Step supports to prompt them with questions like, "What do you remember about the rocks and fossils found in the Grand Canyon?"
- In Module 2, Lesson 11, the Teacher Note materials provide resources if students need additional support expressing their ideas about the force that causes the ball to slow down. Materials provide teachers with guiding questions such as, "How can we use our understanding of forces to explain the ball's motion?" and "Were the forces acting on the ball balanced or unbalanced?"

Materials support and guide teachers in facilitating the sharing of students' thinking and finding solutions.

- The materials provide teacher support and guidance to engage students' thinking in various modes of communication throughout the year. For example, in Module 1, Lesson 7, students communicate their thinking through discussion, writing in their Logbooks, and investigating observations in stations. Throughout the lesson, the materials provide guiding questions and sample student responses. An example of how students share their thinking in the lesson is found in a sidebar note for teachers describing the Jot-Pair-Share instructional routine.

- Module 2, Lesson 12 materials guide the teacher to instruct students to draw a model of how energy moves through the components of the system in their Science Logbook. Materials guide students to consider how their observations of energy indicators can help them identify the movement of energy in the system. Teachers ask students to include labels for all system components and energy indicators and add written explanations where possible. Materials provide sample responses.
- The materials provide teacher support for facilitating the sharing of students' finding solutions. Materials provide feedback tips and examples teachers can use to support students throughout the learning cycle. For example, in Module 1, Lesson 8, students explain how natural materials weather rock. The material provides guiding questions with sample student responses while observing a photograph of rocks with holes in them. Next, students work in pairs to discuss and record responses to preprinted questions. Materials always provide sample student responses to the guiding questions. Students develop their thoughts and explanations.
- In Module 2, Lesson 2, in Construct Physical Models, materials guide the teacher to tell students that after William learned about windmills, he gathered materials from his village and built a large working windmill on his own that generated electricity for the people of the village to use. Materials instruct the teacher to ask students to brainstorm the types of materials they would need to construct a windmill that generates electricity. Materials instruct teachers to prompt them to think about what they know about electricity and what components electrical objects usually have. Students can record their ideas on personal whiteboards before sharing them with the class. Sample student responses follow.
- In Module 3, Lesson 22, Plants in the Environment, materials provide collaborative conversation strategies that students can use in a Socratic seminar circle. Materials provide the following guide: "Make a connection between ideas, explain your thinking, and add to what someone else says."

Great Minds PhD Science Grade 4

Indicator 6.1

Materials include a variety of TEKS-aligned and developmentally appropriate assessment tools.

1	Materials include a range of diagnostic, formative, and summative assessments to assess student learning in a variety of formats.	M
2	Materials assess all student expectations over the breadth of the course and indicate which student expectations are being assessed in each assessment.	M
3	Materials include assessments that integrate scientific concepts and science and engineering practices with recurring themes and concepts.	M
4	Materials include assessments that require students to apply knowledge and skills to novel contexts.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. Materials include a variety of TEKS-aligned and developmentally appropriate assessment tools.

Materials include a range of diagnostic, formative, and summative assessments that include formal and informal opportunities to assess student learning in a variety of formats. Materials assess all student expectations and indicate which student expectations are assessed. Materials include assessments that integrate scientific concepts and science and engineering practices with recurring themes and concepts. Materials include assessments that require students to apply knowledge and skills to novel contexts.

Evidence includes but is not limited to:

Materials include a range of diagnostic, formative, and summative assessments to assess student learning in a variety of formats.

- Materials include benchmark assessments administered mid-year and at the end of the year. The Benchmark assessment is optional and provides additional opportunities for evaluating students' understanding of content and their mastery of scientific and engineering practices and recurring themes and concepts. While benchmarks assess comprehensively, benchmark data tools only provide a general rubric rather than data pinpointing students' strengths and areas of needed growth.
- Materials include formative assessments in a variety of formats to measure student learning and determine the next steps for instruction. Materials have Conceptual Checkpoints. In Module 1, Lesson 6, students consider fossils discovered in California as they work to identify how environments and landforms of the past may have changed over time. Students complete an Engineering Challenge in Module 1, Lessons 13-18, where they apply the engineering design process to design a structure to reduce erosion-related damage. Students look at images of a home affected by a landslide. Students use an erosion table to prevent erosion, such as a landslide on a hill. In Module 2, Lesson 20, Conceptual Checkpoint, teachers display the illustration of a person pedaling a bicycle with a dynamo generator and LED system, or dynamo light system, mounted to the front of their bicycle. Teachers explain to students that this technology was developed by engineers to provide a reliable source of energy to run a light,

called a headlamp, on the front of a bicycle. Teachers distribute the Conceptual Checkpoint and read the prompts aloud, instructing students to record their responses.

- Materials include summative assessments in a variety of formats. Level 4, Module 2, Lesson 28 materials provide an End-of-Module Assessment by explaining that the assessment is a way for students to show all the knowledge they have developed through their study of energy. In Module 1, Lesson 26, students complete a Socratic Seminar. Students will use what they have learned to engage in discourse with their peers to answer the question, "How did the Grand Canyon's features form?" Students first engage in an independent quick write and then begin the class seminar. Next, students complete an End-of-Module assessment on their own that involves short constructed responses requiring students to explain models, maps, and diagrams. The last summative assessment for Module 1 is a Benchmark assessment, which is optional and provides additional opportunities for evaluating students' understanding of content and their mastery of scientific and engineering practices and recurring themes and concepts.
- Materials include a variety of informal assessments that give teachers feedback on student learning in the moment so that they can modify instructional approaches. In Module 2, Lesson 1, Check for Understanding, students identify the advantages and disadvantages of using a windmill to grind flour and explain how the effectiveness of the windmill depends on the strength of the wind. Materials guide teachers to have students share their ideas and identify the advantages and disadvantages of using a windmill to grind flour. Students write an explanation supported by their understanding of a windmill system for how the effectiveness of the windmill depends on the strength of the wind. Module 3, Lesson 3, provides a claim, evidence, and reasoning Check for Understanding. Students choose a claim and provide evidence and reasoning for the claim about the rabbit family photographs. Materials provide the teacher with TEKS assessed, student evidence, and next steps. Student evidence includes, "Students use patterns to choose a claim about the inherited traits of the offspring shown." The teacher's next steps include, "If students need support to choose a claim, prompt them with a question such as the following: Which rabbit parent does this offspring look most like?"

Materials assess all student expectations over the breadth of the course and indicate which student expectations are being assessed in each assessment.

- The materials assess all student expectations, as outlined in the TEKS, by grade level. Materials display the TEKS for each question in the Alignment Map provided for each End-of-Module Assessment, Engineering Challenge, and Benchmark. For example, Benchmark 1 includes an alignment map that lists the TEKS assessed by each item in the Benchmark. Item 1A, Integration of Standards, includes Content Standard 4.10B, Model and describe slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice; SEP 4.1G, Develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem; and RTC 4.5B, Identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems. The End-of-Module Alignment Map shows the Content Standards, Scientific and Engineering Practices, and Recurring Themes and Concepts connected with each item. Question 1 assesses standard 4.12C, SEP 4.1E, and RTC 4.5A.
- The materials indicate which student expectations are assessed. For example, materials contain a Lesson Overview showing the End-of-Module Socratic Seminar, Assessment, and Debrief. The section includes the student learning expectations, TESK covered, and ELPS. The materials indicate which student expectations are assessed in the summative benchmark at the end of module 2. The benchmark rubric contains a table that shows what student expectation is linked to each question number. It includes an answer key. In the answer key, there is a correct answer

shown, and for each incorrect answer, it explains why it is wrong. The Benchmark Alignment Map provides a table showing the question number/item, Integration of Standards, Content Standards, Scientific and Engineering Practices, and Recurring Themes and Concepts.

Materials include assessments that integrate scientific concepts and science and engineering practices with recurring themes and concepts.

- The materials include assessments that require students to integrate scientific knowledge and science and engineering practices with recurrent themes appropriate to the student expectation being assessed. For example, Module 3, Plants in the Environment materials include an End-of-Module Assessment Alignment Map that guides the teacher on what TEKS are assessed on each question of the End-of-Module Assessment. Question number 5 guides students to observe the photograph and model of a Welwitschia plant. Materials include content standard 4.13A, Explore and explain how structures and functions of plants such as waxy leaves and deep roots enable them to survive in their environment; SEP 4.3A, Develop explanations and propose solutions supported by data and models; and RTC 4.5F, Explain the relationship between the structure and function of objects, organisms, and systems.
- Each module also contains an Engineering or Science Challenge where students must integrate scientific knowledge and science and engineering practices. For example, in the Module 1 Engineering Challenge, students apply the engineering design process to design a structure to reduce erosion-related damage. The Standards Addressed provides nine different SEPs that are covered through the lessons and two RTCs that are addressed throughout the Engineering Challenge.

Materials include assessments that require students to apply knowledge and skills to novel contexts.

- Materials include assessments that require students to apply knowledge and skills to a new phenomenon or problem. For example, in Concept 1, the focus is on what the rock layers reveal. In Module 1, Lessons 1 and 2, students document the Grand Canyon and its physical features. In Lesson 6, students explain how the landscape in a different part of the United States changed over time by completing a Conceptual Checkpoint about Kettleman Hills, California, a new area that they have not previously learned about. Materials include assessments that require students to apply knowledge and skills to a new phenomenon or problem. For example, students complete an engineering challenge that requires them to use the knowledge that they gained from the previous lessons to design a plan that will prevent erosion from happening that can cause a landslide.
- In Module 2, Lessons 21–26, Engineering Challenge, students review the engineering design process, identify an available energy source, a desired application of energy, and the materials available. Then, students propose a solution. They apply what they have learned about energy transfer and transformation to design a device that transforms energy from an available form into the desired form, emulating William Kamkwamba. In Lesson 26, students present their final designs to their peers.
- Module 3, End of Module Assessment, has a question where students observe a model of fog in the Namib Desert fill in the blanks about what is occurring, and draw arrows to represent the movement of water.

Great Minds PhD Science Grade 4

Indicator 6.2

Materials include guidance that explains how to analyze and respond to data from assessment tools.

1	Materials include information and/or resources that provide guidance for evaluating student responses.	M
2	Materials support teachers' analysis of assessment data with guidance and direction to respond to individual students' needs, in all areas of science, based on measures of student progress appropriate for the developmental level.	M
3	Assessment tools yield relevant information for teachers to use when planning instruction, intervention, and extension.	M
4	Materials provide a variety of resources and teacher guidance on how to leverage different activities to respond to student data.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. Materials include guidance that explains how to analyze and respond to data from assessment tools.

