

Astronomy

Universe • Galaxies • Planets • Compare and Contrast



Unit Essential Question

What are the characteristics of galaxies, and how does Earth compare to other planets in our solar system?

UNIT DESCRIPTION

In this arts integrated unit, students will become immersed in the areas of dance and the visual arts. Students will have a better understanding of the characteristics of the planets in our solar system as they choreograph dances to interpret specific planets. Students will also study three types of galaxies as they demonstrate their knowledge and understanding of galaxies through a visual arts component using glow-in-the-dark paints.

COMPONENTS (5 Days)

- Dance Component: Dancing with Planets
- Visual Arts Component: Glowing Galaxies Design Challenge

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Units provide differentiated ideas and activities aligned to a sampling of standards. The units do not necessarily imply mastery of standards, but are intended to inspire and equip educators.

DURATION: 5 days

Unit Description	Table of Contents
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UNIT ESSENTIAL QUESTION

• What are the characteristics of galaxies, and how does Earth compare to other planets in our solar system?

CROSS-CUTTING INTERDISCIPLINARY CONCEPT

Relationships Comparison (Compare and Contrast) Parts of a Whole

REAL WORLD CONTEXT

We study and analyze the planets in our solar system, as well as different types of galaxies in outer space, in order to have a better understanding of the world we live in, the universe, and the galaxies that surround us. By understanding the characteristics of each of the planets in our solar system, we can compare and contrast their similarities and differences. The idea of space exploration includes the possibility of discovering new planets, galaxies, or solar systems.

STANDARDS

Curriculum Standards	Arts Standards
S6E1. Students will explore current scientific views of the universe and how those views evolved. a. Relate the Nature of Science to the progression of basic historical scientific models (geocentric,	DMSPFD.2. Understands and models dance etiquette as a classroom participant, performer, and observer
heliocentric) as they describe our solar system, and the Big Bang as it describes the formation of the universe	DMSPCR.1. Demonstrates an understanding of creative and choreographic principles, processes, and structures
Milky Way galaxy and the universe c. Compare and contrast the planets in terms of size relative to the earth, surface and atmospheric features, relative distance from the sun, ability to	DMSPCR.2. Demonstrates an understanding of dance as a way to create and communicate meaning
support life	DMSPRE.1. Demonstrates critical and creative thinking in all aspects of dance
	VA6MC.2. Identifies and works to solve visual problems through creative thinking, planning, and/or



experimenting with art materials, tools and techniques
VA6PR.1. Understands and applies media, techniques, and processes
VA6PR.2. Creates artwork reflecting a range of concepts, ideas, and subject matter

ASSESSMENTS

Summative Assessments

- **Planet Movement Video:** Students will create a choreographed dance, showing the characteristics/attributes of a given planet. They will record this dance, add the elements of music as well as props & background images for the final touches in their video.
- **Galaxy Painting:** Students will create a glowing galaxy visual representation of a specific type of galaxy.
- **Paintbrushes:** Students will create a paintbrush using found materials to use as they create their glowing galaxy. The students should concentrate on the design of their paintbrush and how it will assist them in the brush strokes to best represent their type of galaxy.
- **Glowing Galaxy Painting:** Students will create a glowing piece of art by painting a galaxy to represent the information they've accrued throughout the Activating Strategy as well as the design process.
- **Reflection Questions (both projects):** Students will use these questions to reflect on the important parts of the lessons. (See Downloads)

CHARACTER EDUCATION COMPONENTS

These two arts integrated components lead

naturally into the concept and or the need for accepting all similarities and differences in humans. By learning how and why different planets are

CHARACTER ATTRIBUTES

Respect

For one another

Parts of a Whole

Cooperation/working in groups

allow for the world we live in to be exciting, perhaps challenging, as well as complex. Providing students with the tools necessary for working in groups and being part of a team is crucial for success to occur in and out of the school setting.

unique, but are still part of our solar system, we are

able to also better understand the importance of people being different and how these differences

APPENDIX (see Downloads)

- Written Reflection Sheet
- Video Examples of Student Work
- Photo Examples of Student Work

ADDITIONAL RESOURCES

- Pictures and images of planets' surface, atmosphere, colors to help ignite ideas
- Gustov's "The Planets" (piece of music)
- http://www.jpl.nasa.gov/visions-of-the-future/



