Moon Formation Theories

Resource ID#: 48951

Primary Type: Lesson Plan

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Students will evaluate what types of evidence provide relevant and logical support for moon formation theories.

Subject(s): English Language Arts, Science
Grade Level(s): 8
Intended Audience: Educators

Instructional Time: 1 Hour(s)
Resource supports reading in content area: Yes
Freely Available: Yes
Keywords: solar system, moon, earth, theories, formation, evidence
Instructional Component Type(s): Lesson Plan, Model Eliciting Activity (MEA) STEM Lesson
Resource Collection: STEM Lessons - Model Eliciting Activity

LESSON CONTENT

- Lesson Plan Template:
Model Eliciting Activity (MEA)

- **Formative Assessment**

  The teacher will gather information informally by discussing the types of expected evidence the students provide. The teacher should have students further examine their input through questioning.

- **Feedback to Students**

  The teacher may use a rubric to evaluate student responses. In addition, the teacher can use a rough guide for types of acceptable evidence below.

  Types of Acceptable Evidence:

  Theory 1: The Moon’s composition resembles the Earth.

  Theory 2: The Moon’s composition resembles that of other bodies in the Solar System. Other nearby bodies may show evidence of impact as the Moon traveled towards the Earth. The Moon may be oddly shaped as it traveled and collided with other objects. Material collected from the moon may show evidence of exposure to high temperatures. Material from the moon may be present on other bodies in the solar system. Material from other bodies may be present on the Moon.

  Theory 3: The Moon and Earth would have similar compositions.

  Theory 4: The Moon’s composition would resemble that of Earth’s planetesimal and other Sun orbiting planetesimals.

  Theory 5: The Moon’s composition would resemble that of Earth’s outer layers. Evidence of a large object passing through the Solar system may be visible on other bodies in the Solar System. Earth may be tilted due to the powerful impact. Material on the Moon and the earth would show evidence of an explosive collision.

  Other types of evidence may be evaluated and accepted based on the stated theory.

- **Summative Assessment**

  The teacher will evaluate student answers with regard to logical reasoning about each theory. The teacher should focus on the quality of the reasoning rather than on the types of evidence presented. The teacher should look for gains in the student's ability to reason and examine scientific theories.

Moon Formation Theories Rubric

<table>
<thead>
<tr>
<th>Supporting evidence and explanations for theories</th>
<th>5</th>
<th>3</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response consistently uses examples of evidence that provide direct support for each</td>
<td>Response uses examples of evidence that provide ambiguous or indirect support for each</td>
<td>Response uses examples of evidence that provide no support for each</td>
<td></td>
</tr>
</tbody>
</table>
The student will be able to evaluate scientific theories. The student will be able to evaluate whether different types of evidence are relevant to a particular theory. The student will describe supporting evidence for each theory.

- **Prior Knowledge**

The student should know that the Moon orbits the earth and is smaller than the earth. The student should have general knowledge about the solar system and the bodies contained within it.

The student will need exposure or review of terms such as orbit, exoplanet, planetismals, condensation, etc.
• **Instructional Suggestions**

This unit is recommended for beginning a topic on lunar phases or outer space in general. It can also be used during the introduction of the nature of Science in order to introduce students to the process of examining scientific theories. Students may have aware of scientific theories but may not be aware of the reasoning behind scientific conclusions. It is recommended that the teacher avoid outside references for the first reading passage activity but may choose to include them for the second reading passage activity.

• **Guiding/reflective Questions**

1. What is the prompt asking for?
2. Can evidence provided by the scientific community be ambiguous or be used as evidence for more than one theory?
3. Is there any type of evidence that would be definitive or greatly increase the likelihood that a particular theory is true?

• **Reading Passage 1**

Dear Lunar scientists,

You have been selected to be on a panel to evaluate lunar theories. Several theories have been proposed to explain the formation of the moon. These theories are described briefly in data set 1.

Please write a letter to the scientific community providing specific examples of supporting evidence for each theory. Provide explanations in your response as to why this type of evidence would exist or how it would be formed based on the events described by the theory. In addition, compare and contrast the theories and supporting evidence in order to clarify why one type of evidence provides justification for one theory over another theory. For example, this could be done by indicating what types of evidence would eliminate the possibility of a theory being true, etc.

Sincerely,

Moon B. Hopeful

MoonPassage1.docx

• **Readiness Questions**

1. Did you provide possible evidence for each of the proposed theories?
2. Is it possible to obtain that evidence within the parameters of modern technology?
3. Is the evidence relevant to the theory?

• **Supplemental Reading**


Post activity Reading:

Moon Formation Theories (with diagrams):

Studying Deimos and Phobos: http://space.about.com/od/mars/a/Mars-Moon-Mystery.htm

- **Data Set 1**

**Moon Formation Theories:**

Theory 1: The Moon was part of the earth and separated from the Earth while the Solar system was in its early stages.

Theory 2: The Moon was formed in another part of the solar system, and captured by the gravitational field of the Earth.

Theory 3: The Moon and the Earth formed together during the formation of the Solar System.

Theory 4: The Moon condensed from debris of Sun and Earth orbiting planetesimal.

Theory 5: A large planetesimal (the size of Mars) struck the earth. The impact ejected a mass of material which began to orbit the Earth and condensed into the Moon.

Moon Formation Theories Data Set 1.docx

- **Reading Passage 2**

Dear Lunar Scientists,

Scientists are studying another solar system and have obtained information about an exoplanet and its moon. Examine the data table provided in data set 2. Using the moon formation theories, your response to the first reading passage and the data table provided to determine the origin of the exoplanet's moon.

Create a written response explaining why you think the moon of this exoplanet originated in such a manner.

Sincerely,

Moon B. Hopeful
Moon Passage

- **Data Set 2**

  Exoplanet moon data table.docx

  Exoplanet Moon Observations Data Table

  Moon is composed of material similar to the planet’s inner and outer layer. No data obtained from the core of the moon. Moon has been exposed to a greater amount of heat than the exoplanet as demonstrated by the lack of unstable substances. Haze visible around the moon’s atmosphere. One side of the moon has rugged topography while the other side has smooth topography. Some elements present on the moon which are not present on the planet. Signs of impact craters on the surface of the planet and moon as well as neighboring solar bodies.

- **Comprehension/readiness questions**

  See Readiness Questions

ACCOMMODATIONS & RECOMMENDATIONS

- **Accommodations:**

  Assess students with special needs for comprehension of the instructions. In addition, the teacher may want to review student knowledge about the Moon, Earth and our Solar System.

- **Extensions:**

  The lesson can be extended with a video about how scientists have completed research on the moon and the conclusions that they have come to after evaluating evidence.

- **Special Materials Needed:**

  Handouts of Letter One
  Handouts of Letter Two

- **Further Recommendations:**

  It is recommended that the teacher use this lesson plan early in a solar system unit. However, students often read about theories but do not evaluate how scientists came to accept one theory over another or the type of evidence provided.

SOURCE AND ACCESS INFORMATION

**Name of Author/Source:** Anonymously Submitted

**Is this Resource freely Available?** Yes

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## Related Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAFS.68.RST.2.4:</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.</td>
</tr>
<tr>
<td><strong>Remarks/Examples:</strong></td>
<td></td>
</tr>
<tr>
<td>SC.8.N.1.4:</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.8.N.1.6:</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
</tr>
<tr>
<td>LAFS.8.W.2.4:</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)</td>
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