Materials include information and/or resources that provide guidance for evaluating student responses. Materials support teachers' analysis of assessment data with guidance and direction to respond to individual students' needs, in all areas of science, based on measures of student progress appropriate for the developmental level. Assessment tools yield relevant information for teachers to use when planning instruction, intervention, and extension. Materials provide a variety of resources and teacher guidance on how to leverage different activities to respond to student data.

Evidence includes but is not limited to:

Materials include information and/or resources that provide guidance for evaluating student responses.

- Materials include information that guides teachers in evaluating student responses. Materials include follow-up suggestions for formative assessments in the Teacher's Guide, examples of acceptable answers for evaluating student responses, and suggested teacher actions to address student learning gaps in lessons and units. Materials guide teachers to look for specific components when evaluating student responses. For example, in Module 1, Lesson 3, the Check for Student understanding is used as a pre-assessment. Students use patterns in fossil evidence to make inferences about past environments. The student expectations are in the box, along with evidence that students provide to show their knowledge. In this lesson, the evidence students provide shows whether the environment where the fossils are found is aquatic or land. If a student doesn't provide the appropriate evidence, the materials state, "Prompt them with questions about the fossils such as these: Do they look like anything we see today? Where does that modern animal (or plant) live? In which kind of environment do you think that animal (or plant) lived? Why do you think it lived there?" The materials provide an End-of-Module Assessment that requires students to answer with short, constructed responses. A rubric is provided to support teachers in evaluating student answers. The rubric describes evidence of student work that meets expectations. Blanks are provided for teachers to print the rubric and fill out while evaluating. Question 6 asks students to look at a list of farming practices and

answer, "How would these practices reduce the impact on the groundwater below the farmland?" To meet expectations, the rubric states, "The student explains that if farmers use the practices including conservation and recycling described in the table, then the farmers' impact on the environment will be reduced."

- In Level 4, Module 2, Lesson 5, Check for Understanding materials provide evidence for teachers to use when evaluating student responses. Teachers look for students analyzing data from the energy station investigation to find patterns in their observations and identify energy indicators such as objects in motion. Students classify those indicators according to the patterns they observe.
- Materials include resources that guide teachers in evaluating student responses. The Implementation Guide and the Teacher Edition Module contents include the Rubric for students' use, and the End of Materials includes resources that guide teachers in evaluating student responses. Each module has one Engineering or Science Challenge with an accompanying rubric. Each module has one End-of-Module Assessment and accompanying rubric. Each Benchmark includes a rubric and an alignment map. The alignment map includes details on the standards addressed for each item.
- Each Science and Engineering Challenge includes an accompanying rubric and alignment map with guidance for evaluating students' mastery of the knowledge and skills required to complete the tasks during the challenge. A Teacher's Note within the lesson indicates the first time teachers use the rubric. Additionally, a Check for Understanding within the lesson side notes cues teachers on when to reference the Engineering Challenge rubric throughout the lesson set to assess student progress. The content of the Check for Understanding side note boxes aligns with the language in the rubric for each Engineering Design Process stage. The next steps are provided in at least one check for understanding side notes. For example, in Level 4, Module 3, Lesson 8, the Teacher's Note in the launch section guides the teacher to "review the Science Challenge rubric before beginning Lessons 8 and 9 and 20 and 21. Use the rubric to assess students throughout the Science Challenge by looking and listening for evidence of student engagement as students participate in each activity."
- Teacher Edition: Level 4, Module 3, Plants in the Environment, End-of-Module Assessment includes samples of student responses. Materials provide an End-of-Module Assessment Rubric that describes evidence of student work that meets expectations.

Materials support teachers' analysis of assessment data with guidance and direction to respond to individual students' needs, in all areas of science, based on measures of student progress appropriate for the developmental level.

- Materials provide guidance documents and resources to support teachers' analysis of assessment data. For example, two Benchmarks are provided. Guidance on when to administer the Benchmarks can be found in the Implementation Guide. Materials provide a rubric, answer key, and an alignment map. The alignment map includes details on the standards addressed for each item. Materials provide suggested steps for teachers to follow or questions to ask themselves when interpreting student data in the Implementation Guide. Materials provide questions to ask students.
- Materials provide guidance documents and resources to support the teacher's interpretation of the data. Materials include Evidence and the Next Steps for teachers after completing the informal Check for Understanding and formative Conceptual Checkpoints. Module 2, Lesson 6, Check for Understanding, Evidence, instructs teachers to look for students to identify the cause-and-effect relationship between speed and energy by explaining how adding more energy to an

object causes it to move faster. Students support their explanation with data, including the observations that transferring more energy to the car, windmill, and soccer ball caused them to move faster. The Next Steps state, "If students need support with drawing a connection between energy input and speed, repeat the investigations in a small group or one-on-one. Ask students how they can make the objects move quickly or make them move slowly. Point out the relationship between how much energy they give to an object and how quickly it moves."

- Materials provide guidance and tools to support teachers in responding to data to inform instruction. The formative assessments and informal assessments in the modules provide additional support for teachers, such as the Next Steps in the Conceptual Checkpoints and Checks for Understanding. Materials provide rubrics for each student for Benchmarks and the End-of-Module Assessments. The individual student rubrics have the teacher score the student's assessment based on each item, providing a rating scale of 1-4. A score of 1: Does Not Yet Meet Expectation, indicates an incorrect or unreasonable response with no detail or evidence. A score of 2: Approaches Expectation indicates an incorrect or unreasonable response with some detail or evidence OR a correct or reasonable response with insufficient detail or evidence. A score of 3: Meets Expectations, indicates a correct or reasonable response with sufficient detail or evidence. A score of 4: Exceeds Expectations, indicates a correct or reasonable response with more than sufficient detail or evidence.
- Materials include assessment tools that yield data teachers can easily analyze and interpret. The Implementation Guide supports teachers in data analysis and identifying patterns and trends in data. Materials include scoring guidance for assessments, individual student score sheets, class trackers for item performance, standard performance, module performance, and next steps with data. These tools help teachers track student and class progress toward skill mastery. Guiding questions are included with each section to aid in teacher analysis of patterns and trends in student data. The teacher must use the evidence to understand student mastery using the skills provided. For example, the End-of-Module Assessment provides sample answers for the teacher. Materials also provide a rubric to use while grading the assessment. The rubric includes item numbers, TEKS assessed for each question, and the meets description. Materials provide answer keys and rubrics and explain how to interpret the data. The materials instruct teachers to prepare for the next lesson and review End-of-Module Assessment responses to provide rubric scores and actionable feedback to students on a separate page from the assessment.

Assessment tools yield relevant information for teachers to use when planning instruction, intervention, and extension.

- The information gathered from the assessment tools helps teachers when planning core science instruction. The ongoing assessments throughout the lessons help inform teachers of students' learning. For example, in Module 1, Lesson 1, Check for Understanding, students make observations about the Grand Canyon. The next Check for Understanding is in Lesson 2, and then in Lesson 3, students use patterns to describe past environments, and the Next Steps support students to make inferences. These mini-assessments support teachers in identifying which students are struggling before they get to Lesson 6 for the Conceptual Checkpoint.
- In the Conceptual Checkpoint, students make inferences about the past environment based on the observations made of the provided model. Each part of the Conceptual Checkpoint was practiced in an earlier part of the Concept, allowing teachers to utilize the Check for Understanding to support students to master the Conceptual Checkpoints.

- In Level 4, Module 2, Lesson 11, Conceptual Checkpoint, materials provide the Next Steps for teachers to help plan core instructions. For example, "If students need support to explain the transfer of energy, prompt them with the following question: How did we follow the path of energy transfer in the anchor model of the windmill? If students need support to identify a collision force, prompt them with a question such as the following: What did you observe happen between the ball and catch during the collision investigation? If students need support to identify the correct investigation, prompt them with the following question: In the investigation we did in class, what caused the force of the collision to be greater?"
- In Module 2, Lesson 28, End-Of-Module Assessment, materials suggest students reflect on their responses, recording their self-assessment feedback on their copy of the assessment rubric. Materials guide the teacher to distribute written teacher feedback on students' End-of-Module Assessments. Students review feedback from their responses independently and write questions they want to discuss with the class. The teacher then shares with students samples that meet expectations and conducts a class discussion of the assessment.
- Materials offer support in the Next Steps provided in the Conceptual Checkpoints and Checks for Understanding, but not for the End-of-Modules or the Benchmarks. For example, in Conceptual Checkpoint Level 4 Module 2 Lesson 20 Next Steps materials direct teachers when planning for differentiated instruction. If students need support to highlight the path of energy flow in the model, prompt them with questions such as these: What happens because the dynamo generator produces electrical energy? Where does that electrical energy travel? If students need support to develop an explanation, ask guiding questions such as these: Is light produced in the system? Is the system open or closed? If students need support to explain why the headlamp does not produce light, prompt students with questions such as these: How does this system look different from the working system in the other model? What happens in the system if the path is not closed? If students need support to identify metals as conductors, prompt students with questions such as these: What types of materials have we observed or used as conductors in class? How does the function of a conductor differ from that of an insulator?
- The Benchmark provides an individual student rubric and an alignment map but no further teacher guidance. Materials provide multiple data trackers that allow the teacher to sort students into groups to best support students.

Materials provide a variety of resources and teacher guidance on how to leverage different activities to respond to student data.

- Materials provide a variety of student resources for teachers to use in responding to performance data. Materials provide a variety of activities that a teacher can implement, but the materials contain student resources to be used in response to data. The Implementation Guide contains a section titled Implementation and Instructional Resources that provides additional activities for students to review and practice. For example, each lesson has a Check for Understanding box. If students struggle to answer the Check for understanding, the materials provide suggestions for the next step to support student learning in the moment. Teacher sidebar notes also offer suggestions and tips for teachers if students are struggling with the material. Optional homework is provided for each lesson that teachers can use in any manner that they see fit.
- The Next Steps describe how teachers can respond to student data by providing questions to focus student responses. For example, in Level 4 Module 2, Lesson 2, the purple check for understanding box includes a next steps section that guides teachers: "If students need support drawing their model, review each part of the windmill and ask students what they think the

purpose of each part is and how it should connect to the other parts in the windmill system to allow for the circuit to light up the LED. Then guide students to add each part to their windmill model."

