



NAME OF THE LESSON

Grade(s): *4th*
 Lesson Duration: *Class 2 weeks*
 Course Name(s): *4th grade science*
 Lesson Author: *Amanda Rossini, Wentzville, MO*

BIG IDEAS

What are the conceptual ideas in STEM that you address in the lesson?

EDUCATION STANDARDS

4-ESS1- Earth's place in the universe.

4-ESS2- Earth's systems

NGSS Performance Expectation(s):

4-ESS1-1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

4-ESS2-2 Analyze and interpret data from maps to describe patterns of the Earth's features. (This will be applied to Mars.)

Science and Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
<p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanation that specific variables that describe and predict phenomena</p>	<p>ESS1.C: The History of Planet Earth</p> <ul style="list-style-type: none"> Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns can be used as evidence to support an explanation. (4-ESS1-1, 4-ESS2-2) <p>Connections to Nature of Science</p> <p>Scientific Knowledge Assumes an Order and</p>

<p>and in designing multiple solutions to design problems.</p> <ul style="list-style-type: none"> Identify the evidence that supports particular points in an explanation. (4-ESS1-1) <p>Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.</p> <ul style="list-style-type: none"> Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. 4-ESS2-1 <p>Analyzing and Interpreting Data Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</p> <ul style="list-style-type: none"> Analyze and interpret data to make sense of phenomena using logical reasoning. 4-ESS2-2 	<p><i>fossil types indicate the order in which rock layers were formed. (4-ESS1-1)</i></p> <p>ESS2.A Earth Materials and Systems</p> <ul style="list-style-type: none"> <i>Rainfall helps shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. 4-ESS2-1</i> <p>ESS2.B Plate tectonics and Large-Scale Systems Interactions</p> <ul style="list-style-type: none"> <i>The locations of mountain ranges, deep oceans trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns, Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate</i> 	<p>Consistency in Natural Systems</p> <ul style="list-style-type: none"> Science assumes consistent patterns in natural systems. (4-ESS1-1) <p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified, tested, and used to explain change. 4-ESS2-1
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	<i>the different land and water features of Earth. 4-ESS2-2</i>	
<p>Common Core State Standards:</p> <p>Math: <i>MP.2 Reason abstractly and quantitatively. 4-ESS1-1, 4-ESS2-1</i> <i>MP.4 Model with mathematics 4-ESS1-1, 4-ESS2-1</i> <i>MP.5 Use appropriate tools strategically. 4-ESS2-1</i> <i>4.MD.A.1 Know relative sizes of measurements within one system of units including km, m, cm; lb, oz; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table 4-ESS1-1, 4-ESS2-1</i></p> <p>and</p> <p>ELA: <i>W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. 4-ESS1-1, 4-ESS2-1</i> <i>W.4.8 Recall relevant information from experiences or gather relevant information from print and digital a sources; take notes and categorize information, and provide a list of sources. 4-ESS1-1, 4-ESS2-1</i> <i>W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. 4-ESS1-1</i> <i>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. 4-ESS2-2</i></p>		
<p>ITEEA Standards: <i>N/A</i></p>		
<p>Other Standards: <i>N/A</i></p>		

MEASURABLE STUDENT LEARNING OBJECTIVES

Write the learning objectives as “students will be able to” statements. Be sure that your objectives are measurable and connect to the standards listed above. You are encouraged to use [Webb’s Depth of Knowledge](#) to create action-oriented objectives.

MATERIALS NEEDED

List all materials and links to online materials.

ENGAGING CONTEXT/PHENOMENON

What is your engaging phenomenon or your “hook” for the lesson? Be sure whatever you choose is appropriate for the subject area and grade level you are addressing. Several example phenomena are shared in course. Consider how observations of the natural world serve as phenomena to engage students in the content. You must utilize at least one NASA resource in your lesson. Please discuss this with your instructor if you need assistance.

DATA INTEGRATION

What data is being used in this lesson? Are students analyzing or collecting data? What are they doing with the data? This would be a great place to include all the different NASA data made available to you. If NASA data is not appropriate for your lesson, speak to your course instructor to identify another source of data that is appropriate. It may be publicly available, collected by students, or accessible to you with permission through other projects.

TEACHER BACKGROUND KNOWLEDGE

What background information does the teacher need to effectively teach this lesson? (Provide links to resources that support this information.)

DIFFERENTIATION OF INSTRUCTION

How can you adjust this lesson to meet the unique needs of students in your classes? What needs should be addressed? Think about and make these modifications PRIOR to the lesson so all students have the greatest ability to participate.

REAL-WORLD CONNECTIONS FOR STUDENTS

Is there a real-life connection to this lesson? If so, what is it? Is the lesson culturally responsive? What teaching practices do you suggest? How will students connect to the lesson in their everyday lives?

POSSIBLE PRIOR or MISCONCEPTIONS

Are there any previous ideas or thoughts you anticipate students having about this concept? List them here as it will help you consider ideas to include in your lesson.

