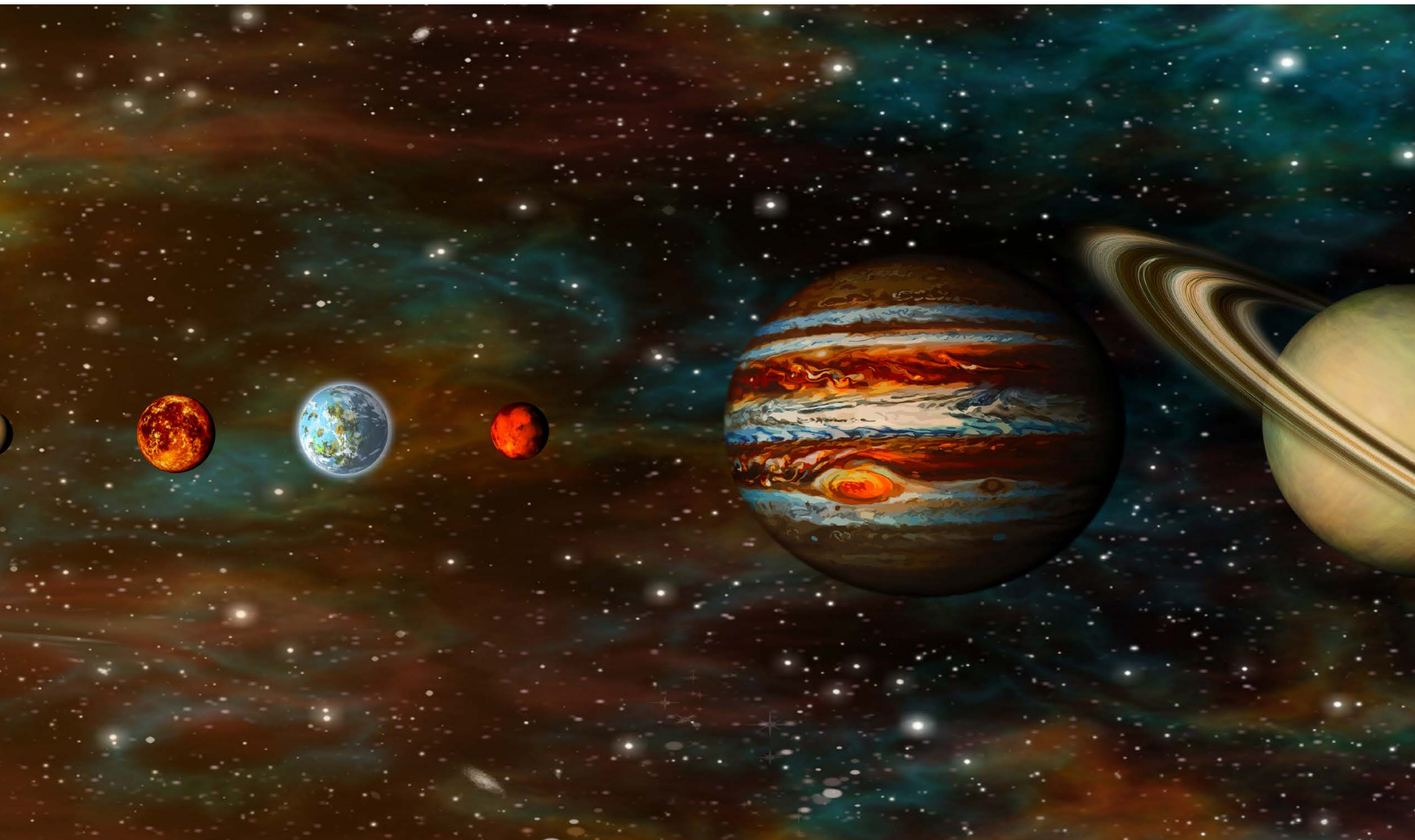
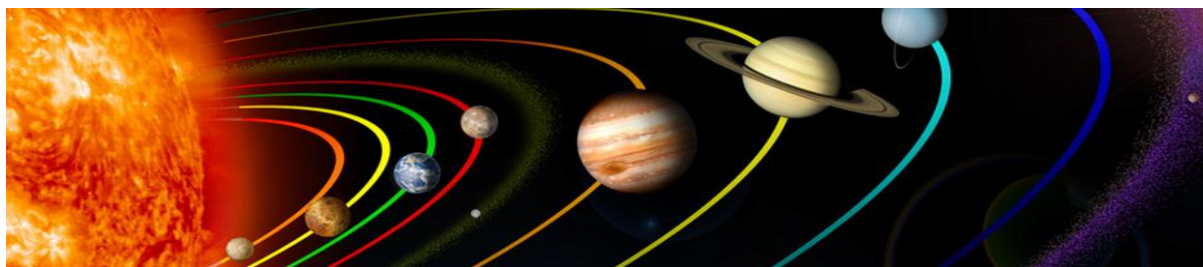