- Materials provide a variety of teacher guidance for responding to student data. Materials provide guidance in the informal assessments of Checks for Understanding and the formative assessments, Conceptual Checkpoints. For example, in Module 1, Lesson 6, students complete a Conceptual Checkpoint. Materials provide step-by-step instructions for giving the Conceptual Checkpoint. Sample student responses are provided for the teacher. In Level 4 Module 2, Lesson 4 in Next Steps materials provide an activity if students need support in recording their observations and identifying energy at the stations, using one of the stations as a demonstration, manipulating the objects, and then identifying evidence of energy.
- The Materials provide Next Steps for the End-Of-Module Assessments, End-of-Spotlight Assessments, and Benchmarks and are listed by module. For example, for the Level 4 Module 1: Earth Features, if a student gets the first question incorrect, the Next Steps provided for the teacher are "To provide additional support with using fossils as evidence, review materials found in Lesson 6 with students.

Great Minds PhD Science Grade 4

Indicator 6.3

Assessments are clear and easy to understand.

1	Assessments contain items that are scientifically accurate, avoid bias, and are free from errors.	M
2	Assessment tools use clear pictures and graphics that are developmentally appropriate.	M
3	Materials provide guidance to ensure consistent and accurate administration of assessment tools.	M
4	Materials include guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned to learning goals.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. Assessments are clear and easy to understand.

Assessments contain items that are scientifically accurate, avoid bias, and are free from errors. Assessment tools use clear pictures and graphics that are developmentally appropriate. Materials provide guidance to ensure consistent and accurate administration of assessment tools. Materials include guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned to learning goals.

Evidence includes but is not limited to:

Assessments contain items that are scientifically accurate, avoid bias, and are free from errors.

- Assessments contain items for the grade level that are scientifically accurate. For example, the End-of-Module 1 Assessment contains items that accurately show what the environment was like in the past through a model. In Module 2, Energy, End-of-Module Assessment, question 1 states, "The model shows the transfer of energy between the accelerator pedal and the wheels of a car. Part a. Circle a word that describes how the accelerator pedal changes the flow of energy in the system." The materials accurately state the scientifically correct answer: pushing the accelerator pedal increases the energy flowing to the wheels of the car.
- Assessments contain items for the grade level or course that avoid bias. For example, Benchmark Assessment 1 uses various images and photographs in the assessment questions. The photographs are from diverse locations that are of a barrier wall on a shoreline, a rockfall from a cliff, a frozen lake, and a snowman. In Module 2, Lesson 20, in a Conceptual Checkpoint assessment, students look at a "person" on a bicycle. It doesn't distinguish between males and females. Students use the picture to complete the Conceptual Checkpoint.
- Assessments contain items for the grade level or course that are free from errors. For example, the End-of-Module Assessment contains items for the grade level and course that are free from errors. In Module 2, Lesson 11, the Conceptual Checkpoint guides students to explain how forces and energy interact within a system. The information could be considered scientifically correct as the materials cite the reference scientific source of the information. The assessment also does not contain errors. Benchmark 2 provides a question item with a food web model. The model includes an accurate food web with energy arrows in the correct direction and organisms from the correct environment.

Great Minds PhD Science Grade 4

Assessment tools use clear pictures and graphics that are developmentally appropriate.

- Assessment tools use clear pictures and graphics. For example, in Benchmark 1, question 2, materials use a graphic of rock layers. In the graphic, each layer is enlarged to show the particle structure so that students can accurately determine which two layers that have oil stored. Additionally, the End-of-Module Assessment uses a graphic for question 7. The graphic shows a hydroelectric dam, and another shows hydrokinetic turbines. These graphics include the effects of each on the environment. Students can easily see the effects of the sediment in each graphic, which helps them answer part B in question 7.
- In Module 2, Spotlight Lessons on Earth and Space, End of Spotlight Assessment, question 5 includes pictures of the moon phases in the UK. Materials represent each stage clearly for assessment. Teacher Edition: Level 4, Module 3, Plants in the Environment materials provide an End-of-Module Assessment. The assessment includes a clear picture of fog in the Namib Desert.
- Assessments contain pictures and graphics that are developmentally appropriate. For example, in Benchmark 1, question 3 shows a graphic of a person pushing a snowball. Below each push, there is a ruler that shows the distance pushed in meters. The graphic is appropriate for the grade level and question since it uses the correct unit of measure and supports the student in determining that the data can answer how a push can change the distance a snowball travels. In Module 2, Spotlight Lessons on Earth and Space, End of Spotlight Assessment, question 4 materials use a monthly calendar to represent the different phases of the moon.
- Module 3, Plants in the Environment materials provide an accurate and grade-appropriate model image of a plant diagram. Materials provide a Check for Understanding and ask students to use the plant diagram to describe how plants use resources to make food by cycling matter.

Materials provide guidance to ensure consistent and accurate administration of assessment tools.

- Materials provide clear guidance for teachers to consistently and accurately administer assessment tools. Materials include instructions for each assessment. For example, in Module 2, Complete the End-of-Spotlight Assessment, instructions for teachers are provided. Materials state, "Prepare students for the End-of-Spotlight Assessment by explaining that the assessment is a way to show the knowledge they have developed through their study of seasonal and Moon phase patterns. Remind students to provide detailed explanations and to use resources posted in the room if needed. Tell students they will use what they have learned about seasonal and Moon phase patterns to complete the assessment. Distribute a copy of the End-of-Spotlight Assessment and a copy of the day length and temperature data to each student. Read aloud the assessment items. Students complete the End-of-Spotlight Assessment individually. If needed, provide additional time for students to finish."
- In Level 4, Module 2, Lesson 28, the teacher is guided by the Prepare for End-of-Module Assessment section. "Tell students they will complete an End-of-Module Assessment to apply their learning to a new context: the energy technology used for hybrid electric cars. Explain that, like traditional, gasoline-using cars, hybrid cars have systems that work together to provide energy for a car and its functions. Both types of cars produce and use energy in many forms, including electrical, mechanical, sound, light, and thermal energy."
- The materials include detailed information that supports the teacher's understanding of assessment tools and their scoring procedures. The materials include detailed information that supports the teacher's understanding of assessment tools and their scoring procedures. Materials provided in the Teacher Edition include sample answers for the End-of-Module

Assessment. The rubric states, "Score each student's End-of-Module Assessment. The rubric describes evidence of student work that meets expectations. Use the blank spaces as needed to record evidence of student work that exceeds or falls below expectations." The alignment map provided lists the TEKS by each item number and includes the content standards, scientific and engineering practices, and recurring themes and concepts.

- In Level 4, Module 2, Earth and Space, End-of-Spotlight Assessment Rubric, materials score each student's End-of-Spotlight Assessment. The rubric describes evidence of student work that meets expectations. Teachers use blank spaces as needed. In Lesson 11, Conceptual Checkpoint, the materials state, "After students finish, debrief the Conceptual Checkpoint with students to clarify their understanding of energy transfer in the system. Confirm that energy is transferred from the boat to the waves and then to the shoreline. As the wave collided with the shoreline, there was a collision force between the wave and the shoreline, and energy was transferred to the shoreline, causing damage." The materials provide detailed information that supports scoring procedures for teachers. For example, Teacher Edition: Level 4, Module 3, Plants in the Environment, Lesson 8 materials provide a Teacher Note that states the following: "Review the Science Challenge rubric and use the rubric to assess students throughout the Science Challenge by looking and listening for evidence of student engagement as students participate in each activity."

Materials include guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned to learning goals.

- Materials offer accommodations for assessment tools so that students of all abilities can demonstrate mastery of learning goals. For example, Teacher Edition: Level 4, Module 3, Plants in the Environment, End-of-Module Assessment materials provide color pictures and labeled models. Materials also provide sentence stems for students to complete using a word bank.
- The Implementation Guide states, "Students engage with assessment tasks in a variety of ways, and teachers may modify assessment items as needed while preserving scientific rigor." Materials add, "Some students may need additional processing time and support as they complete assessments. To evaluate students' scientific understanding, teachers may need to read items to some students or allow students to answer orally with a scribe. Students may complete assessments individually or in groups; however, when using formative assessments summatively, teachers should evaluate individual student contributions rather than group performance."
- In Level 4, Module 2, Lesson 21, in the Engineering Challenge, the teacher is given guidance on differentiation of the assessment for some students: "For students who would benefit from a visual aid, display the engineering design (Lesson 21 Resource C) process, and draw arrows from each step to the others." Materials provide the suggested visual aid.
- Materials provide "Differentiation" that instructs teachers to provide an audio recording of the assessment items for students who need additional reading support. In Level 4, Module 2, Lesson 28, End-of-Module Assessment, teacher guidance about accommodation is provided in the sidebar: "Provide an audio recording of the assessment items for students who need additional reading support." In Level 4, Module 2, Lesson 28, instruction is provided for the teacher to "Read aloud the assessment items." Additionally, in the Teacher Edition: Level 4, Module 3, Plants in the Environment, Lesson 7, materials provide a sidebar note guiding the teacher, when administering the Conceptual Checkpoint, to "Consider working with students individually or in small groups to support students with interpreting the models."

Great Minds PhD Science Grade 4

Indicator 7.1

Materials include guidance, scaffolds, supports, and extensions that maximize student learning potential.

1	Materials provide recommended targeted instruction and activities to scaffold learning for students who have not yet achieved grade-level mastery.	M
2	Materials provide enrichment activities for all levels of learners.	M
3	Materials provide scaffolds and guidance for just-in-time learning acceleration for all students.	M

Meets | Score 2/2

The materials meet the criteria for the indicator. Materials include guidance, scaffolds, supports, and extensions that maximize student learning potential.

Materials provide recommended targeted instruction and activities to scaffold learning for students who have not yet achieved mastery. Materials provide enrichment activities for all levels of learners. Materials provide scaffolds and guidance for just-in-time learning acceleration for all students.

Evidence includes but is not limited to:

Materials provide recommended targeted instruction and activities to scaffold learning for students who have not yet achieved grade-level mastery.

- The materials include teacher guidance for scaffolding instruction and differentiating activities for students who have not yet achieved mastery. Lessons include embedded support, labeled "Differentiation," to support all students in meeting the lesson goals, including accommodations for activities and assessments as necessary.
- In Module 1, Lesson 1, a note suggests defining critical words and using expressions and gestures to support students with unknown vocabulary during the read-aloud.
- Module 2, Lesson 3, Differentiation, includes information that some students may need support to come up with questions about energy. If needed, teachers should post pictures around the classroom of windmills and models from previous lessons as a visual reminder of students' experiences with energy thus far. A Teacher Note in the sidebar explains how to support students if they are not understanding how energy is a common factor in the lesson: "If students need support to identify the presence of energy as the common factor, press students to share why the wind helps in each of their examples. Discuss how each example demonstrates how wind can help make people's lives easier by doing work for them. Draw this back to the usefulness of wind by asking, Where did that extra energy come from?"
- In Module 3, Lesson 1, students look at plant characteristics. Materials provide a sidebar note, Differentiation, that suggests the teacher create a list of possible characteristics such as leaf shape, leaf color, stem width, and stem color to support students as they describe plant characteristics. In Module 3, Lesson 15, students cut out organism cards and read the information on each card and arrange the cards into a food chain. Materials provide a suggestion for students that need support arranging the cards into a food chain. The sidebar

note suggests temporarily pairing students from different groups who are working with the same set of organism cards.