Books

- Astronomy in the Real World by Susan E. Haman
- Beyond the Solar System: Exploring Galaxies, Black Holes, Alien Planets, and More: A History with 21 Activities by Mary Kay Carson
- The Milky Way and Beyond: Stars, Nebulae, and Other Galaxies by Explorer's Guide to the Universe/Erik Gregersen
- Galaxies by Howard K. Trammel
- 20 Fun Facts about Galaxies by Michael Sabatino
- A Trip through the Milky Way by Heather Moore Niver
- Our Solar System by Seymour Simon
- A Trip through the Milky Way by Heather Moore Niver
- Planetary Motion by Andrew P. Karam
- The Planets [The definitive visual guide to our solar system] by Ben Morgan
- *Neptune* by Ruth Owen
- Uranus by Ruth Owen
- Jupiter by Ruth Owen
- Mars by Linda T. Elkins-Tanton
- Mercury by L.H. Colligan

CREDITS

ArtsNow, Inc. and Bear Creek Middle School, Barrow County School System Ideas contributed and edited by: Melissa Dittmar Joy, Shannon Mulkey, Ashley Bailey, Michele McClelland



6th Grade Astronomy - Pre/Post Assessment

Name: _____

Date: _____

Circle the correct answer.

- 1. Which of the following lists Earth, Jupiter, Mercury, and the Sun in order from largest to smallest?
 - a) Jupiter, Earth, Sun, Mercury
 - b) Sun, Jupiter, Earth, Mercury
 - c) Sun, Jupiter, Mercury, Earth
 - d) Jupiter, Sun, Earth, Mercury
- 2. Which of the following is a terrestrial planet?
 - a) Saturn
 - b) Jupiter
 - c) Uranus
 - d) Mars
- 3. Which planet is characterized by thick cloud cover, greenhouse effect, vast plains, and high mountains?
 - a) Uranus
 - b) Saturn
 - c) Mercury
 - d) Venus
- 4. Which planet is characterized by polar ice caps, a pink sky, a rustcolored surface, large volcanoes, and surface channels?
 - a) Uranus
 - b) Pluto
 - c) Mars
 - d) Saturn

6th Grade Astronomy - Pre/Post Assessment

- 5. Which planet has a great red spot, many moons, and is the largest?
 - a) Neptune
 - b) Jupiter
 - c) Mars
 - d) Mercury
- 6. Which planet is a gas giant?
 - a) Uranus
 - b) Mars
 - c) Earth
 - d) Venus
- 7. Which planet has a breathable atmosphere, land masses, and large amounts of surface water?
 - a) Earth
 - b) Mars
 - c) Pluto
 - d) Saturn
- 8. Scientists think that the Milky Way probably is _____
 - a) An irregular galaxy
 - b) An elliptical galaxy
 - c) A spiral galaxy
 - d) A nebula
- 9. There are about 24 hours in a day. What would happen to the length of a day if the rotation of Earth sped up?
 - a) The length of a day would be shorter.
 - b) The length of a day would remain the same.
 - c) The length of a day would be longer.
 - d) The length of a day would be unpredictable.



Dancing with Planets

Planets • Galaxies • Characteristics





Project Essential Questions

- How does Earth compare to other planets in our solar system?
- How can dance elements represent characteristics of planets through planned choreography?

PROJECT DESCRIPTION

In this component, students will study the planets of our galaxy and create a choreography piece that represents their planet. Students will understand the elements of dance, specifically movement qualities and how they can be used to express ideas. The students will be given the opportunity to make connections between movement qualities of dance and the characteristics of planets. The final outcome of this project will be a short film in which the students record their planet dance and learn how to edit a video that has been recorded.

LEARNING TARGETS "I Can..."

- Compare and contrast the size of my chosen planet relative to the Earth
- Compare and contrast the surface and atmospheric features of my chosen planet relative to Earth
- Decipher the relative distance from the sun and my chosen planet
- Examine the ability to support life on Earth to my chosen planet

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DURATION: 4 Days

Project Description	Learning Targets
In this component, students will study the planets of our galaxy and create a choreography piece that represents their planet. Students will understand the elements of dance, specifically movement qualities and how they can be used to express ideas. The students will be given the opportunity to make connections between movement qualities of dance and the characteristics of planets. The final outcome of this project will be a short film in which the students record their planet dance and learn how to edit a video that has been recorded.	 "I Can" Compare and contrast the size of my chosen planet relative to the Earth Compare and contrast the surface and atmospheric features of my chosen planet relative to Earth Decipher the relative distance from the sun and my chosen planet Examine the ability to support life on Earth to my chosen planet

ESSENTIAL QUESTIONS

- How does Earth compare to other planets in our solar system?
- How can dance elements represent characteristics of planets through planned choreography?

