

**ITQ ARTS AND SCIENCE INTEGRATION
GRADE 3
DANCE AND EARTH SCIENCE**

**Sunrise, Sunset
Lesson 1**

Foss California, Grade 3, "Earth Science: Sun, Moon and Stars", Investigation 1: The Sun, Part 1

CONTENT STANDARDS

Dance Grade 3

5.1 Explain relationships between dance elements and other subjects (e.g., spatial pathways – maps and grids, geometric shapes – body shapes).

Earth Science Grade 3

ES4e Students know the position of the sun in the sky changes during the course of the day and from season to season.

ESSENTIAL QUESTIONS (*Questions students might ask about the topic*)

- What are the four Cardinal Directions (north, south, east, and west)?
- Why does the sun appear to rise in the east and set in the west?
- What causes day and night?
- How does dance help me understand day and night?

OBJECTIVES & STUDENT OUTCOMES (*Students will be able to...*)

- demonstrate knowledge of cardinal directions through movement and know the sun rises in the east and sets in the west.
- demonstrate rotation of the Earth through beat and movement.

ASSESSMENT (*Various strategies to evaluate effectiveness of instruction and student learning*)

- **Feedback for Teacher**
 - Student performance
 - Response to teacher questions
 - Performance Rubric
 - Student science notebook entries
- **Feedback for Student**
 - Feedback from teacher
 - Performance Rubric

WORDS TO KNOW

Dance

- **Axial Movement:** Movement anchored to one spot by a body part. Movement is organized around the axis of the body and does not travel from one location to another (e.g., stretching, bending, twisting, turning in place, gesturing).
- **Beat:** Unit of measure of rhythmic time: a steady pulse of movement.
- **Shape:** A position of the body in space. A shape can be still or moving.

Science

- **Axis:** An imaginary line around which spheres, such as planets, rotate.
- **Day:** The time between sunrise and sunset on Earth when it is light.
- **Cardinal Directions:** The four main points on a compass: north, south, east, and west.
- **East:** One of the four cardinal directions. The direction where the Sun rises.

- **Night:** The time between sunset and sunrise on Earth when it is dark.
- **North:** One of the four cardinal directions.
- **Rotate:** To turn on an axis.
- **South:** One of the four cardinal directions.
- **Sun:** The star around which the Earth and other planets orbit.
- **Sunlight:** Light from the sun.
- **Sunrise:** The time of day when the Sun is coming over the horizon in the east.
- **Sunset:** The time of day when the Sun is going below the horizon in the west.
- **West:** One of the four cardinal directions. The direction where the Sun sets.

MATERIALS

- Four 8"X10" sheets of paper labeled N, S, E, and W, pp. 153-156 of the FOSS *Grade 3*, "Earth Science: Sun, Moon and Stars" Teacher Guide
- Large Styrofoam ball and a pencil or stick
- Performance Rubric: Cardinal Directions and the Earth's Rotation
- Science notebooks (1/student)
- One globe
- Video Camera

RESOURCES

- *FOSS California, Grade 3*, "Earth Science: Sun, Moon and Stars", Investigation 1: The Sun, Part 1
- *Toe Tap Step:* <http://www.youtube.com/watch?feature=endscreen&v=Vm0j4E6l8qE&NR=1>
- *VAPA DVD, teaching the Toe Tap Step*

PREPARATION

- Identify and label the cardinal directions on each wall of the performance space (classroom, auditorium, etc.). Use the symbols (N,S,E,W) found on pp. 153-156 of the *FOSS Teacher Guide*.
- Review beat if necessary (clap an even rhythm counting eight beats, three times). Review the term counterclockwise.
- (Extension) Prepare 2 signs. Label one sign: San Diego. Label the other sign Indian Ocean.
- Safety Consideration: Remind students to never look directly at the Sun.

WARM UP *(Engage students, access prior learning, review, hook or activity to focus the student for learning)*

(5 minutes)

- Mark the performance space with the four **cardinal directions** (see preparation).
- Review/define **Cardinal Directions (north, east, south, and west)**. Identify these directions on each wall of the room or space.
- Have the class stand in personal space. Have students turn to face each of the cardinal directions.
- Have each student remain in their personal space.
- *Say: We are going to practice making **shapes** with our bodies.* Have students practice making open/closed, curved, angular, large/small, high/medium/low, balancing and twisted **shapes** with their eyes focused toward the correct **cardinal direction**.
 - *Say: Make a low twisted **shape** facing **east**. Make a balanced straight **shape** facing **north**. Make a low, flat **shape** facing **west**, etc.*
- *Say: We are going to do **axial movement** toward each of the **cardinal directions**:*
 - Reach with your arms to the **east**.
 - Punch your arms to the **west**.
 - Kick your legs to the **north**.
 - Do any axial movement to the **south**.

MODELING *(Presentation of new material, demonstration of the process, direct instruction)*

(10 minutes)