- Materials ensure that teachers can target instruction to develop precursor skills necessary to access grade-level content. Materials provide instructional practices to help teachers implement lessons such as student groupings, reading complex texts, videos and images, and models and investigations.
- For example, in Module 2, Lesson 4, Visit Energy Stations, embedded support, “Differentiation,” materials support students not familiar with the terms indicate or indicator. Materials explain some other common indicators in everyday life, such as a car's fuel light as an indicator of low fuel, snow as an indicator that it is cold outside, or a snake's bright colors as an indicator that it may be venomous. Materials allow students multiple opportunities to use these terms and other content area vocabulary during discussions and in their writing.
- In Module 2, Lesson 17, a Teacher Note in the sidebar is available to guide the teacher in providing differentiation for students on how to help students achieve mastery in building the generator, stating, "Building a generator is a challenging task, and students will need to pay close attention as they work. Use discretion when forming groups, and consider assigning roles that align with abilities, interests, and safety concerns."
- Materials provide additional resources for targeted instruction and differentiation to support students who have not yet achieved mastery. For example, in Module 1, Lesson 1, students are observing and asking questions about pictures. Students should be able to use the pictures and ask questions about the age of the landform. The material suggests prompting them to look for specific details and direct them towards things you want them to look at more closely.
- The embedded support, "Check for Understanding," in Module 2, Lesson 5, Classify Energy Indicators, includes materials for students to identify examples of energy and classify indicators of energy within energy systems. In Next Steps, materials provide instructions if students need support identifying and classifying indicators of energy to have the students revisit an energy station and help them use their observations to identify energy indicators. Teachers give the students copies of the indicator sentence strips and work with them to classify the strips by the type of energy indicated.
- In Module 3, Lesson 13, students draw and label a model that shows how water moves through Big Thicket in their Science Logbook. Materials provide a Differentiation note for the teacher to provide "..a word bank for students to use as they draw their models. Include terms such as evaporation, condensation, precipitation, and water vapor."

Materials provide enrichment activities for all levels of learners.

- The materials provide enrichment activities that account for learner variability. For example, materials provide Extension activities in the sidebar of the lessons. In Module 1, Lesson 5, the extension activity for the phenomenon of the Grand Canyon, is to research the organisms found in different environments and discuss why those animals are found in certain locations in the canyon. In Module 1, Lesson 10, students are investigating the weathering of rocks. The Extension recommendation is for students to research different ways humans affect the land and contribute to erosion.
- In Module 2, Lesson 10, students investigate what variables should change to cause a marble to slow down and stop. The sidebar notes an Extension for adding additional materials for students to test such as using the different surfaces on the playground, in the hallway, and on a rug, allowing students to see more variety in the lab.

- In Module 3, Lesson 12, students observe a water model and draw and write their observations in their Science Logbook. Materials provide an Extension suggestion allowing students to design simple evaporation investigations that can be performed indoors or outdoors. In Module 3, Lesson 18, students model matter movement in a food web, a food chain. Students look at nutrients that are found in the food web. Materials provide a sidebar note for the teacher to "consider providing photographs of nutrient labels from a multivitamin and a plant fertilizer for students to compare. Students can investigate ways that different organisms rely on nutrients for health, growth, and survival."

Materials provide scaffolds and guidance for just-in-time learning acceleration for all students.

- The lessons include recommendations for just-in-time scaffolds to develop productive perseverance of learning in the moment. For example, in Module 1, Lesson 7, students investigate how natural materials can break rock. Students are provided with a clay model of rock layers from Lesson 4. Materials provide questions and student sample answers. Teacher Notes are found in the sidebar to extend the learning or provide clarification for students. In the Launch section, the Teacher Note suggests that teachers use Google Maps to show where the image is located. An example of guidance provided in the lesson is, "If students do not call out the holes and cracks in the rock wall, point them out on the photograph and wonder aloud about how they could have formed."
- In Module 2, Lesson 12, a Check For Understanding box provides an evidence box that guides the teacher in what learning should be evident at this point in the lesson: "Students develop and communicate explanations with peers (4.3B) to identify how energy can transfer from one location or object to another in a system (4.8A) while causing changes in observable energy indicators including light, motion, temperature, and sound (4.5B)." If students have not met this criterion the teacher is guided in the Next Steps box to scaffold the lesson and place the arrow in the correct order. "If students need support to explain their reasoning, prompt them with questions such as these: What indicators of energy did you observe at a station? What caused the noise at the solar cell station (or rice to move at the sound cup station, or temperature to increase at the air temperature station)? Work with students to identify the path energy travels at each station."
- In Module 3, Lesson 5, materials provide Check for Understanding Next Steps. As students observe plant structures in this lesson, Next Steps suggest, "If students need support to identify or compare plant structures, display the images of the plants next to the plant model and have students compare the individual structures such as leaves, roots, and stems."
- Lessons provide support and resources for students who are ready to accelerate their learning. Teacher Editions provide support in the sidebar through the use of a resource titled “Differentiation.” The resource can provide support for scaffolding as well as acceleration. For example, in Module 1, Lesson 3, students are interpreting patterns in Fossil Evidence and a Differentiation note is included in the sidebar to support advanced students to identify adaptations in the organisms that would indicate what type of habitat the organisms would have lived. In Module 2, Lesson 4, a challenge is presented for students to rephrase the Phenomenon Question after discussing that the word *present* that is used in the provided question is a multiple-meaning word. In Module 3, Lesson 2, students complete a card sort and the Differentiate in the sidebar guides the teacher that students who complete the card sort quickly should then be allowed to sort the cards differently by using different categories.

Great Minds PhD Science Grade 4

Indicator 7.2

Materials include a variety of research-based instructional methods that appeal to a variety of learning interests and needs.

1	Materials include a variety of developmentally appropriate instructional approaches to engage students in the mastery of the content.	M
2	Materials consistently support flexible grouping (e.g., whole group, small group, partners, one-on-one).	M
3	Materials consistently support multiple types of practices (e.g., modeled, guided, collaborative, independent) and provide guidance and structures to achieve effective implementation.	M
4	Materials represent a diversity of communities in the images and information about people and places.	M

Meets | Score 2/2

The materials meet the criteria of the indicator. Materials include a variety of research-based instructional methods that appeal to a variety of learning interests and needs.

Materials include a variety of developmentally appropriate instructional approaches to engage students in the mastery of the content. Materials consistently support flexible grouping (e.g., whole group, small group, partners, one-on-one). Materials consistently support multiple types of practices (e.g., modeled, guided, collaborative, independent) and provide guidance and structures to achieve effective implementation. Materials represent a diversity of communities in the images and information about people and places.

Evidence includes but is not limited to:

Materials include a variety of developmentally appropriate instructional approaches to engage students in the mastery of the content.

- Materials engage students in mastery of the content through a variety of developmentally appropriate instructional approaches. For example, throughout each module, students engage in the learning cycle to make sense of and explain the Anchor Phenomenon and supporting phenomena. The Content Learning Cycle includes the five content stages shown in the following: Wonder, Organize, Reveal, Distill, and Know. Each part of the Learning cycle builds and allows the student to experience the content in a different format.
- Materials include a table that lists instructional routines that appear in the lessons. The table organizes the routines by main purpose. The sections for instructional routines include Collaborative Conversation Routines and Techniques, Written Response Routines, Terminology Learning Routines, and Text-Based Routines. For example, materials use student engagement to develop an understanding of concepts. In Module 1, Lesson 2, of Mixtures & Solutions, students use the physical properties of matter to classify materials that pollute water. First, students watch a phenomenon video of an ocean with pollution. Students share what they observe and discuss how pollution affects the environment. Materials suggest a Snowball routine for students to answer and share their answers about, "What is matter?" This serves as a

recall/review for students. Students then investigate the properties of objects that represent water pollution materials. Students sort these materials and construct graphic organizers to represent their categories.

- In Module 2, Lesson 5, students look for patterns in the appearance of the Moon as it changes each month throughout the year, by participating in the Gallery Walk instructional routine. The Gallery Walk routine deepens engagement and understanding by allowing students to share their work with peers in a gallery setting.
- In Module 3, Plants in the Environment, Lesson 3, students observe similarities in the characteristics of parents and their offspring and identify those characteristics as inherited traits. Materials provide photographs for teachers to display for students to observe and determine which of the plants are the offspring and parent. Students then Think-Pair-Share as they determine which plant produced the seed that grew into the offspring.

Materials consistently support flexible grouping (e.g., whole group, small group, partners, one-on-one).

- The materials support a variety of instructional groupings (e.g., whole group, small group, partners, one-on-one). For example, the Implementation Guide provides a table with categorized instructional routines. Each routine has a suggested grouping. When looking at the written response routines, a teacher could select a group routine, such as Chalk Talk, or an individual routine, such as Quick Write.
- In Module 2, Lesson 1, students observe two Piet Mondrian paintings, photographs of how windmills work, and a video and share their thinking as a whole group. Then, students are grouped to construct a miniature windmill model. While in their groups, students work independently on their model but share ideas with their group as they work. Next, groups share information with the class about what they learned about animals living in groups which gets added to a class chart. After, groups return together to discuss and record similarities and differences among groups. Finally, students debrief the activity as a whole group.
- In Module 2, in the Lesson 2 Teacher Note, materials instruct teachers to make different groups; sizes will depend on the class size. During materials preparation, teachers determine how many groups they can support, and use that to select a grouping method that works best for their classroom.
- The materials guide teachers on when to use specific grouping structures based on the needs of students. For example, materials explain in the instructions of the lesson whether students are working independently, in groups, or as a whole group. In Module 1, Lesson 3, directions tell the teacher to organize students into five groups, one for each layer of dirt in the model. The materials include sidebar notes and Check for Understanding boxes that the teacher can use to support concept acquisition. In Module 1, Lesson 3, a Differentiation sidebar note guides the teacher to "consider the needs of each student to develop groups with a variety of abilities and interests. For example, it may be helpful to group students with varied English language abilities to support students as they develop interpersonal and academic language (3E)."
- In Module 3, Lesson 11, materials provide the teacher guidance on leading a whole class discussion of a Texas precipitation map. The teacher explains to students that the map shows the amount of precipitation that occurred in different parts of Texas during one year. The teacher asks students what they notice and wonder about the precipitation map.