STANDARDS

Curriculum Standards	Arts Standards
S6E1. Students will explore current scientific views of the universe and how those views evolved. c. Compare and contrast the planets in terms of size relative to the earth, surface and atmospheric.	DMSPFD.2. Understands and models dance etiquette as a classroom participant, performer, and observer
features, relative distance from the sun, ability to support life	DMSPCR.1. Demonstrates an understanding of creative and choreographic principles, processes, and structures
	DMSPCR.2. Demonstrates an understanding of dance as a way to create and communicate meaning
	DMSPRE.1. Demonstrates critical and creative thinking in all aspects of dance

KEY VOCABULARY

Content Vocabulary	Arts Vocabulary
 Planet Gravity Solar system Relative size Relative distance Atmospheric features Orbit Ellipses Dwarf planet 	 Locomotor: a movement that travels through space Non-locomotor: a movement that does not travel through space Levels: one of the aspects of the movement element space; in dance there are 3 basic levels - high, middle and low Pathways: the designs traced on the floor as a dancer travels across space; the



 Planetary motion Inertia Gravitational attraction 	 designs traced in the air as a dancer moves various body parts Shapes: an interesting and interrelated arrangement of body parts of one dancer; the visual makeup or molding of the body parts of a single dancer; the overall visible appearance of a group of dancers Movement qualities: Percussive, vibratory,
	swinging, sustained, suspended

TECHNOLOGY INTEGRATION

- Green Screen Technology
- Video Camera
- Video Editing Software, such as iMovie

ASSESSMENTS

Formative	Summative
 Teacher led questioning through activating strategy and main activity 	 Planet Movement Video

MATERIALS

Video camera, recording device, "green" screen, selections of music pieces/songs, various prop materials, chart paper, notebook paper, writing instruments

Activating Strategy (5-10 min)

Explore movement qualities of dance through a warm-up, concentrating on the following elements • of dance: level, space, shape, pathways, and movement qualities.

Main Activity

Part 1

Students will identify characteristics of planets. When they identify an attribute they will perform a • movement or action to represent it non verbally. (This will set the tone for this project.)

Part 2

- Students select a planet/group. •
- Students will begin to research their planets.

Part 3

- With their partner, students will discuss characteristics/attributes of their assigned/selected planet that they are going to represent through their choreography.
- Students will begin to choreograph their planet dance. Remind the students to think about the elements of dance that they learned about during the Activating Strategy.



• Students must select music (from given choices) that also represents the feeling/mood/attributes of their planet.

Part 4

- Utilizing costuming and props, students will create a choreographic work to represent their planet.
- Choreography will be recorded in front of a green screen.
- Students must select visual images of their planet to be placed in edited work.
- Students will edit their film using iMovie or a similar type of software.
- Students will add their selected musical pieces along with the background images for the final touch.

<u>Part 5</u>

• When all films have been completed have a film screening session in order for the groups to share their films.

Classroom Tips:

- Student groups will need space to work, plan and choreograph.
- Give them the dimension of the screen or camera reach before planning begins.
- There will be noise, but understand this should be on-task "chatter."
- Some groups will need more guidance than others in getting ideas together.

REFLECTION

Reflection Questions

- What dance elements did you use to represent size, features, distance, and life? How do they represent these things for your planet?
- What background image and music did you choose? Why?
- What movement choices did you make and why- what were they representing?
- Why did you choose that costume, prop, music, etc.?
- How did you make your decisions, what changes occurred in the choreographic process?

DIFFERENTIATION

BELOW GRADE LEVEL/EL STUDENTS:

 Create a class work on one selected planet, remove options for self-selection of music, props, and costumes.

ABOVE GRADE LEVEL:

• Add in additional elements/requirements. Add another planet to be represented in complete work and relationship between the two planets also must be represented in choreography.

ADDITIONAL RESOURCES

- Pictures and images of planets' surface, atmosphere, colors to help ignite ideas
- Gustov's "The Planets" (piece of music)

Books

- Astronomy in the Real World by Susan E. Haman
- Beyond the Solar System: Exploring Galaxies, Black Holes, Alien Planets, and More: A History with 21 Activities by Mary Kay Carson



Astronomy Dance Component

- The Milky Way and Beyond: Stars, Nebulae, and Other Galaxies by Explorer's Guide to the Universe/Erik Gregersen
- Galaxies by Howard K. Trammel
- 20 Fun Facts about Galaxies by Michael Sabatino
- A Trip through the Milky Way by Heather Moore Niver

APPENDIX

- Written Reflection Sheet
- Video examples of student work

CREDITS

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Reflection Questions - Dancing with Planets

- 1) What dance elements did you use to represent size, features, distance, and life? How do they represent these things for your planet?
- 2) What background image and music did you choose? Why?
- 3) What movement choices did you make and why- what were they representing?
- 4) Why did you choose that costume, prop, music, etc.?
- 5) How did you make your decisions, what changes occurred in the choreographic process?





