David Heffelfinger and 9/21/2021

Comparing Mars surface to Earth's Surface

Grade/Grade Band: 8th grade	**Topic:** Mars and Earth's Surface	**Lesson Title:** How two planets formed differently
Brief Lesson Description: Students will be comparing Mars and Earth's surface and looked at what forces have shaped both planets.		
NGSS Performance Expectations:MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.		
Specific Learning Outcomes: Students will be investigating what forces have shaped Mars surface overtime. After their investigation the students will compare Mars and Earth surfaces. The students will design a model of their findings.		
Specific Modifications for Struggling Learners: The students will be giving more detailed/guided information to help them find the correct information. The students will be directed to the NASA website JBL California Institute of Technology. The details and model will be less detailed so they are able to focus on less material and not be overwhelmed.		
Specific Modifications for Advanced Learners: The students will be given a tiered lesson where they will be more challenged. Their lessons will be independent and they will have to look more of their own resources. The model and compression of Earth and Mars will be more detailed.		
Prior Student Knowledge: The students are studying how Earth was formed right now. Then the students will be studying how Earth's surface changes over time.		
Science & Engineering Practices: Planning and Constructing and carrying out an investigation. Then use multiple sources to provide evidence to use to support their solution.	**Disciplinary Core Ideas:** ESS2.A: Earth's Materials and Systems The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's ESS2.B: Plate Tectonics and Large-Scale System Interactions Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)	**Crosscutting Concepts:** Patterns Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3) Scale Proportion and Quantity Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1- 4),(MS-ESS2-2
Possible Preconceptions/Misconceptions: That Earth is completely different from Mars. Mars never had water or an atmosphere. Mars couldn' be the same as Earth's.		

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LESSON PLAN – 5-E Model

ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions:
At the start of class I will have a picture of Mars's surface. During this time the students analyze and write down what they notice about the Mars surface. After they have some time to analyze the photos I will ask them how Earth's surface compares to Mars.

EXPLORE: Lesson Description:	**Probing or Clarifying Questions to ask while students explore:**	**Materials Needed**
After the students are finished with comparing Mars's surface to Earth it is time to Explore. Students will go to the following sites: NASA MARS: The Red Planet, NASA Science: Solar System Exploration, NASA Exploration Mars Program. As they are exploring Mars the students will take notes on their findings. My classes are 90 minute blocks and I am planning to make a short video on Curiosity Steam called *Drilling for Marsquake: Mars insight* This video shows how they are using the rover to student the core of Mars by using the sounds wave. This will give my students a little brain break. Plus, this will connect with how scientists know that the Earth's core is liquid. Then after the students are finished investigating Mars they will go to NASA Explore Earth, NASA Earth Observatory and more sites. Once they finished finding information and data on the Mars surface. The students will create a model demonstrating their knowledge and findings.	What have you noticed about the surface of mars? How do scientists know how Mars' surface has changed over time? How has Earth's changed over time and how can you compare that information to Mars's surface? How do scientists know what kind of core or layers Mars has?	Chromebook, internet, Google doc with different links the students can use to start their investigation. Whatever materials they need to build their models.

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<table>
<tr><td colspan="2">EXPLAIN: Concepts Explained and Vocabulary Defined:
The students will present their models on Mars and Earth’s surface.
The model will show scale, proportion and quantity
Then the students will explain what their findings on comparing the forces have shaped Earth’s and Mars’s surfaces.
The students will show patterns that shaped the Mars and Earth’s surfaces.</td><td>Key Vocabulary: Crust, Mantle, Inner Core, Outer Core, Volcano, mountains, trenches, soil</td></tr>
<tr><td>ELABORATE: Connecting Concepts to the CCC and SEP. Making sense through building models and constructing explanations
Students will make connections between Mars surface and Earth’s surface. The Students will compare the Earth layers to Mars layers.</td><td>SEP
1. Asking questions
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information</td><td>CCC
1. Patterns.
2. Cause and effect
3. Scale, proportion, and quantity.
4. Systems and system models.
5. Energy and matter
6. Structure and function
7. Stability and change.</td></tr>
<tr><td colspan="2">EVALUATE Formative Monitoring (Questioning / Discussion):
The students will create the model and show their information.
The teacher observation of classwork.
The students will present their data to show how they came with idea of how Mars surface has changed over time.</td><td>Summative Assessment (Quiz / Project / Report): The students will apply their previous knowledge of how Earth’s surface has changed over time to their work on this project.
The model will present what they have learned about Mars' surface and how it compares to Earth.
The student will present their evidence to prove their model is correct.</td></tr>
<tr><td colspan="3">Elaborate Further / Reflect: Enrichment:
The students will write a paragraph what surprised them during their research and what they thought knew was right.</td></tr>
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