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Materials consistently support multiple types of practices (e.g., modeled, guided, collaborative, independent) and provide guidance and structures to achieve effective implementation.

- The materials provide multiple types of **practices** (e.g., modeled, guided, collaborative independent)**.** The Teacher Edition clearly describes the actions of the teacher and the student and when the activities will be a class demonstration, teacher-guided, collaborative learning, or independent practice.
- For example, in Module 1, Lesson 7, students investigate how natural materials can break rock. Students work in investigative stations to observe how plants, ice, water, and air can weather rock. In Lesson 8, students explain how natural materials weather rock. Materials provide instructions on an instructional routine called "Snowball," so that students can share their ideas from the previous lesson and the new phenomenon presented to them, a picture of rocks with holes.
- In Module 2, Lesson 12, students participate in a teacher-guided energy station solar oven. This teacher-guided activity can be conducted in small groups or as a class.
- In Level 3, Module 2, Lesson 2, students are guided to listen to the first part of the book, *The Boy Who Harnessed the Wind,* and participate in a class discussion where they also respond in a Think-Pair-Share routine. Then, students work collaboratively in a group to build physical models of windmills that generate electricity. Finally, students independently draw a model in their Science Logbook to show how their physical model worked. In Module 2, Lesson 5, students are guided in the observation and discussion of images of the Peruvian apple cactus taken during the day and during the night. Then, students collaboratively examine a gardener's notes and data to begin identifying patterns in the appearances of the Moon and cactus flowers. Then, students work with a partner to observe photographs of the Moon at different times of the month and label the photographs with phases. Student pairs create groups and compare the Moon's appearances for two calendar months. Finally, students independently draw predictions and record responses in their Science Logbook about the appearance of the Moon on the first day of the next month.
- The materials provide teacher guidance and structures for effective implementation of multiple types of practices. For example, materials provide question prompts and sample answers that the teacher can anticipate. Teacher sidebar notes also include support for students who may not be able to provide explanations. For example, in Module 1, Lesson 7, students complete 4 stations to observe how rock can be weathered. Materials provide a materials list, and Preparation Guides state the amount of time to prepare before class and how long the investigation should take in class. Instructions are provided for class setup and how to prep the students thinking before the investigation. Sidebar notes are provided to help students in lesson implementation. A safety note is provided to prevent eye injuries from particles. Guidance is provided to the teacher about what to do during the investigation and what students should learn from each investigation. A Check for Understanding box in teacher instructions provides support to the teacher if students do not develop the understanding that they should from the investigation.
- In Module 3, Lesson 3, materials provide a guided lesson for teachers to implement with the whole class in the Launch piece of the lesson. Students go outside to observe plants with teacher guidance. The teacher encourages students to record the physical characteristics of plants. In Module 3, Lesson 9, materials provide guiding questions for the Learn piece of the lesson. Materials provide a scripted piece that teachers can use when preparing students for the investigation they will be conducting on radish plants.

Great Minds PhD Science Grade 4

Materials represent a diversity of communities in the images and information about people and places.

- Materials represent diverse communities using images and information that are respectful and inclusive. For example, the Implementation Guide in "Characteristics of Rich Phenomena" describes the social context of the materials using phenomena to exhibit enduring significance in diverse cultures and content areas. Stories, art, and primary sources often illustrate the multifaceted nature of these phenomena.
- Materials represent diverse communities in the images and information about people and places. For example, as the material focus is earth features, there are not enough images of people to state that the material does not represent a diverse amount of people. In one lesson, John Wesley Powell, a white American geologist, is presented through images of his travel and his journal notes about the land. Another picture shows a group of white people at Deer Creek Falls. One other image in the module contains a picture of a Hispanic female.
- Materials show diversity in showing real-life images of various locations, landforms, and animal life. For example, real-world images are presented to students for concept development. "An oil spill in the Gulf of Mexico" and the "Charles River" images are used in lessons so that students can make connections between relative density and real-world situations in the Spotlight Lessons on Mixtures and Solutions. The phenomenon focus is the Grand Canyon. Materials include images and models of the Grand Canyon while also including images of fossils found in the Grand Canyon. Materials also include Texas fossil images and a Texas map showing where fossils have been found in Texas. Other places in the United States are included such as the California coastline, Colorado River, and North American Glaciers.
- In Module 3, Lesson 5, students observe photographs that show plants found in different environments in Big Thicket. The variety of plants includes grass, prickly pear cactus, and bladderwort. Teacher Edition: Level 4, Module 3, Plants in the Environment, Lesson 14 materials include photographs that show two environments in Big Thicket, the wetland pine savanna and arid sandy land. Students observe and compare the two different areas in Big Thicket.
- Materials represent diverse communities using texts and activities of different cultures. For example, in the Level 4 Energy module, students raise questions about windmills and energy by exploring two of Piet Mondrian’s windmill paintings and the story of young William Kamkwamba building a windmill to generate electricity in Malawi. In Module 2, students read about a little boy, in *The Boy Who Harnessed the Wind (Kamkwamba and Mealer 2012).* In Level 4, Module 2, Lesson 6, students use their previous learning as they analyze scientific observations of the songbirds called European nightjars. In the End-of-Spotlight assessment, students use a migration map and field notes to answer the Phenomenon Question, "How do seasons and Moon phases relate to nightjar migration?"

Great Minds PhD Science Grade 4

Indicator 7.3

Materials include listening, speaking, reading, and writing supports to assist emergent bilingual students in meeting grade-level science content expectations.

1	Materials include guidance for linguistic accommodations (communicated, sequenced, and scaffolded) commensurate with various levels of English language proficiency as defined by the ELPS.	M
2	Materials encourage strategic use of students' first language as a means to linguistic, affective, cognitive, and academic development in English.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. Materials include listening, speaking, reading, and writing supports to assist emergent bilingual students in meeting grade-level science content expectations.

Materials include guidance for linguistic accommodations (communicated, sequenced, and scaffolded) commensurate with various levels of English language proficiency as defined by the ELPS. Materials encourage strategic use of students' first language as a means to linguistic, affective, cognitive, and academic development in English.

Evidence includes but is not limited to:

Materials include guidance for linguistic accommodations (communicated, sequenced, and scaffolded) commensurate with various levels of English language proficiency as defined by the ELPS.

- Materials include linguistic accommodations commensurate with various levels of English language proficiency as defined by the ELPS. Materials offer information about constructing sentence frames in the English Language Development section of the Implementation Guide. The material provides teacher support boxes in lesson instructions titled "English Language Development." For example, in Module 1, Lesson 1, the English Language Development box suggests introducing the term *canyon*. Materials first state to explicitly teach *canyon*, have students restate *canyon* and break it into syllables, then look at images of canyons. The Spanish cognate *cañón* is provided to the teacher for students whose first language is Spanish. Materials include teacher guidance for class discussions.
- In Module 1, Lesson 2, the English Language Development purple box suggests using a collaborative conversation routine, Mix and Mingle or Inside-Outside Circles, to share responses about features of the Grand Canyon.
- In Level 4, Module 2, Lesson 1, English Language Development, the materials provide the following line of questioning involving using vocabulary such as windmills. Materials provide scaffolding for English learners with the sentence frames "1. Windmills might work by.... 2. I think windmills work with.... 3. In the windmill picture, I see.... 4. That makes me think...." In Module 2, Lesson 1, materials instruct teachers, when forming groups, to consider the needs of each student to develop groups with various abilities and interests. Teachers also consider a student's English proficiency level. Grouping students with other speakers of their native

language who are at different levels may be beneficial. Materials guide how teachers explain difficult words and their definitions.

- In Module 3, Lesson 8, as students learn about plants, food, and resources, materials provide teacher guidance when introducing a familiar term with a different meaning. Materials suggest the teacher introduce the term *food* and discuss different examples of food. In Module 3, Lesson 12, materials provide a sidebar note guiding the teacher on how to explain the term *surface water* to students. Materials guide the teacher to "explain that surface water is water that is above the ground or on Earth's surface. Consider providing familiar examples of surface water, such as ponds, rivers, and lakes."

Materials encourage strategic use of students' first language as a means to linguistic, affective, cognitive, and academic development in English.

- Materials encourage strategic use of students' first language as a means to linguistic, affective, cognitive, and academic development in English. In the Implementation Guide in English Language Development materials provide teacher guidance for grouping students who speak the same home language at complementary proficiency levels and can provide additional scaffolding by allowing English learners to converse in their home language, thereby supporting English comprehension and understanding. The Implementation Guide has teachers consider using students' own words when recording questions and related phenomena on the driving question board and when adding labels and explanations to the anchor model. Student language on anchor visuals may include everyday language and students' home language.
- The Implementation Guide provides a paragraph about Bilingual Program Considerations. Appendices C & E provide Content-Specific Words, General Academic Words, and Spanish Cognates—a list of key terms in the module and their Spanish cognates to support English language development. The material provides a summary in Spanish, links for translation of instructional language, and links to access videos with Spanish dubbing or closed captioning in the Implementation Guide.
- In Level 4, Module 2, Lesson 11, in the side note labeled "English Language Development," the materials suggest that teachers introduce the Spanish cognate for the word *friction*. "Students will encounter the term friction throughout the module. Providing the Spanish cognate fricción may be helpful."
- In Teacher Edition: Level 4, Module 3, Appendix C materials provide a list of content-specific words with cognates. Appendix C includes the following terms: *characteristic-caracteristica*, *function-función*, and *water vapor-vapor*. Module 3, Lesson 5, includes a sidebar note that provides terms that are frequently used throughout the module. "Students will encounter the terms structure and function throughout the module. Providing the Spanish cognates for structure (estructura) and function (función) may be helpful."

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Indicator 7.4

Materials provide guidance on fostering connections between home and school.

1	Materials provide information to be shared with students and caregivers about the design of the program.	M
2	Materials provide information to be shared with caregivers for how they can help reinforce student learning and development.	M
3	Materials include information to guide teacher communications with caregivers.	M

Meets | Score 2/2

The materials meet the criteria of the indicator. Materials provide guidance on fostering connections between home and school.

Materials provide information to be shared with students and caregivers about the design of the program. Materials provide information to be shared with caregivers for how they can help reinforce student learning and development. Materials include information to guide teacher communications with caregivers.

Evidence includes but is not limited to:

Materials provide information to be shared with students and caregivers about the design of the program.

- Materials provide information to share with students and caregivers about the design of the program. Each grade level includes the Family Tip Sheet Overview as a resource, available in English and Spanish, that gives families and caregivers an overview of the PhD Science Texas curriculum and suggests ways to participate in and extend learning outside the classroom. The document provides caregivers with information about PhD Science Texas, what students do in class, what a lesson will look like, how science is connected to other disciplines, how to help students, and what students will study at each level.
- For example, the Level 4, Module 2 Family Tip Sheet includes a list of some of the classroom activities students may complete, as well as at-home activities and conversation starters for families. “Classroom activities for this module include the following: Observing and classifying energy at different energy stations. Investigating speed, forces, and collisions to show energy transfer.”

Materials provide information to be shared with caregivers for how they can help reinforce student learning and development.

- Materials provide resources and strategies for caregivers to help reinforce student learning and development. For example, the Level 4, Module 2 Family Tip Sheet includes a list of at-home activities and conversation starters for families. Some conversation starters listed are “Talk about energy in the community. Discuss how it is produced and delivered to homes, schools, and businesses. Discuss how energy is used in different rooms of the home or at different times of the day.” In Module 1, Lesson 23, students observe the properties of land materials that allow

them to store water underground. The optional homework for this lesson is for the student to identify the nearest major aquifer by using a map with the provided link. Students are to share their research and explain what an aquifer is to a family member or friend. In the Module 1 Family Tip Sheet, there is a box that includes Conversation Starters and Activities that families can use at home. One activity is to "research a dam, landform, or water feature. Visit and take photos or sketch details. If you visit a dam, discuss its purpose."

- The Family Tip Sheet provided with Module 3 suggests that families visit a local library or use an online library to explore related topics such as carnivorous plants, inherited traits, acquired traits, climate, water cycle, decomposers, producers, consumers, and food webs.
- Materials provide at-home activities for caregivers to help reinforce student learning and development. For example, in the Family Tip sheet, a section is included that is titled, "How can I help?" The section explains that the Family Tip Sheet outlines the Module Concepts and includes ideas on how caregivers can support the student at home. The Family Tip Sheet also provides suggestions to visit the "National Science Teaching Association's Tips for Busy Parents" website. Materials provide optional homework for caregivers to help reinforce student learning and development.
- The Level 4, Module 2 Family Tip Sheet includes a list of at-home activities and conversation starters for families. Materials state, "Have fun with these related activities at home: Use objects found in the home to safely demonstrate the transfer of energy. Safely take apart a flashlight or other small object that uses energy. Observe the parts and research how energy makes the object work."
- The Family Tip Sheet for Level 4, Module 3 encourages caregivers to help students to learn more about their area by reading about their local state park by visiting the Texas State Park Website provided.

Materials include information to guide teacher communications with caregivers.

- Materials include teacher guidance for communicating with caregivers. Materials supply a Family Tip Sheet overview and a Family Tip Sheet for each module for caregivers to understand the PhD Texas instructional materials. The Implementation Guide provides a section for additional teacher resources and includes the Family Tip Sheet (Overview) and Family Tip Sheet (Module). The materials state, "This resource, available in English and Spanish, gives families and caregivers an overview of the PhD Science Texas curriculum and suggests ways to participate in and extend learning outside the classroom." The Implementation Guide mentions that the Family Tip Sheets are provided in English and Spanish.
- Materials include teacher guidance for communicating with caregivers. For example, the Family Tip Sheet contains a section titled "How are students assessed," and materials list the formal tasks of Science Challenges, Engineering Challenges, an End-of-Module assessment, and Socratic Seminars in the modules. The materials state, "The balance of ongoing and cumulative assessment allows instruction to be adjusted throughout the module to ensure that students are progressing."
- Materials provide an optional homework activity with each lesson and guidance for communicating with caregivers when assigning this optional assignment in the Communicating with Caregivers section of the Implementation Guide. The Family Tip Sheet contains a "Is there homework?" section that states the students have informal assignments, including ideas to discuss with adults at home or questions that prompt a simple observation. For example, in Module 1, Lesson 1, the optional homework assignment is for students to record their observations of the natural features around their homes in journals like Powell. For example,

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Module 3, Lesson 3 provides optional homework for students to complete under adult supervision. Materials guide the teacher to communicate with caregivers by sending notifications in a weekly class newsletter, homework planner, or digital message.

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Indicator 8.1

Materials include year-long plans with practice and review opportunities that support instruction.

1	Materials are accompanied by a TEKS-aligned scope and sequence outlining the order in which knowledge and skills are taught and built in the course materials.	M
2	Materials provide clear teacher guidance for facilitating student-made connections across core concepts, scientific and engineering practices, and recurring themes and concepts.	M
3	Materials provide review and practice of knowledge and skills spiraled throughout the year to support mastery and retention.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. Materials include year-long plans with practice and review opportunities that support instruction.

Materials are accompanied by a TEKS-aligned scope and sequence outlining the order in which knowledge and skills are taught and built in the course materials. Materials provide clear teacher guidance for facilitating student-made connections across core concepts, scientific and engineering practices, and recurring themes and concepts. Materials provide review and practice of knowledge and skills spiraled throughout the year to support mastery and retention.

Evidence includes but is not limited to:

Materials are accompanied by a TEKS-aligned scope and sequence outlining the order in which knowledge and skills are taught and built in the course materials.

- Materials include a cohesive scope and sequence that shows how science knowledge and skills are addressed over the course of the entire year, grades K through Grade 5. The scope and sequence provides pacing information (for each module component) and a summary of the focus standards addressed and assessed in each module of each grade level.
- Materials also include a comprehensive TEKS Content Development Progression document within the implementation guide. The progression document lists each module and spotlight lessons from grades K through grade 5 and correlating TEKS, ELPS, recurring themes and concepts (RTCs), science and engineering practices (SEPs), and scientific concepts that are covered within each module or spotlight lesson. Modules for each grade level also include any other previous grade-level standards that are also spiraled into the module. The progression document clearly shows the order in which knowledge and skills are taught and built in the course materials.
- Each module and spotlight lesson includes a progression of concepts outlined in the Module (or Spotlight Lesson) Map document. For example, in the Earth Features module, the map lists the anchoring phenomenon, essential question, and a progressive list of concepts (such as the A landscape can be described by its distinctive features) with focus questions, such as “What can we discover in an unknown canyon?” For each concept, phenomenon questions, a bulleted list of student learning with corresponding lessons, and a list of correlating TEKS and ELPS are included.

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Materials provide clear teacher guidance for facilitating student-made connections across core concepts, scientific and engineering practices, and recurring themes and concepts.

- The materials provide teacher clarity in understanding how activities and experiences connect concepts and SEPs. Included in each module's appendix is a Module Storyline, written from the student's perspective, that describes how students engage with core concepts, practices, and themes as they seek to make sense of phenomena throughout the module. For example, in the Earth Changes Module Storyline, materials provide a detailed progression of how students engage with earth science concepts using science and engineering practices through the lens of the recurring theme of cause and effect. Within one portion of the Storyline, students look at a map of fossil fuel locations in the United States and "notice that fossil fuels are not found in Rhode Island." The teacher explains that Rhode Island still relies on natural gas and oil as energy resources, which must be transported through pipelines. Students discuss how people in Rhode Island need fossil fuels but must use other natural resources for energy. Students demonstrate their understanding by identifying that as the population of Rhode Island increases, so does energy use. Students identify the advantages and disadvantages of using fossil fuels and solar power as energy resources, and then consider these advantages and disadvantages as they explain why Rhode Island uses both fossil fuels and solar power for energy
- Teachers can use the Prepare section of each lesson set to see how students develop scientific understanding during a lesson set. The Prepare section includes Knowledge Statements and Objectives, which are brief reflections of student actions in advancing their learning during a lesson. They begin with a verb that explains what students will do to build understanding of a sub-component of the Knowledge Statement. For example, in the lessons on dams, and renewable and nonrenewable resources in the Earth Features module, materials include the Knowledge Statement, "The environment is impacted by human use of energy resources." Materials include objectives for the lessons, such as students interpreting information to determine the uses of dams, and students describing how the use of renewable and nonrenewable energy resources impacts the environment.
- Materials include, within the Teacher Guide sidebar, notes explaining how a lesson activity develops students' understanding of content, concepts, and practices throughout the year and across grade levels. For example, in Lesson 20 of the Earth Changes module, the Spotlight note provides teacher clarity in facilitating student connections between the need for modeling natural phenomena and processes and the complexity or danger of observing naturally as they observe a mixture representing pollution. Materials direct teachers to remind students that scientists often develop models to represent phenomena and relationships in the natural world that are difficult to study directly. The Spotlight sidebar states, "Modeling the natural environment is a scientific practice students use here to represent a scenario that is too complex and dangerous to observe outside of the classroom. Students should understand the importance of models in representing natural phenomena and processes."
- At the end of each module and set of spotlight lessons, students have the opportunity to reflect on RTCs in module learning. Students make connections between their use of RTCs and the concepts learned. Materials provide clear, scripted guidance for teachers to facilitate student-made connections. For example, at the end of the Energy Module, students reflect on how concepts of energy transfer and transformation can be evaluated through the lenses of cause and effect and systems. After discussing concept statements from the module, such as, "Energy transformation occurs when one phenomenon indicating the presence of energy changes into any other energy phenomenon," materials direct teachers to ask questions to help students

connect recurring themes and ideas, such as How do some of these statements relate to systems? and How do these statements relate to cause and effect?

Materials provide review and practice of knowledge and skills spiraled throughout the year to support mastery and retention.

- Materials include information about review (including any previous grade-level content) and practice of knowledge and skills throughout lessons in the Pacing Guide. In the horizontal and vertical alignment section in the implementation guide, materials list all module and spotlight lessons in fourth grade and how each continues to spiral throughout lessons during the year. For example, force and motion concepts are introduced and developed in Module 1, Earth Features, and are intentionally spiraled in later modules.
- Students practice and review previously taught science knowledge and skills through the use of the Spotlight on Knowledge and Skills. Students have the opportunity to review TEKS taught in previous years before addressing the TEKS for the current school year. For example, in the Plants in the Environment module, Lesson 1 materials include a Spotlight on Knowledge and Skills to reinforce that students learned that plants depend on air, sunlight, water, and nutrients in the soil in kinder and first grade. Students also learned that plants have different structures in second grade. Students use this knowledge to observe the type of environment a carnivorous plant needs to survive.
- Materials provide guidance within the body of the lesson for reviewing and practicing previously learned knowledge and skills. For example, students review the effects of erosion before investigating how people can reduce erosion-related damage in the Earth Features module. Students discuss what they think would happen when water flows over the soil buildings are on the soil in the stream table. Materials direct teachers to explain that erosion can affect many different types of landscapes and that engineers work to solve the problem of erosion damage in places where people live and work.
- Materials identify content standards as Introduced, Addressed, or Mastered in the Standards Addressed table at the beginning of each lesson set. The Introduced label appears in the first lesson set at a level in which students interact with a particular standard. The Addressed label appears in all lesson sets from those lessons that introduce a standard through those lessons that demonstrate mastery of the standard. The Mastered label appears in lessons that assess a standard for the final time, and students demonstrate understanding. Some content standards may be introduced in one module and then addressed and mastered in a later module.

Great Minds PhD Science Grade 4

Indicator 8.2

Materials include classroom implementation support for teachers and administrators.

1	Materials provide teacher guidance and recommendations for use of all materials, including text, embedded technology, enrichment activities, research-based instructional strategies, and scaffolds to support and enhance student learning.	M
2	Materials include standards correlations, including cross-content standards, that explain the standards within the context of the grade level.	M
3	Materials include a comprehensive list of all equipment and supplies needed to support instructional activities.	M
4	Materials include guidance for safety practices, including the grade-appropriate use of safety equipment during investigations.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. Materials include classroom implementation support for teachers and administrators.

The materials provide teacher guidance and recommendations for use of all materials, including text, embedded technology, enrichment activities, research-based instructional strategies, and scaffolds to support and enhance student learning. Materials include standards correlations, including cross-content standards, that explain the standards within the context of the grade level. Materials include a comprehensive list of all equipment and supplies needed to support instructional activities. Materials include guidance for safety practices, including the grade-appropriate use of safety equipment during investigations.

Evidence includes but is not limited to:

Materials provide teacher guidance and recommendations for use of all materials, including text, embedded technology, enrichment activities, research-based instructional strategies, and scaffolds to support and enhance student learning.

- The materials include overview documents to support teachers in understanding how to use all materials and resources as intended. For example, a 3–5 Review Walkthrough video provides an introduction to PhD Science and explains each component in the reviewer resources and student resources section. Materials contain an implementation guide with a visual map of the recommended sequence of module implementation with details of concepts and lessons broken down by the standards. Materials provide a curriculum map that includes the module titles, anchor phenomenon, spotlight lessons title, and spotlight lessons anchor phenomenon. A pacing guide, preparation guide, and scope and sequence are explained for teacher ease of use in the Implementation Guide.
- The Teacher Edition provides key terms and Advanced Materials Preparation to prepare teachers for upcoming activities and suggestions for additional reading that will support teachers' use of materials. The sidebar found in the Teacher's Edition contains instructional supports to include cross-content connections, differentiation, and teacher notes. Materials contain links to embedded technology in the Teacher's Guide as options for teachers to use to support student learning.

- The materials are organized in a way that facilitates ease of implementation and use. Tools to support navigating the resources include a table of contents in each module, tabbed pages to easily identify lessons within the module, and lesson agenda at the beginning of each lesson to help guide the teacher with navigating the Teacher Guide.

Materials include standards correlations, including cross-content standards, that explain the standards within the context of the grade level.

- The materials include science standards correlations for lessons units, lessons, and activities within the context of the grade level in teacher guidance documents. For example, the Teacher Guide begins each module with a map of the phenomenon, student learning by lesson, TEKS for Science, and ELPS for the module. Science standards are listed in each module, with standards in bold to identify what standard students should master in that module. The material indicates the standards that are being developed in the current module through the use of italicized text. Modules also contain Spotlight Lessons, which give an overview to describe TEKS and the lessons. Within one module, the Building Content Knowledge section of the guide explains what foundational skills students have studied in kindergarten through Level 2. The section explains how students at these levels compare patterns of movement. The section further explains that in Level 3, students observe how pushing and pulling on an object can change its position and motion. In Level 4, students build on their knowledge of force, motion, and energy as they investigate and determine the relationship between speed and energy.
- The materials include cross-content standards for ELA, Math, and Social Studies in sidebar support within the teacher's guide to lessons. Materials also include a Content Area Connection within each module that lists embedded cross-content correlations to English language arts and mathematics standards. Materials include cross-content material within extensions, reminders, and examples for reinforcing reading and writing, calculation, and problem-solving skills as students apply them to science learning. For example, in Level 4 Module 2, a sidebar explains how to include the poem "Who Has Seen the Wind" with the phenomenon of wind being studied. The activity then has the teacher "Ask students to infer the poem's topic and explain their reasoning with evidence from the text."

Materials include a comprehensive list of all equipment and supplies needed to support instructional activities.

- The materials include a comprehensive list of all equipment and supplies located under the section "Instructional Hands-On Materials Kits" as well as within each Module and Spotlight Lessons Prepare section of the Teacher Guide.
- Resources include a list of student and teacher materials required for the lesson or lessons to support instructional activities. Materials offer an Instructional Hands-On Materials Kit (for purchase) for each module that contains all materials needed for modules. Teachers can view a comprehensive list of all equipment and supplies needed to support instructional activities, as well as which supplies are available in the refill kit. Each module provides a list of materials needed before each lesson within the "Prepare" section. The materials list is broken into student materials, teacher materials, and teacher preparation. For example, Level 4, Module 2, includes a list of materials such as supplies for building circuits, meter sticks, and metric rulers. Level 4, Module 1, contains an Advance Materials Preparation list that states that the Plant Station will require seven days in advance to prepare plaster of Paris and plant seeds for investigation.

Great Minds PhD Science Grade 4

Materials include guidance for safety practices, including the grade-appropriate use of safety equipment during investigations.

- The materials provide teacher guidance for safety practices and grade-appropriate use of safety equipment during investigations, in accordance with Texas Education Agency Science Safety Standards. The Implementation Guide contains a Safety section with a list of personal protection equipment such as goggles, gloves, and aprons. Materials recommended that teachers design and hang a safety poster in the classroom for students to refer to at any time and refer to the chart when explaining safety expectations before a science activity. Each Module Overview in the Teacher Edition contains a section titled “Safety Considerations.” The materials state, “Safety considerations appear in the Module Overview section of each module, and additional safety notes for teachers appear in lessons. These instructions should be regarded as the minimum safety precautions, and teachers may elect to implement additional precautions.” Some Safety Considerations include teacher tips, such as explaining all safety considerations to students and reviewing all safety expectations before each activity. Students must demonstrate appropriate classroom behavior (e.g., no running, jumping, or pushing) during science investigations.
- The materials provide student guidance for safety practices and grade-appropriate use of safety equipment during investigations, in accordance with Texas Education Agency Science Safety Standards. During the first module of each grade level, students review and sign a Safety Contract and take a Safety Quiz. Materials provide guidance for safety procedures specific to a lesson activity within in-line or sidebar Safety Notes. For example, Level 4, Module 1, lists safety considerations for all investigations included in the module. Reminders within lessons include that students must wear safety goggles, avoid putting samples in their mouths, tell the teacher if a spill occurs, and wash their hands.

Great Minds PhD Science Grade 4

Indicator 8.3

Materials provide implementation guidance to meet variability in program design and scheduling.

1	Materials support scheduling considerations and include guidance and recommendations on required time for lessons and activities.	M
2	Materials guide strategic implementation without disrupting the sequence of content that must be taught in a specific order following a developmental progression.	M
3	Materials designated for the course are flexible and can be completed in one school year.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. Materials provide implementation guidance to meet variability in program design and scheduling.

The materials support scheduling considerations and include guidance and recommendations on required time for lessons and activities. Materials guide strategic implementation without disrupting the sequence of content that must be taught in a specific order following a developmental progression. Materials designated for the course are flexible and can be completed in one school year.

Evidence includes but is not limited to:

Materials support scheduling considerations and include guidance and recommendations on required time for lessons and activities.

- The materials include support for specific scheduling considerations, with guidance for covering required science content for the grade level/course within various schedules. Materials contain an overview providing teachers with considerations for planning instruction at the module and lesson levels. The implementation guide includes pacing information with total instructional days for each module and total days for each lesson. Teacher choice days for review are included in the pacing guide. For example, the Module at a Glance section in the Level 4, Module 2, suggests that even with teacher choice, the module should take no more than 45 days to complete with a school year that has 150 days.
- The materials include guidance and recommendations on required time for lessons and activities with options for various scheduling considerations. Materials provide each lesson with an agenda that paces out each component of the lesson and how much time the teacher should allot for that component. Each concept lasts from 2–12 days in length, depending on the number of minutes within a science block. Materials also contain guidance for the time needed for teacher-led instruction and classroom collaboration. For example, in Level 4, Module 2, Lesson 7, each component has a reminder of how much time should be utilized to implement the task. The Learn segment should take 38 minutes, and within each segment, materials include a timestamp, such as the Design of a Fair Test Investigation should be implemented in 13 minutes.

Great Minds PhD Science Grade 4

Materials guide strategic implementation without disrupting the sequence of content that must be taught in a specific order following a developmental progression.

- Materials provide guidance for strategic implementation that ensures the sequence of content is taught in an order consistent with the developmental progression of science. Materials include a suggested sequence of units that considers the interconnections between the development of conceptual understanding and scientific and engineering practices. Materials state, “PhD Science Texas modules are sequenced to build coherent student understanding of science ideas. Each module provides opportunities for students to explore questions and apply knowledge and skills they developed in previous modules.”
- The Curriculum Map provides an at-a-glance view of module titles, anchor phenomena, and Spotlight Lesson titles for each level with color-coded tables that show when students are learning and building upon previously taught concepts. Modules allow students to explore questions and apply knowledge and skills they developed in previous modules. For example, Level 3, Module 1, has a focus on Earth. Later in Module 3, students are brought back to the concept of Earth in the spotlight lessons provided.
- Each module’s Pacing Guide emphasizes applying concepts throughout the school year. For example, the Pacing Guide for Level 4, Module 2, Spotlight Lessons on Space and Earth, maps out the lesson progression for a spotlight lesson. Students study patterns found in nature. First, they next engage in a lesson on seasonal patterns, followed by moon patterns, and the culmination of the lessons is an activity on nightjar migration.

Materials designated for the course are flexible and can be completed in one school year.

