STEM Integrated Concepts: Earth and Space Science | 4th Grade

Big Idea: Earth Processes (Energy from Natural Resources) — Quarter 4

Inquiry Questions

Science:

- What are nonrenewable resources? (Les. 1 pages 270-283)
- How are renewable resources used as energy? (Les. 2 pages 284-301)
- How do humans use and misuse natural resources?

Technology & Engineering:

- How can technology prevent erosion or solve problems caused by weathering and erosion?
- How might technology help humans to conserve natural resources?
- How are houses constructed and designed differently in various regions of the world based on the earth's processes that occur there?

Mathematics:

- How does the angle of a river affect the rate of erosion? How might you measure?

Social Studies:

- How has Earth's natural processes impacted Indiana over time?
- How might the surface of Indiana continue to change in the future?

Grade Level Standards

Science	4..ESS.4: Develop solutions that could be implemented to reduce the impact of humans on the natural environment and the natural environment on humans. **(reclamation, conservation, alternative energy source, biomass, biomass conversion, geothermal, hydroelectricity, solar power, renewable resource) Les. 2** 4.ESS.2: Obtain and combine information to describe that energy and fuels are derived from the natural resources and their uses affect the environment. **(natural resource, conservation, fossil fuel, nonrenewable resource, pollution, replenish) Les. 1** **Words in parenthesis are module and academic standard vocabulary!!!!!!**
Technology	STL 20. D Structures need to be maintained. STL 11. D Identify and collect information about everyday problems that can be solved by technology, and generate ideas and requirements for solving a problem. STL 15. D Most agricultural waste can be recycled.
Mathematics	4.MD.5 Recognize angles as geometric shapes that are formed whenever two rays share a common endpoint and understand concepts of angle measurement. 4.MD.6 Measure angles and whole number degrees using a protractors. Sketch measures of specified angles. 4. MD. 7 Recognize angle measures as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the part.

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	4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. 4.G.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
Social Studies	4.3.5 Explain how glaciers shaped Indiana's landscape and environment. 4.3.8 Identify the challenges in the physical landscape of Indiana to early settlers in modern day economic development. 4.3.1 Use latitude and longitude to identify physical and human features of Indiana. 4.3.6 Describe Indiana's landforms (lithosphere, water features, hydrosphere, plants and animals biosphere) 4.3.9 Explain the importance of major transportation routes including rivers in the exploration, settlement and growth of Indiana and the state's location as a crossroad of America. 4.3.11 Create maps of Indiana at different times in history showing regions and major physical and cultural features, give examples of how people in Indiana have modified their environment over time.
ELA	**Reading: Foundational Skills** CCSS:ELA- Literacy RF. 4.3 Know and apply grade-level phonics and word analysis skills in decoding words.a. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context. **Reading: Informational Text** CCSS.ELA-Literacy.RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. CCSS.ELA-Literacy.RI.4.2 Determine the main idea of a text and explain how it is supported by key details; summarize the text. CCSS.ELA-Literacy.RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. CCSS.ELA-Literacy.RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*. CCSS.ELA-Literacy.RI.4.5 Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text. CCSS.ELA-Literacy.RI.4.6 Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided. CCSS.ELA-Literacy.RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. CCSS.ELA-Literacy.RI.4.8 Explain how an author uses reasons and evidence to support particular points in a text. CCSS.ELA-Literacy.RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

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CCSS.ELA-Literacy.RI.4.10 By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.

WRITING

CCSS.ELA-Literacy.W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

- W.4.2a Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.
- W.4.2b Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.
- W.4.2c Link ideas within categories of information using words and phrases (e.g., *another*, *for example*, *also*, *because*).
- W.4.2d Use precise language and domain-specific vocabulary to inform about or explain the topic.
- W.4.2e Provide a concluding statement or section related to the information or explanation presented.
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
- W.4.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences

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	Standards for Mathematical Practice
Science Process Standards ***Nature of Science*** ☒Make predictions and formulate testable questions ☐Design a fair test. ☒Plan and carry out investigations—often over a period of several lessons—as a class, in small groups or independently. ☒Perform investigations using appropriate tools and technologies that will extend the senses. ☒Use measurement skills and apply appropriate units when collecting data. ☐Test predictions with multiple trials. ☒Keep accurate records in a notebook during investigations and communicate findings to others using graphs, charts, maps and models through oral and written reports. ☒Identify simple patterns in data and propose explanations to account for the patterns. ☒Compare the results of an investigation with the prediction. ***Design Process*** ☒Identify a need or problem to be solved. ☒Brainstorm potential solutions. ☒Document the design throughout the entire design process. ☒Select a solution to the need or problem. ☒Select the most appropriate materials to develop a solution that will meet the need. ☒Create the solution through a prototype. ☒Test and evaluate how well the solution meets the goal. ☒Evaluate and test the design using measurement. ☒Present evidence by using mathematical representations (e.g. graphs, data tables) ☒Communicate the solution (including evidence using mathematical representations (graphs, data tables), drawings or protoypes. ☒Communicate how to improve the solution.	**Mathematical Practices** ☒MP.1. Make sense of problems and persevere in solving them. ☒MP.2. Reason abstractly and quantitatively. ☒MP. 3 Construct viable arguments and critique the reasoning of others. ☒MP.4. Model with mathematics. ☒MP.5. Use appropriate tools strategically. ☐MP.6. Attend to precision. ☐MP.7 Look for and make use of structure. ☐MP. 8 Look for and express regularity in repeated reasoning.

Plan of Work

Common Misconceptions

What misconceptions might students have with these ideas?
The land has always been this way (in Indiana and everywhere).
The Earth is 5,000 years old.
We have always had roads.
Natural resources are unlimited.
The same cataclysmic events can happen everywhere. (Tsunamis can occur in Indiana)

Suggested Activities

- River table simulations to demonstrate erosion using rocks, sand, water and flat container on a sloped surfaces.
- Observe characteristics of different landforms, rocks and minerals.
- Utilize art, technology, photography etc. to show students various landforms and natural processes.
- Show that smaller rocks come from the breakage and weathering of larger rocks by rubbing different rock types together.
- Create rock jars with various combinations of rocks using plastic jars with equal amounts of water to be shaken daily over a specified amount of time. (Be sure rocks are of different hardness i.e. limestone, pumice and sandstone)
- Research specific natural resources. Discover where they come from, how are they used as well as problems with using this resource and possible solutions
- Take a product and discover the natural resources used to create it.
- Simulate glacial movement and its impact on Indiana by using and ice cubes, foil and sand demonstration or crushed Oreo cookies, ice cream and syrup.
- Research earth's processes to determine their cause and effect on humans and the environment.
- Create model volcanoes to demonstrate erosion and deposition.

Suggested Vocabulary	weathering, erosion, environment, physical feature, lithosphere, water features, hydrosphere, plants and animals biosphere, mineral, earthquake, deposition, political feature, natural resource, volcano, landslide, conservation
Resources	http://www.need.org/needpdf/Energy%20Math%20Challenge.pdf http://www.partselect.com/JustForFun/Electric-Math-Numbers-Behind-Appliances.aspx http://www.eia.gov/kids/energy.cfm?page=6 www.edu.glogster.com

Assessment	
Type of Assessment	Example
☒Observation	Observe students working and using materials in simulations and activities
☒Oral Questioning	During demonstrations ask questions, make connections and meaning from investigations
☒Exit Slip	Provide students with short questions demonstrate their understanding and clear up common misconceptions
☐Journal	
☒Graphic Organizers	Use Venn Diagram to compare and contrast natural resources or cataclysmic events
☐Self-Assessment	
☐Writing Prompt	
☒Presentation	Students present their research findings about earth's processes
☒Electronic media	Create PowerPoint or Glogster project (interactive poster) about natural resources and earth resources
☐Think Pair Share	
☐Whiteboards	
☒Experiment/projects	Construct a home project that is on a fault line or the side of a hill
☐Quiz	
☐	
☐	
☐	