Glowing Galaxies Design Challenge

Planets • Galaxies • Design Process





Project Essential Questions

- How can we create a visual representation of the different types of galaxies?
- How can we use experimental design to create paintbrushes that represent the characteristics of the galaxies?

PROJECT DESCRIPTION

In this arts integrated component, students will create a visual representation of a glowing galaxy using paintbrushes that they create from everyday materials. Students will identify three types of galaxies found in our universe. Students will also describe the shapes and colors of these galaxies, understanding the reasons behind the shape and color of the galaxy.

LEARNING TARGETS

"I Can..."

- Identify the types of galaxies found in the universe
- Describe the Milky Way galaxy and where our solar system is located within that galaxy
- Distinguish the shape and color of different types of galaxies
- Use the design process to create experimental paintbrushes
- Identify the elements of art and principles of design in photographs of galaxies

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DURATION: 1 Day

Project Description	Learning Targets
In this arts integrated component, students will create a visual representation of a glowing galaxy using paintbrushes that they create from everyday materials. Students will identify three types of galaxies found in our universe. Students will also describe the shapes and colors of these galaxies, understanding the reasons behind the shape and color of the galaxy.	 "I Can" Identify the types of galaxies found in the universe Describe the Milky Way galaxy and where our solar system is located within that galaxy Distinguish the shape and color of different types of galaxies Use the design process to create experimental paintbrushes Identify the elements of art and principles of design in photographs of galaxies

ESSENTIAL QUESTIONS

- How can we create a visual representation of the different types of galaxies?
- How can we use experimental design to create paintbrushes that represent the characteristics of the galaxies?

STANDARDS

Curriculum Standards	Arts Standards
 S6E1. Students will explore current scientific views of the universe and how those views evolved a. Relate the Nature of Science to the progression of basic historical scientific models (geocentric, heliocentric) as they describe our solar system, and the Big Bang as it describes the formation of the universe b. Describe the position of the solar system in the Milky Way galaxy and the universe 	 VA6MC.2. Identifies and works to solve visual problems through creative thinking, planning, and/or experimenting with art materials, tools and techniques VA6PR.1. Understands and applies media, techniques, and processes VA6PR.2. Creates artwork reflecting a range of
	concepts, ideas, and subject matter

KEY VOCABULARY

Content Vocabulary	Arts Vocabulary
 Universe Galaxy Milky Way Solar System Spiral Galaxy Elliptical Galaxy 	 Design process: to plan and make decisions about something that is being built or created Brushstroke: the configuration given to paint by contact with the bristles of a brush Light spectrum: the group of colors that a ray of light can be separated into including red, orange, yellow, green, blue, indigo, and violet: the colors that can be seen in a rainbow



 Black light: invisible ultraviolet light, a lamp that radiates black light Line: an element of art which refers to the continuous mark made on some surface by
a moving point
 Shape: an enclosed space defined by other elements of art
 Form: an element of art that is three-dimensional and encloses volume
(cubes, spheres, and cylinders are
 examples of various forms) Color: an element of art with three
properties 1) hue, the name of the color 2)
color such as brightness or dullness 3)
value, or the lightness or darkness of the color
 Space: refers to the distance or area
 between, around, above or within things Movement: associated with rhythm and
refers to the arrangement of parts in an
the viewer's eye through the work
 Proportion: refers to the relationships of the size of objects in a body of work
 Balance: a sense of stability in the body of
 work Harmony: this is achieved in a body of work
by using similar elements throughout the work
 Unity: this is seen in a painting or drawing when all the parts equal a whole

TECHNOLOGY INTEGRATION

- Design Process/Makerspace
- Computer, internet, projector

ASSESSMENTS

Formative	Summative
 Teacher led questioning through Activating Strategy and Main Activity 	 Galaxy painting Paint brushes Reflection Questions (see downloads)

MATERIALS

- White cardstock, paper clips, string, toothpicks, yarn, binder clips, corks, scrap paper, clothes pins, cardboard, paper plates
- Black lights (the link provided below is one option from which to order black lights)