LESSON PROCEDURE

This is where you include each phase of the 5E. They should be extremely clear, well organized, and ready to be used by another educator. Be sure that each learning experience meets the guidelines for each “E”. The template below will help you.

5E	Details of 5E Lesson Implementation (Visit BSCS to learn more about the 5E instructional model)
Engage <i>Introduce the lesson with an anchoring phenomenon.</i> <i>Facilitate student questions,</i>	Lesson Objective: <i>(Which lesson objective does this phase address?)</i> Procedure: <i>(What happens during this phase? What is the teacher doing? What is the student doing?)</i> Modifications <i>(What student needs must be addressed? How can you make each experience accessible for ALL learners?)</i>

<p><i>discussion, etc. as appropriate.</i></p> <p><i>Learn about what students already know and want to know.</i></p>	<p>Standards Addressed <i>(Which standards are being explicitly taught in this phase?)</i></p> <p>Formative/Summative Assessments <i>(How will you assess in this phase? Be sure to include the assessment tool.)</i></p> <p>Resources <i>Article about how alien life could have been unknowingly killed on Mars 50 years ago https://www.space.com/nasa-may-have-unknowingly-found-and-killed-alien-life-on-mars-50-years-ago-scientist-claims#</i></p> <p><i>Video and article with the Mar's Rover Perseverance Mission https://mars.nasa.gov/mars2020/mission/overview/</i></p>
<p>Explore <i>Plan for students to engage in hands-on activities that are designed to facilitate conceptual change.</i></p>	<p>Lesson Objective: <i>(Which lesson objective does this phase address?)</i></p> <p>Procedure: <i>(What happens during this phase? What is the teacher doing? What is the student doing?)</i></p> <p>Modifications <i>(What student needs must be addressed? How can you make each experience accessible for ALL learners?)</i></p> <p>Standards Addressed <i>(Which standards are being explicitly taught in this phase?)</i></p> <p>Formative/Summative Assessments <i>(How will you assess in this phase? Be sure to include the assessment tool.)</i></p> <p>Resources <i>Driving the Rover simulation https://eyes.nasa.gov/curiosity/</i></p> <p><i>Mars rover game https://spaceplace.nasa.gov/explore-mars/en/</i></p> <p><i>Mars sample 19 video https://mars.nasa.gov/mars2020/multimedia/videos/?v=559</i></p> <p><i>Rock cycle lesson Additional Mars samples https://mars.nasa.gov/mars-rock-samples/#21</i></p>

<p>Explain Facilitate opportunities for students to explain their understanding of the concepts and processes and make sense of new concepts.</p>	<p>Lesson Objective: <i>(Which lesson objective does this phase address?)</i></p> <p>Procedure: <i>(What happens during this phase? What is the teacher doing? What is the student doing?)</i></p> <p>Modifications <i>(What student needs must be addressed? How can you make each experience accessible for ALL learners?)</i></p> <p>Standards Addressed <i>(Which standards are being explicitly taught in this phase?)</i></p> <p>Formative/Summative Assessments <i>(How will you assess in this phase? Be sure to include the assessment tool.)</i></p> <p>Resources <i>Article about how the rover is mapping the crater</i> https://www.planetary.org/articles/heres-how-scientists-mapped-jezero</p>
<p>Elaborate Provide applications of concepts and opportunities to challenge and deep ideas; build on or extend understanding and skills.</p>	<p>Lesson Objective: <i>(Which lesson objective does this phase address?)</i></p> <p>Procedure: <i>(What happens during this phase? What is the teacher doing? What is the student doing?)</i></p> <p>Modifications <i>(What student needs must be addressed? How can you make each experience accessible for ALL learners?)</i></p> <p>Standards Addressed <i>(Which standards are being explicitly taught in this phase?)</i></p> <p>Formative/Summative Assessments <i>(How will you assess in this phase? Be sure to include the assessment tool.)</i></p> <p>Resources <i>Video about What if Olympus Mons was located in South America</i> https://www.youtube.com/watch?v=G-Je-ZWOXyc</p>
<p>Evaluate Students are encouraged to assess their understanding and abilities. It also provides opportunities for teachers to evaluate their progress toward achieving the</p>	<p>Lesson Objective: <i>(Which lesson objective does this phase address?)</i></p> <p>Procedure: <i>(What happens during this phase? What is the teacher doing? What is the student doing?)</i></p> <p>Modifications <i>(What student needs must be addressed? How can you make each experience accessible for ALL learners?)</i></p> <p>Standards Addressed <i>(Which standards are being explicitly taught in this phase?)</i></p>

<i>educational objectives of the lesson.</i>	Formative/Summative Assessments <i>(How will you assess in this phase? Be sure to include the assessment tool.)</i> Resources <i>opinion writing piece lesson</i>
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REFERENCES

List all references using APA formatting. In addition, use a highlighter color to highlight the above content in your lesson borrowed from elsewhere and provide the citation below. In the lesson, describe how it was modified for your audience.