**University of Arkansas**

**College of Education**

**Lesson Plan Format**

**COE Course**

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| --- | --- |
| **Unit Title: Astronomy** | **Lesson Title: Asteroids, Meteors, and Comets** |
| **Subject Area: Science** | **Grade Level:    6th Grade** |

1. **Pre-assessment and Planning**

Pre-Assessment quiz (Completed via clickers).

1. Which of the following happens to the majority of space debris that enters Earth’s

atmosphere?

a. The majority of space debris impacts the earth’s surface.

b. The majority of space debris melts on the earth’s surface.

c. The majority of space debris explodes in the earth’s atmosphere.

d. The majority of space debris burns up in the earth’s atmosphere.

2. Which of the following best describes a meteorite?

a. A meteorite is a meteor that makes it through earth’s atmosphere.

b. A meteorite is a universal object that has fallen to the earth.

c. A meteorite is a piece of rock or metal that is traveling through space.

d. A meteorite is a piece of ice with rock and dust that has its own orbit.

3. Where do many scientists believe most asteroids, meteors, and comets come from?

a. debris from planets in other galaxies

b. leftover material from the formation of the solar system

c. pieces of older planets in the solar system that exploded

d. material that has evaporated from the surface of the planets in the solar system

4. The asteroid belt in our solar system is located between which two planets?

a. Uranus and Pluto b. Venus and Mars

c. Mars and Jupiter d. Neptune and Jupiter

5. A comet’s tail always points toward the sun?

a. true b. false

Answer Key 1. d, 2. a, 3. a, 4. c, 5. b

Students will engage in a pre-assessment clicker quiz to gauge their initial understanding of non-planetoid celestial bodies in the solar system. This lesson will use whole class instruction and cooperative learning games to increase student understanding of these astronomy concepts.

Cooperative learning groups will be organized by table groups in order to prevent large disparities in learning ability.

* adjust teacher talk when explaining activity to increase comprehensibility (face the students, pause frequently, speak at a moderate speed)
* decrease details needed to learn main concepts
* reduce length of assignment
* pair verbal directions with visual clues
* provide additional examples

1. **Objective(s)**

ESS 10.6.6 Comets/Meteors/Asteroid- Compare and contrast comets, meteors, and asteroids by size, orbits, nucleus, mass.

* + I will be able to categorize comets, meteors, and asteroids by examining their size, orbits, nucleus, and mass.

1. **Assessment** 
   * Observe groups demonstrating the activity to make sure the concepts are understood. Engage in student questioning during the Prezi to check for understanding.
   * Students will complete a Venn Diagram worksheet as homework and turn it in for a grade at the beginning of the next lesson.

**Venn Diagram Worksheets:**

**http://www.asc-csa.gc.ca/pdf/edu\_astro-teachers\_differences.pdf**

**http://www.asc-csa.gc.ca/pdf/edu\_astro-students\_differences.pdf**

***Suggestions:***

* How will you determine that the students achieved the objective(s)
* How will you determine that the students learned what was intended for them to learn
* How will you measure/provide evidence of impact on student learning
* Assessment is not always a test or test question
* Describe formative, summative
  + Monitoring of student learning
  + Evaluation and assessment of learning outcomes
* Assessments must be authentic
  + Assessments must match learning expectations, for example, authentic performance tasks, criterion-based scoring tools used to evaluate student products and performances, variety of appropriate assessment formats
* Describe how results of assessment will guide future planning
* Describe how assessments can be differentiated for student needs
* Describe how you will provide feedback to individual students on their progress toward the objective(s)
* To what extent do the assessments provide fair, valid, reliable, and sufficient measures of student performance
* Speak with your university instructor for more content-specific suggestions, if needed

1. **Engaging the Learner**

[**http://www.youtube.com/watch?v=kAJHVII3\_-0**](http://www.youtube.com/watch?v=kAJHVII3_-0)

[**http://www.youtube.com/watch?v=B1gM0XzFT3g**](http://www.youtube.com/watch?v=B1gM0XzFT3g)

**How can we tell the difference between celestial bodies?**

By examining their size, orbits, nucleus, and mass, we can determine what type of celestial body we are examining.

**Why is it important to know about the objects in our solar system?**

These objects give clues to the history of the solar system and the universe. They represent potential resources for space travel. They pose potential threats to life on Earth.

* Connect future learning to past knowledge- relative positioning, phases of the moon, measuring space distance and speed

1. **Methods, Activities and Resources**

**Methods**

* Whole class instruction- during the introduction, Prezi presentation, and closure
* Cooperative groups- playing the meteor game
* Closure
  + Review of lesson referring to the objectives
    - I will be able to categorize comets, meteors, and asteroids by examining their size, orbits, nucleus, and mass.
  + Solicit summary of learning from students/feedback to students
  + Preview of next lesson- Comet lab
  + Connect to future learning and real-world experiences- future lab and summative assessment, remind students of the video of the meteor over Russia.

**Activities**

* Pre-assessment quiz- 7 min
* Engaging the learner- 7 min
* Distribute materials (Venn Diagram WS)/set up science notebook- 3 min
* Prezi Presentation, students will take notes and answer essential questions in science notebooks- 25 min
* Meteor Game- 15 min

**Resources**

* Computer/Microsoft Office/Internet/overhead camera/projector
* Resources for classroom use and to extend content knowledge and pedagogy
* Links:
  + [**http://prezi.com/wigdgmo1-fq3/copy-of-asteroids-comets-meteors/**](http://prezi.com/wigdgmo1-fq3/copy-of-asteroids-comets-meteors/)
  + [**http://www.youtube.com/watch?v=kAJHVII3\_-0**](http://www.youtube.com/watch?v=kAJHVII3_-0)
  + [**http://www.youtube.com/watch?v=B1gM0XzFT3g**](http://www.youtube.com/watch?v=B1gM0XzFT3g)
  + [**http://www.lpi.usra.edu/education/skytellers/meteors/activities/space\_rocks.shtml**](http://www.lpi.usra.edu/education/skytellers/meteors/activities/space_rocks.shtml) **(Meteor Game)**
* Printed handouts
  + **http://www.asc-csa.gc.ca/pdf/edu\_astro-teachers\_differences.pdf**
  + **http://www.asc-csa.gc.ca/pdf/edu\_astro-students\_differences.pdf**

This board game reinforces children’s understanding of the origins of meteors, meteoroids, and meteorites, as well as their characteristics and importance, while tackling some common misconceptions about these space rocks!

Players begin on Track 1 — “The Meteoroid Zone,” above Earth’s atmosphere. They progress to Track 2 — “The Meteor Zone,” where particles enter Earth’s atmosphere and create brilliant streaks of light (meteors) as they race toward Earth’s surface. Most burn up completely. On Track 3 — “The Meteorite Zone,” those rocks from space that passed through Earth’s atmosphere without being vaporized may be found as meteorites.



*The children’s mission is to have their meteoroid pass through Earth’s atmosphere and reach Earth as a meteorite, where it can be found and tell its story to scientists.*

Have the children get into small groups, and choose one of their group to be the “Cosmic Questioner.” This person verifies responses to the board questions.

Each player, other than the Cosmic Questioner, will begin as a “Meteoroid” in the “Start” square and will roll the die and move their gamepiece the appropriate number of spaces. They are to follow the directions on the initial square on which they land.

“Query squares” have questions for the players to answer. When a player answers correctly, as verified by the Cosmic Questioner, he or she may *advance to the next square and await their next turn to roll the die*. If a player answers incorrectly, he or she must remain on that square until their next turn and then try again to answer that same question correctly. Once they have answered correctly, they may advance to the next square and await their next turn.

As players complete a track, they move to the next track. To win, the player must roll — in turn — *until they land on the last square in “Antarctica,”* where they may be discovered and studied by a team of scientists, and perhaps reveal clues to the mysteries of our origins!

**Answer Key**

***Meteoroid Zone —***

*A meteoroid can be a piece of what?*   
**a.** the Moon or Mars   **b.** an asteroid   **c.** a comet   **d. all of the above**

*Are meteoroids really “shooting stars”?*  
**No.** *Meteoroids* do not have trails of light because they are not moving through Earth’s atmosphere. *Meteors, not meteoroids,* are called shooting stars, but they are not really stars at all, either.

*What is a meteoroid?*   
**a.** a rock from space found on Earth   **b.** a small minor planet   **c. a tiny particle, often no bigger than a grain of sand, orbiting around the Sun**

*What does a meteoroid sometimes become?*   
**a**. a black hole   **b. a meteor**   **c.** a small planet  
*Meteoroids are smaller than objects scientists would call small planets. When a meteroid moves through Earth’s atmosphere, it creates a brilliant streak of light — a meteor.*

*Often meteoroids are what?*   
**a.** the size of planets   **b. not much larger than a grain of sand**   **c.** solid gold

*A meteoroid can be made of what?*   
**a.** metal (typically iron and nickel)   **b.** rock   **c.** metal and rock   **d. all of the above**

*Where do meteoroids NOT occur?*   
**a.** throughout our solar system   **b.** in the asteroid belt   **c. on Earth**  
*Meteoroids are “rocks in space.” When a meteoroid lands on Earth, it is called a meteorite.*

***Meteor Zone —***

*What causes an “annual” meteor shower?*   
**a. Earth passing through the debris of a particular comet in its orbit**   **b.** favorable weather conditions   **c.** the birthdays of certain astronomers

*What are meteors incorrectly called?*   
**a.** falling stars   **b.** shooting stars   **c.** fireballs   **d. all of the above**  
*Meteors are created by particles falling through our atmosphere — they have nothing to do with stars or fire!*

*Meteors are often seen as what?*   
**a.** particles in space   **b. streaks of light**   **c.** stars  
*Meteors are the streaks of light we see in the night sky. They are caused by particles moving through our atmosphere so fast that they compress the air in front of them and the air heats up and glows.*

*What are the names of two famous meteor showers that occur annually?*   
**a.** the Alphas and the Omegas   **b. the Leonids and the Perseids**  **c.** the Hatfields and the McCoys  
*When Earth’s orbit intersects a comet’s orbit, the particles in the comet’s trail enter Earth’s atmosphere and create meteor showers! The Perseid meteor shower peaks in August and radiates from the constellation of Perseus. It comes from particles in the trail of Comet Swift-Tuttle. The Leonid meteor shower peaks in November and appears to come from the direction of the constellation Leo.*

*How many meteors might you see in a meteor shower in an hour?*   
**a.** 1 to 2   **b.** 1,000,000   **c. between 10 and a few hundred**  
*Comet trails are dusty places!*

http://www.lpi.usra.edu/education/skytellers/meteors/activities/spacerocksgame.pdf

1. **Potential Adaptations to the Lesson {PAL}**

* Technology fails- Utilize the whiteboard to outline the instructions and give the presentation using printed materials and the overhead projector
* Material grasped or completed faster or slower than expected- If slower than expected, remove or delay the cooperative game in the lesson. If the lesson is faster than expected, allow the students to play the meteor game and rotate roles on who is the Galactic Questioner.

1. **Collaboration**

* This lesson was made with coordination from my mentor teacher.