- <u>https://www.amazon.com/Eliminator-Lighting-Black-Lights-24/dp/B000GATTMY/ref=sr_1_10?ie=UTF8&qid=1473740261&sr=8-10&keywords=black+lights</u>
- Fluorescent paint (the link provided below is one option from which to order fluorescent paint)
 - https://www.amazon.com/dp/B0042SR7V6/ref=sxr_pa_click_within_right_2?pf_rd_m=AT VPDKIKX0DER&pf_rd_p=2329824862&pf_rd_r=GRYCHSQY4Y1XK5VNSFG6&pd_rd_w g=Wqv4L&pf_rd_s=desktop-rhs-carousels&pf_rd_t=301&pd_rd_w=itQxf&pf_rd_i=neon+p aint&pd_rd_r=SWFJBZ3KSYMACMDGH3J0&psc=1

Activating Strategy (5- 10 min)

- Project NASA photographs of galaxies onto whiteboard:
 - <u>http://hubblesite.org/gallery/album/galaxy/</u>
- Discuss the characteristics of galaxies using the Elements of Art and Principles of Design.
- Compare and Contrast different types of galaxies.

Guiding Questions:

- Look closely, What do you notice about these photographs?
- What can we learn from them?
- Using your background knowledge of galaxies, where is the light coming from?
- Do you notice a pattern in the images?
- How do you think these photographs were taken?
- If you were asked to recreate this photograph as a painting what type of brushstrokes would you use? What color choices would you make?

Main Activity

PROCESS:

- Students decide what type of Galaxy to paint.
- Pass out materials for paint brushes.
- Pass out White paper for paint.
- Have black lights off, but accessible.

<u> PART 1</u>

Design Challenge

- Introduce students to the Design process.
- Students are instructed to choose a galaxy to represent in a painting based off of their knowledge and the NASA images. Give students time to brainstorm ideas on paper or in small groups.
- Students are challenged to think about what kind of paintbrush they would need to create the specific brushstrokes to best represent their type of galaxy.
- Students are presented with everyday materials and found/recycled objects.
- Students may work alone or in small groups to create 3 paintbrushes each.
- Allow approximately 15 minutes.

<u>PART 2</u>

Glowing Galaxy Painting

- Distribute the black lights around the room.
- Portion the neon paint onto paper plates. Distribute cups of water and paper towels.
- Give each student a piece of paper.
- Explain the process: Students will use their handmade paint brushes to create a galaxy.



- Some paintbrushes may work better than others. The goal is to create a visual representation of a specific type of galaxy.
- Turn off the overhead lights and turn on the blacklights.
- What do you notice about the paint?
- Allow approximately 25-30 minutes.

Reflection:

- How did working in the black light inspire your work?
- Which of your paintbrushes worked best and why?
- How did you use problem solving skills to complete your painting?
- Compare and contrast your painting viewed under black light and regular classroom lights.

Classroom Tips:

- If carpeted room, put down drop cloths or newspaper for painting.
- Room with no windows works great!

REFLECTION

Reflection Questions

- What brush worked the best? Why?
- What did you change or improve on your brush while you were painting?
- What object helped you create the effect you needed for your type of galaxy?

DIFFERENTIATION

BELOW GRADE LEVEL/EL STUDENTS:

• Lead students in a directed painting exercise. All students will be painting the same type of galaxy. Give students step by step instructions, including color suggestions and specific brushstrokes. The galaxy may be painted with a standard paintbrush.

ABOVE GRADE LEVEL:

• Ask students to pay close attention to the positive and negative space of the painting, noting the areas where the light shines the brightest. Ask students to visually define the specific characteristics of their galaxy painting. (i.e. Spiral galaxies are known for black holes, radiating arms and bulges.)

ADDITIONAL RESOURCES

• <u>http://www.jpl.nasa.gov/visions-of-the-future/</u>

Books:

- Our Solar System by Seymour Simon
- A Trip through the Milky Way by Heather Moore Niver
- Planetary Motion by Andrew P. Karam
- The Planets [The definitive visual guide to our solar system] by Ben Morgan
- *Neptune* by Ruth Owen
- Uranus by Ruth Owen
- Jupiter by Ruth Owen
- Mars by Linda T. Elkins-Tanton
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- Photo examples of student work

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Reflection Questions - Glowing Galaxies

1) What brush worked the best? Why?

2) What did you change or improve on your brush while you were painting?

3) What object helped you create the effect you needed for your type of galaxy?

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Reflection Questions - Glowing Galaxies

1) What brush worked the best? Why?

2) What did you change or improve on your brush while you were painting?

3) What object helped you create the effect you needed for your type of galaxy?



Photographs of the design process and student paintings:

