

Endeavor

STEM Teaching Certificate Project



Psyche

Grade 5

Space Science

Mrs. Dillard, Drummonds, TN

BIG IDEAS

In this lesson students will explore asteroids as objects in their solar system. Students will research the compositions and motions of asteroids. Students will focus on a specific NASA mission whose purpose is to study one particular asteroid: Psyche.

EDUCATION STANDARDS

ESS1.3 - Use data to categorize different bodies in our solar system including moons, asteroids, comets, and meteoroids according to their physical properties and motion.

5.RI.IK1.9 Integrate information from two or more texts on the same topic in order to build content knowledge.

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

NGSS Performance Expectation(s)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
<p><i>*Analyzing and Interpreting Data</i> <i>*Asking questions and defining problems</i> <i>*Planning and carrying out investigations</i> <i>*Creating and using models</i></p>	<p><i>ESS1.B: Earth and the Solar System</i></p> <ul style="list-style-type: none"> <i>The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.</i> 	<p><i>*Scale, Proportion and Quantity</i></p> <p><i>*Systems and System models</i></p>
<p>ELA: TN State Standard: 5.RI.IK1.9 Integrate information from two or more texts on the same topic in order to build content knowledge.</p> <p>CCSS.ELA-LITERACY.RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>CCSS.ELA-LITERACY.RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>		
<p align="center">ITEEA Standards <i>(If applicable)</i></p>		

Other Standards *(as needed)*

MEASURABLE STUDENT LEARNING OBJECTIVES

- *I can analyze data comparing and contrasting two asteroids: NT7 and Psyche.
- *I can construct a model of an asteroid based on the composition of the asteroid Psyche.
- *I can differentiate the movements of planets and asteroids.
- *I can differentiate the compositions of planets and asteroids.
- *I can investigate the movements and compositions of asteroids in our solar system.

STEM INTEGRATION

Science- Students will investigate the movements and compositions of asteroids in our solar system.

Technology- Students will access data using their chrome books to investigate two different asteroids: NT7 and Psyche.

Engineering- Students will create a model of an asteroid choosing materials carefully to match the composition of asteroids they learned about through their research.

Art- Students will sketch an image of the solar system depicting the planets and their motions and asteroids and their motions.

ELA- Students will read an article on readworks.org about asteroids to build foundational knowledge and to identify a specific asteroid, NT7, which they will later analyze and contrast with the asteroid Psyche.

NATURE OF STEM

This lesson meets the components of the nature of science in several ways. First, this lesson fulfills the empirical nature of science, meaning that the information gained is based on the observations of the world around us. The fact that scientists theorize that the asteroid Psyche is made of similar materials found at the core of planet Earth is the foundation of the NASA mission with the same name. This lesson allows for creativity as students will use materials of their choosing to create a model asteroid. Finally, this lesson has embedded social ramifications since it is possible entrepreneurs will try to mine the materials on the asteroids for financial gain.

Part of the nature of technology is that people use technology as a way to satisfy their needs and wants. This lesson fits the nature of technology in that the NASA mission sent to study the asteroid Psyche is there to determine whether or not this asteroid can be used to help scientists understand the metallic materials at the core of planet Earth, which cannot be reached. This could also lead to people using this asteroid for financial gain, thus satisfying people's want for more financial resources.

While this lesson might not satisfy the components of the nature of engineering for students personally, it is most definitely an example of NASA using the components of engineering. NASA scientists and astronauts identified an opportunity, both learning and possible financial gain, in the asteroid Psyche. This lesson could be used as a model for students as to how NASA engineers used the different components of the nature of engineering to launch this mission. The specific components students will be exercising in these lessons are identifying an opportunity and brainstorming techniques to generate ideas. This would pertain to the final part of the lesson in which students consider the possibility of scientists mining asteroids for financial gain.

MATERIALS NEEDED

- Individual one on one devices
- Teacher technology and projection systems
- Access to [readworks.org](https://www.readworks.org)
- Access to the internet
- Art/STEM materials including clay, beads, metal objects such as bbs, pebbles, glitter,
- Access to websites referenced throughout the 5E lesson
- Paper and art supplies

ENGAGING CONTEXT/PHENOMENON

Students will view images of asteroids and will brainstorm what they believe they are observing through class discussion. The teacher will identify the asteroid as an asteroid named Psyche and will lead the students in a discussion about what they know about asteroids and what they wonder about asteroids. The teacher will show students a short video found on a NASA website that introduces the students to the astronauts who worked on the Psyche mission. <https://beta.science.nasa.gov/mission/psyche/>

DATA INTEGRATION

Students will do a mini research activity in which they search for data on the size and composition of two different asteroids: NT7, which they read about in their asteroid reading article, and Psyche, which is the focus of the NASA mission students are being introduced to.