- The materials include modules, lessons, and activities for a full year of instruction. Materials outline a full year's worth of instruction which includes 34 weeks of total instruction, including assessments, teacher choice days, spotlight lessons, and challenge days. For example, each module contains 25 to 35 lessons organized into two to four concepts. Materials include a Year at a Glance document that includes recommendations on how to cover all material within the year. The Year at a Glance includes a visual that shows where all three modules fit in a year. Materials state that “to ensure completion of each module, it is recommended to teach science five days a week.”
- Materials provide teacher guidance on how to make adjustments to extend or condense units and lessons within the Teacher’s Guide if scheduling allows for additional instruction days or needs to be shortened due to lack of time. The pacing guide provides suggestions to teachers that will help them bridge the gaps for review, assessment, and other instructional support as needed. The Pacing Guide provides options “to allow teachers to maximize instructional time while remaining responsive to students' needs,” but the options do not omit parts of lessons. For example, the Pacing Option Key includes a calendar symbol and denotes a lesson that can be taught in one day or split into two days. Lesson 2 in Module 1 can be taught as follows, “Day 1: Launch through Build a Driving Question Board” and “Day 2: Develop an Initial Model of Grand Canyon Features through Land.” The Pacing Option Key also includes Instructional Notes, represented by a clock image. The Instructional Notes describe time-saving strategies such as sentence frames for writing assignments and Teacher Notes that suggest alternative activities. Extension activities are also provided to extend student learning.

Great Minds PhD Science Grade 4

Indicator 9.1

The visual design of materials is clear and easy to understand.

1	Materials include an appropriate amount of white space and a design that supports and does not distract from student learning.	Yes
2	Materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting.	Yes
3	Materials include digital components that are free of technical errors.	Yes

Not Scored

The visual design of materials is clear and easy to understand.

Materials include an appropriate amount of white space and a design that supports and does not distract from student learning. Materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting. Materials include digital components that are free of technical errors.

Evidence includes but is not limited to:

Materials include an appropriate amount of white space and a design that supports and does not distract from student learning.

- The digital materials include an appropriate amount of white space and an overall design that does not distract from student learning. Appropriately designed student materials support student learning. Teachers can locate important information easily for planning and implementation through the design of the Teacher's Guides.
- The Teacher Editions include a title with subtitles, and sidebar information for the teachers. Materials use color-coded boxes with sidebar notes, and embedded instructional supports to easily identify important information. Materials include links within modules for additional reading for teachers. The content is organized, with prominent and clear titles and headings, and sections marked with subheadings.

Materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting.

- The materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting. Materials embed age-appropriate pictures in the Student Logbook and as Reference Materials throughout each Module. For example, Teacher Edition: Level 4, Module 3, Plants in the Environment, Lesson 15, Resource B, includes Big Thicket Organism Cards. Materials provide organism cards with clear and age-appropriate pictures of plants and animals from the Big Thicket Environment. Materials include pictures of a Fern plant, a Pine tree, a Coyote, and a Bobwhite Quail. Level 4, Module 1, Lesson 1, includes photos of an unknown canyon from Powell's expedition in 1871. Students then compare the photos to a painting by Thomas Moran of the same unknown canyon. After students are shown

current pictures of the Grand Canyon which is the canyon Powell explored. These photographs support student concept development about land features.

Materials include digital components that are free of technical errors.

- The materials include digital components that are free of technical errors. Materials are free of spelling, grammar, and punctuation errors. Materials are free of inaccurate content materials or information. Materials are free of wrong answer sheets to problems.
- The Teacher's Edition includes activities that are free of inaccurate content materials or information. The materials are also free of wrong answers to questions being asked. For example, Module 2 provides accurate information about how energy transfers and can transform. The materials are clear of errors in the Student Edition: Science Logbook. For example, the Module 1 Student Edition is free from spelling, grammar, and punctuation errors.

Great Minds PhD Science Grade 4

Indicator 9.2

Materials are intentionally designed to engage and support student learning with the integration of digital technology.

1	Materials integrate digital technology and tools that support student learning and engagement.	Yes
2	Materials integrate digital technology in ways that support student engagement with the science and engineering practices, recurring themes and concepts, and grade-level content.	Yes
3	Materials integrate digital technology that provides opportunities for teachers and/or students to collaborate.	No
4	Materials integrate digital technology that is compatible with a variety of learning management systems.	Yes

Not Scored

Materials are intentionally designed to engage and support student learning with the integration of digital technology.

Materials integrate digital technology and tools that support student learning and engagement. Materials integrate digital technology in ways that support student engagement with the science and engineering practices, recurring themes and concepts, and grade-level content. Materials do not integrate digital technology that provides opportunities for teachers and/or students to collaborate. Materials integrate digital technology that is compatible with a variety of learning management systems.

Evidence includes but is not limited to:

Materials integrate digital technology and tools that support student learning and engagement.

- The materials integrate digital technology and tools that support student learning and engagement. For example, all components are available on a digital platform. Materials offer a digital platform that provides all components that teachers and students can log in and use at any time. The Implementation Guide states that all product components can be found in the Great Minds Digital Platform, stating, "Facilitation slides are available through PhD Science TEKS Edition Projected for each day's lesson." Additionally, "PhD Science TEKS Edition in Sync® offers video lessons and assignments for continuous learning so students can build knowledge if they—or the teacher—have to take time away from class," and "Alt text is available for images on the Great Minds Digital Platform."
- For example, in Level 4, Module 1, Lesson 6, materials provide a link to the Google Earth mapping service so that students can look at Kettleman Hills, California. Students are learning how fossils tell about environments from long ago. Students use images from Google Maps to observe the land currently. Then they will look at fossils found in the same area and talk about how the environment has changed.

Great Minds PhD Science Grade 4

Materials integrate digital technology in ways that support student engagement with the science and engineering practices, recurring themes and concepts, and grade-level content.

- The materials integrate digital technology in ways that support student engagement with science and engineering practices, recurring themes and concepts, and grade-level content. For example, materials provide links to videos to support student conceptual understanding. In level 4, Module 1, Lesson 1, students learn how land is shaped by reading about John Wesley Powell's exploration of the Grand Canyon. A link is also provided in a teacher sidebar note to watch a video clip from *John Wesley Powell: From the Depths of the Grand Canyon* (National Geographic 2013) to present more of Powell's experiences and develop the context for his life and epic adventures.
- Materials use videos throughout the lessons to support student engagement with the science and engineering practices, recurring themes and concepts, and grade-level content. Video links are found in the teacher guides in the lesson outline and sidebar notes for additional academic support.

Materials integrate digital technology that provides opportunities for teachers and/or students to collaborate.

- The materials do not integrate digital technology that provides opportunities for teachers and/or students to collaborate. Materials offer videos for students to review and then respond to in their journals and during class discussions. Materials do not offer or provide guidance about utilizing a digital collaboration tools platform for students or teachers to video conference or collaborate online during or outside school hours. The Implementation Guide lists the product components. Materials offer access to most components through the digital platform except Knowledge Deck Posters and Cards. The investigations are not offered through simulations.

Materials integrate digital technology that is compatible with a variety of learning management systems.

- Digital materials are accessible and compatible with multiple operating systems and devices. For example, materials offer a PhD Science in Sync platform. Videos and tasks can be assigned to students through this PhD Science In Sync platform. The materials are accessible online through any device with internet access. PhD digital platform is optimized on laptops and desktop computers with a minimum of 1 GB RAM and 2 GHz processor and Broadband internet connection. Materials are fully supported on the last two major versions of the following browsers: Chrome and Safari. Information is found in Help Center Home>Technical Support>General Information>Technical Specifications.

Great Minds PhD Science Grade 4

Indicator 9.3

Digital technology and online components are developmentally and grade-level appropriate and provide support for learning.

1	Digital technology and online components are developmentally appropriate for the grade level and align with the scope and approach to science knowledge and skills progression.	Yes
2	Materials provide teacher guidance for the use of embedded technology to support and enhance student learning.	Yes
3	Materials are available to parents and caregivers to support student engagement with digital technology and online components.	Yes

Not Scored

Digital technology and online components are developmentally and grade-level appropriate and provide support for learning.

Digital technology and online components are developmentally appropriate for the grade level and align with the scope and approach to science knowledge and skills progression. Materials provide teacher guidance for the use of embedded technology to support and enhance student learning. Materials are available to parents and caregivers to support student engagement with digital technology and online components.

Evidence includes but is not limited to:

Digital technology and online components are developmentally appropriate for the grade level and align with the scope and approach to science knowledge and skills progression.

- Digital technology and online components are developmentally appropriate for the grade level and align with the scope and approach to science knowledge and skills progression. For example, in Level 4, Module 1, Lesson 12, students observe an animated glacier video to gather evidence of how the movement of a glacier affects rock. Then, students apply their knowledge of processes that shape the Earth to describe the cause of glacial formations. Materials instruct teachers to "play the animated glacier video and ask students to observe how the movement of a glacier affects rocks. Clarify for students that a real glacier moves much slower than the animated glacier in the video but that the effect the glacier has on the rocks beneath it is the same."
- In Level 4, Module 3, Lesson 1, students observe videos of three plants. As students observe the videos, they record what they notice and wonder about the plants. Materials state, "Tell students they will watch videos of three different plants. Without identifying the type of plant in each video, play plant video 1 (sundew), plant video 2 (pitcher plant), and plant video 3 (Venus flytrap). Tell students they will watch the videos again. Instruct students to record what they notice and wonder about the three plants in their Science Logbook Then replay the videos. Invite students to share their observations and questions."

Great Minds PhD Science Grade 4

Materials provide teacher guidance for the use of embedded technology to support and enhance student learning.

- Materials provide teacher guidance for the use of embedded technology to support and enhance student learning. In Level 4, Module 1, Lessons 9-12, the Teacher Preparation section of the Materials contains advanced preparation of using an animated glacier video to gather evidence of how the movement of a glacier affects rock and includes an embedded hyperlink for the teacher to use. Materials provide specific instructions for using the resource: "Cue the animated glacier video. Prepare to distribute a copy of Lesson 12 Resource C to each student." On the Materials page under the teacher preparation section, advanced preparation for investigating the effects of forces on the motion of objects by watching players play golf. "Cue motorboat on a river video. Cue water wave and shoreline video. Prepare to distribute a copy of Lesson 11 Resource B to each student."

Materials are available to parents and caregivers to support student engagement with digital technology and online components.

- Materials are available to parents and caregivers to support student engagement with technology and online components. In the Level 4, Module 3 Family Tip sheet, under the additional resources section, websites provide support for learning about national parks and preserves, stating, "Explore the plants and animals of Big Thicket National Preserve at the website provided. Learn more about your area by reading about your local state park on the website provided." In the Level 4, Module 1 Family Tip sheet, websites are given under the additional resources section to support learning about the Grand Canyon and water pollution, stating, "See short videos about the Grand Canyon at the website provided. Learn more about fossils at the Grand Canyon at the website provided. See short videos about water pollution on the website provided."