MeTEOR Learning Modules

STEM MEA (Model Eliciting Activity)

Creating a Paper Mache Solar System





Our Solar System Ceiling (Creating the Universe inside the classroom)

Reflective Planning

Description/Summary of Lesson:

This lesson will be focused on creating a paper mache solar system based on science, mathematics and visual arts content standards. Students will research relative size and distance from the sun of each planet. Groups will be assigned a specific planet. They must research their planet as it relates to size and distance from the sun and other planets. The teacher creates the sun as an example and starting point. Activity includes instructions on how students will create paper mache structures. The collaboration will result in a “room size” universe displayed from the ceiling where the sun is in the center of the classroom.

Essential Questions:

- How can creating models help us understand our world?
- Why are making inferences and generalizations and conclusions important to understanding our world?

Suggested Grade Level: Grades 3-4

Approximate Time: Five days (30 minute class periods including research, drying and painting time)

Class Set-Up: Groups of two-three students at tables or desks put together

Success Standards:

- Students can identify the solar systems order from the sun.
- Students can explain the details about one planet as it relates to size and distance from the sun.
- Students can analyze relative size and distance from the sun using the classroom model as a reference.
- Students can create paper mache models of other structures using basic materials.
- Students will be knowledgeable about and make use of the materials and resources available for participation in the arts in various roles.

Learning Purpose:

- Students will recognize that the earth is part of a system called the solar system that includes the sun (a star), planets and many moons.
- Students will identify that the earth is the third planet from the sun in our solar system.
- Students will measure and estimate masses of objects using standard units of grams (g), kilograms (kg).

Vocabulary:

- Solar System
- Mass
- Planets
- Relative Distance
- Relative Size
- Revolution

Math Practices:

- MP 1: Make sense of problems and persevere in solving them.
- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 4: Model with mathematics.
- MP 6: Attend to precision.

Depth of Knowledge:

- DOK Level 3: Strategic Thinking

Materials:

- 1 Cup of Flour, 1 cup of Water (per group)
- Round Balloons or Inflatable Objects (various sizes, beach balls work for large planets)
- Multiple Newspaper (students will shred into large strips)
- Paints (acrylic works best and cleans up easily with water)
- Paintbrushes
- Sponges
- Stabilizing Base (glasses, bowls, flower pots)
- Clear Coat (optional but adds special shine)
- Hair Dryers or Fans (optional)
- Paperclips and Fishing Line (for attachment to ceiling)

Summary of Tasks/Experiences

Spark Activity:

- Ask students: “What do you know about the solar system?” (The answers to this question will provide the teacher with the students’ current understanding of the solar system.)
- Share the following link with the students: <http://nineplanets.org/tour/>. This website provides a visual model of a tour through the solar system. This model is different from many of the prior models that the students may have been exposed to that shows the sun on one side with the planets lined up. This model shows the sun in the middle and the planets revolving and rotating.
 - Showing this model after evoking prior knowledge is a great way to open discussion about the realities of the Universe.

Lesson Descriptions:

Before Activity:

The teacher will:

- gather balloons and other round inflatables. (Have balloons inflated and have an idea which item should represent which planet.)