TEACHER BACKGROUND KNOWLEDGE

[https://solarsystem.nasa.gov/asteroids-comets-and-meteors/asteroids/16-psyche/in-depth/#:~:text=Psyche%20has%20an%20irregular%2C%20potato.miles%20\(165%2C800%20square%20kilometers\).](https://solarsystem.nasa.gov/asteroids-comets-and-meteors/asteroids/16-psyche/in-depth/#:~:text=Psyche%20has%20an%20irregular%2C%20potato.miles%20(165%2C800%20square%20kilometers).)

The above website provides the educator with background information about the particular asteroid this lesson will focus on: Psyche, as well as provide a rationale for studying this asteroid. In addition to the background information in the afore mentioned website, teachers should know that most asteroids in our solar system orbit the sun between the planets of Mars and Jupiter. Teachers should know that most asteroids are composed of metals and rocks.

<https://beta.science.nasa.gov/mission/psyche/>

The above website provides more information for educators about the Psyche mission.

DIFFERENTIATION OF INSTRUCTION

Students who have reading accommodations will be able to listen to the reading passage using headphones. Some students will require more assistance in completing

their data collection charts and the teacher should plan on working at a small table with students as needed. Alternatively, some students may be able to work with partners. Students with reading accommodations should be able to listen to the online research articles using the text to speech accommodation on their individual devices.

REAL-WORLD CONNECTIONS FOR STUDENTS

The most obvious real life connection of this lesson is the classic interest students have in the solar system and the question, “What’s out there?” This particular NASA mission can also help students connect due to the timing: this mission will be launching during the same time that students are studying asteroids. This helps students see that the body of scientific knowledge is consistently growing. Students will be able to feel like they are a part of this mission, especially if the teacher is able to find a video feed of the launch of Psyche in October.

INTEGRATION POSSIBLE MISCONCEPTIONS

During the engagement phase of the lesson students will be given the opportunity to tell what they already know about asteroids, once the image of Psyche has been revealed as that of an asteroid. I predict that students might share that they heard that asteroids destroyed the dinosaurs, so it might be helpful for the teacher to have brushed up on this theory to be able to engage with students in an appropriate discussion and be able to correct any possible misconceptions.

LESSON PROCEDURE

5E	Details of 5E Lesson Implementation
<p><u>Engage</u></p>	<p>Procedure: The teacher will show images of the asteroid Psyche to the students, with no captions under the asteroid. The teacher will lead the class in a discussion as to what they think they are observing. Most likely students will identify the object as an asteroid. The teacher will ask the students what they know about asteroids and what they wonder about them. The teacher will create a list that can be displayed throughout this series of lessons. The teacher will then introduce the NASA mission to this particular asteroid by providing a brief summary of the mission and by showing the NASA video introducing the mission team. Finally, the teacher will show a link from NASA’s website Eyes on the Solar System that shows the Psyche vessel compared to the Hubble Telescope. This will be used in this lesson for this group of students because the class recently read a personal narrative involving the Hubble Space Telescope. Other teachers implementing this lesson might find that this step is unnecessary.</p> <p>Modifications The teacher will allow all students to participate in the conversation about the asteroid. It is necessary for students who are visually impaired to be seated appropriately.</p> <p>Standards Addressed: ESS1.3 - Use data to categorize different bodies in our solar system including moons, asteroids, comets, and meteoroids according to their physical properties and motion.</p> <p>Formative/Summative Assessments: The teacher will use this as an opportunity to gain insight about students’ prior knowledge of asteroids.</p> <p>Resources: https://beta.nasa.gov/centers-and-facilities/jpl/new-video-series-reveals-what-drives-nasas-psyche-mission-team/ https://eyes.nasa.gov/apps/solar-system/#/sc_psyche/compare?rate=0&</p>

	<p>time=2023-10-05T15:45:00.001+00:00</p> <p>https://earthsky.org/space/hubble-asteroid-psyche-iron-nickel-rust-planet/</p>
<p><u>Explore</u></p>	<p>Procedure: During the explore phase students will use their google classroom to do some research on the asteroid Psyche. The teacher will link several NASA websites on the students' google classroom so students can peruse the information and take notes on what they learn about the asteroid. The teacher will give the students a data collection form on which to list the information they are gathering. This will be done on the same day as the Engage.</p> <p>Modifications: As needed, the teacher may pair students to work on the research portion of the lesson.</p> <p>Standards Addressed:ESS1.3 - Use data to categorize different bodies in our solar system including moons, asteroids, comets, and meteoroids according to their physical properties and motion.</p> <p>CCSS.ELA-LITERACY.RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>CCSS.ELA-LITERACY.RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>Formative/Summative Assessments: Students will complete a data collection form to show what they learned about the asteroid Psyche through their research.</p> <p>Resources: https://solarsystem.nasa.gov/asteroids-comets-and-meteors/asteroids/16-psyche/in-depth/#:~:text=Psyche%20has%20an%20irregular%2C%20potato.miles%20(165%2C800%20square%20kilometers).</p>

	<p>https://www.jpl.nasa.gov/missions/psyche</p> <p> Asteroid Data Collection Form</p>
<p><u>Explain</u></p>	<p>Procedure: During this portion of the lesson students will read an informational article about asteroids in space. This article will mention a specific asteroid called NT7. After completing the online reading practice, students will do a short research to compare and contrast the asteroid NT7 mentioned in the article and the asteroid that is the subject of this mission: Psyche. Students will work with a partner to complete a simple VENN diagram to display the information they gathered about the two asteroids. The students may choose how to display the information in the article. For example, they may use words and images. Student partners will get together and share the information with each other. To bring it together, the teacher will create a basic table on chart paper with NT7 as the title of one column and Psyche as the title of the second. The teacher will add as many rows as necessary to display the data students found. At a minimum, students should find the sizes, composition and motion of each asteroid. If students do not offer this information in the share out session, the teacher will pose these questions to the students and prompt them to research for the answer.</p> <p>Modifications : The teacher may choose to provide links to websites in a google classroom assignment in case students struggle with finding the specific information they need. Students should be given the opportunity to search on their own first.</p> <p>Standards Addressed:ESS1.3 - Use data to categorize different bodies in our solar system including moons, asteroids, comets, and meteoroids according to their physical properties and motion.</p> <p>CCSS.ELA-LITERACY.RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>CCSS.ELA-LITERACY.RI.5.9 Integrate information from several texts on</p>

	<p>the same topic in order to write or speak about the subject knowledgeably.</p> <p>Formative/Summative Assessments: completed VENN diagram, class discussion and shared information, reading grade on the “Asteroid Attack” article posted on readworks.org.</p> <p>Resources: https://www.readworks.org/article/Asteroid-Attack!/e29fd2f6-05cc-4355-aed6-34f0b2c8555a#!articleTab:questionsets/questionsetsSection:1371/</p>
<p><u>Elaborate</u></p>	<p>Procedure: Students will be given the opportunity to model an asteroid based on their understanding of the composition of asteroids following the learning activities in this mini unit. Students will be given clay and various materials such as pebbles, glitter, beads, rust colored beads. The teacher will allow the students the opportunity to brainstorm materials that would help model the composition of the asteroid Psyche.</p> <p>Students should write a short paragraph on an index card describing the materials they used to model the possible physical composition of the asteroid Psyche.</p> <p>After students have made their models they will have the opportunity to share their final products with their classmates, giving a reason for the materials they chose to include in their model.</p> <p>Modifications This learning activity is accessible to all students and offers students the ability to get creative.</p> <p>Standards Addressed ESS1.3 - Use data to categorize different bodies in our solar system including moons, asteroids, comets, and meteoroids according to their physical properties and motion.</p>

	<p>Formative/Summative Assessments: Students will be assessed based on their paragraph justifying the materials they used to model their asteroid.</p> <p>Resources https://www.jpl.nasa.gov/edu/teach/activity/modeling-an-asteroid/</p>
<p><u>Evaluate</u></p>	<p>Procedure: In this final stage of the asteroid unit the teacher will assess whether or not the students are able to place asteroids in their appropriate location in a drawing of the solar system. Students will be given paper and be instructed to take out coloring materials. Students will be asked to draw a sketch of the solar system including the 8 planets they have previously learned, the sun, and now add the asteroids where they would be located. Underneath the drawing students will need to answer the following prompt: “How do the motions of asteroids such as Psyche in our solar system compare to the motions of the 8 planets?”</p> <p>To give students the opportunity to extend their learning, the teacher will close the lesson with a class discussion about whether or not organizations should consider mining asteroids for financial gain. Students should discuss the issues that might arise if this took place and the implications of asteroid mining on society. As time allows, the teacher may allow students to research asteroid mining, or the teacher may assign this as an extend outside of the classroom activity in order to give the students more to think about.</p> <p>Modifications: As needed, students will be prompted or read aloud according to their own individual learning plans.</p> <p>Standards Addressed ESS1.3 - Use data to categorize different bodies in our solar system including moons, asteroids, comets, and meteoroids according to their physical properties and motion.</p> <p>Formative/Summative Assessments: Students' understanding will be assessed through the drawings and the answer to the prompt listed above.</p>

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REFERENCES

I borrowed the idea for the modeling of the asteroid from the following website:

<https://www.jpl.nasa.gov/edu/teach/activity/modeling-an-asteroid/>