Introduction: Day 1

The students will:

- research relative size of assigned planet: <http://nineplanets.org/tour/>.
- collaborate and discuss which inflatable would best represent their planet. (Teacher needs to hand out 8 inches of masking tape and duct tape to each group.)
- create a plan of action to accomplish their goal.
- collect materials and shred newspapers into long 1- inch wide pieces.
- mix one cup of flour and one cup of water into bowl and stir until clumps are gone. (The mix should be the consistency of pancake batter.)
- apply three layers of strips to each balloon, allowing each layer to dry in between. (Rest the planets on a stabilizing base while drying. Students can speed up drying by using a hair dryer or fan. You don't want to be so neat and smooth with the layering. Remember, planets are textured.)

Day 2

The students will:

- paint their planet with a coat of white primer before applying the color.
- let dry again, resting the planets on a stabilizing base helps keep them stable.

Day 3-4

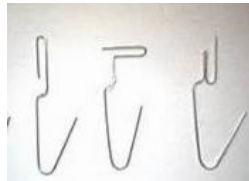
The students will:

- paint the first layer of color onto their planet. Let dry and then add the second coat.
 - With two coats of base color, sponge on a second darker or lighter color to bring out the texture. This works best when the planet is not fully dry. Have fun, you can't really make any mistakes here.

Day 5

The students will:

- insert an anchor inside of their balloon to have the ability to attach it to a fishing line. (A paperclip works great for this.)
- spray on a gloss coat to give the planets some shine and protection.
- hang planets from ceiling. (Teacher will assist with this.)



Student Engagement

Social/Emotional Engagement:

- Students show positive, respectful and supportive small group interpersonal relationships and skills that provide friendship.
- Students share materials and work load.
- Students are respectfully involved in the learning process as teacher and tutors so they are able to give feedback to one another.

Physical Engagement:

- Students are involved with face-to-face interaction of student team members.
- Students complete all processes of building the planet as a group, each sharing in the responsibility.
- Positive group processing about their working relationships and response.

Cognitive Engagement

- Students monitor their own progress and thinking relative to their learning toward the Success Standards.
- Students support each other in clarification of the Success Standards, ensuring that each member of the group meets the intent of each standard.

Evidence of Learning

Checks for Understanding/Expected Outcomes:

- As teacher circulates, have students practice target academic language and vocabulary in speaking.
- Daily summary of group accomplishments should also include target academic language.
- The teacher should ask relevant questions and each member of the group should be able to identify why the inflatable object was chosen, relative size and distance from the sun, and what characteristics about the planet led to paint choice.
- Ask relevant questions, listen closely and articulate ideas. Students should be able to represent new knowledge in language as well as refer to the models.

Teacher Notes:

- Students should be able to list and label all planets.
- Students should create “planets” with characteristics that match given body.
- Sizes should be relative. (Jupiter and Saturn being the biggest.)

**Creating a Paper Mache Solar System
RUBRIC**

	0 Points	6 Points	8 Points	10 Points
Relative Size	Size of planet isn't relative to others.	Planet size was proportional to one planet but not others.	Planet size was slightly proportional to other planets.	Planet size was proportional to other planets.
Relative Distance	Distance to other planets wasn't taken into consideration.	Distance was relative to one planet but not others.	Distance was closely related to other planets.	Distance was relative to other planets.
Collaboration	Group didn't work well together.	Group worked fairly well together.	Group worked well together, but one student did most of the work.	Group worked well together.
Creativity and Neatness	Project wasn't neat.	Slightly neat and creative.	Somewhat neat and creative.	Very neat and creative.
Daily Summary	Not submitted.	Summaries were not complete and thorough. Only some evidence of learning was apparent.	Summaries were somewhat complete and thorough. Evidence of Learning was apparent.	Summaries were complete and thorough. Evidence of Learning was apparent.



meteoreducation.com . 800.699.7516

MeTEOR CONNECT, MeTEOR Education and MeTEOR Design are trademarks or registered trademarks of MeTEOR Education, LLC © 2019.

All rights reserved. STMEA.3.2