Part 1, Cardinal Directions, Sunrise and Sunset

- Ask:
 - *When do you know it is **day**?* [When it is light outside and the **Sun** is shining on our side of the Earth.] Have students look up, raise arms and flash fingers in jazz hand position to show **sunrise**.
 - *When do you know it is **night**?* [When it is dark outside and the **Sun** is not shining on our side of the Earth.] Have students close hands, pull arms down and drop head down (tuck) to show **sunset**.
 - *Have you ever seen the **Sun** rise? Where did you see it rise?* [Accept student responses].
 - *Have you ever seen the **Sun** set? Where did you see it set?* [Accept student responses].
- Say:
 - *When you see the **Sun** rise, that direction is **east**. In San Diego, the **Sun** rises over the mountains. Everyone flash jazz hands to the **east**.*
 - Ask students to chant: “The **Sun** rises in the **east**”.
 - *When you see the **Sun** set, that direction is **west**. In San Diego, the **Sun** sets over the ocean.*
 - Ask students to chant: “The **Sun** sets in the **west**”.
- Have students say two chants several times to commit to memory.
- Ask:
 - *How can we show the **Sun** rising with our bodies?* [Accept answers and guide students to start in at a low level hands placed on the floor to the **east** side of the room. Slowly and gradually raise the arms and body in an arc from **east** to **west**. When students reach midway between **east** and **west**, they should be in a standing position arms stretched overhead.
 - *What time of **day** would this position represent?* [This position represents noon or mid day.]
 - *How do we show the **Sun** setting with our bodies?* [Accept answers and guide students to continue the arc to the **west** side of the room. Move slowly and gradually, returning to a low level to the **west**.
- Have students face a different **cardinal direction** (e.g., **north**) and have students demonstrate the rising and setting of the **sun** using the same movement.
 - *Say: No matter which direction you are facing, the **sun** always rises in the **east** and sets in the **west**.* Repeat this as many times as needed so that students understand.
- Review the phrase with students: “The **Sun** rises in the **east**. The **Sun** sets in the **west**.”
 - As a whole group, practice the chant with the movement several times.
 - Note: Students have the naïve conception that the **Sun** is moving around the **Earth**. Be sure to reinforce the idea that the **Earth** is rotating on its **axis**, which accounts for the appearance of the **Sun** rising and setting from our position on **Earth**.

GUIDED PRACTICE (Application of knowledge, problem solving, corrective feedback)

(25 minutes)

- Ask: *How does the **Earth** move?* [Accept student responses.]
- Show students a styrofoam ball (representing the **Earth**) with a stick through it (representing the **axis**). Hold the stick so that it is slightly tilted (the **Earth** is tilted 23.5 degrees).
- Say: *This is what the **Earth** looks like in the sky. It's tilted.*
- Turn the styrofoam ball around on the stick.
- Say:
 - *The **Earth rotates** (have students twist their hand and say **rotate**) or turns slowly around this **axis** but we cannot see the **axis**. It is invisible. When the **Earth rotates** around its **axis** it causes **day** and **night** here in San Diego.*
 - *Our bodies move around an **axis** just like the **Earth**. We call this kind of movement **axial movement**. What do you recognize about the words **axis** and **axial movement**? [They both have the word **axis** in them therefore they must be similar.] In dance, when we do **axial movement** we are anchored to the ground by an invisible **axis** that goes through the top of our head, through our body, and into the floor. We can bend, stretch, reach, turn and twist many different ways but we cannot move from one location to another.*
- Have the class stand and find personal space. You, the teacher, will stand against the **north** wall.

You will represent the **sun**.

- Using a slow walking movement, ask students to slowly **rotate** in a full circle for 24 **beats**. Note: Review **beat** if necessary (clap an even rhythm counting eight **beats**, three times). Review the term counterclockwise if necessary.
 - Have students face **east**.
 - *Ask/Say: I will represent the **Sun** and you will be the **Earth**. Looking straight ahead, can you see the **Sun**? [Students respond something like “yes, just a little” or “out of the corner of my eye.”] **The sun appears to be rising because the earth is rotating and we are facing east.***
 - Have the students **rotate** counterclockwise (left), one-quarter turn by taking six small steps. Count six **beats**.
 - As students **rotate** say “*You are rotating on your axis.*”
 - *Ask/Say: (Students should now be facing you and north.) Can you see the **Sun** now? [Yes, we can see the **sun**. It’s right in front of me.] **This would be noon because the Sun is at the highest point in the sky.***
 - Have students **rotate** counterclockwise (left) making another quarter turn taking six steps to face **west**. As students **rotate** say, “*You are rotating on your axis*”. Count six **beats**.
 - *Ask/Say: Can you see the **Sun** now? [We can see the **sun** a little bit or out of the corner of our eye.] **If you can only see the Sun a little bit, what time of day is it?** [The **Sun** is setting because we are facing the **west**.]*
 - Have students **rotate** counterclockwise (left) another quarter turn taking six steps. As students **rotate** say, “*You are rotating on your axis*”. Count six **beats**.
 - *Ask/Say: Can you see the **Sun** now? [No we cannot see the **Sun**.] **If you cannot see the sun, what time of day is it?** [It is **night**.]*
 - Finish the last quarter turn to face **east**. Count six **beats**.
 - *Ask/Say: You, as the **Earth**, have made one full rotation.*
 - *Did the **Sun** ever move from its position in the sky?* [No. The **Sun** did not move, the **Earth** moved by **rotating** on its **axis**.]
 - *What causes **day** and **night** on **Earth**?* [The **Earth** rotates on its **axis**.]
 - *How many **beats** did it to make a quarter turn.* [We took six **beats**.]
 - *How many quarter turns did we make?* [We made four quarter turns.]
 - *We counted to six **beats**, four times. How many **beats** is that altogether?* [24 **beats**, 4 groups of 6, or $4 \times 6 = 24$]
 - *If each **beat** equals one hour and we took 24 **beats** to make a full rotation, how many hours does it take the **Earth** to make one rotation?* [It takes the **Earth** 24 hours to make one rotation.]
- Step in Time – **Earth Rotation** Dance
- *Say: Dance helps make learning science even more fun!, Let’s learn some hip-hop steps to represent the **Earth’s rotation** around its **axis**. These dance steps are **axial movements**. Can you explain what **axial movements** are?* [The dance steps are **axial** because we do not move away from our original spot. We just change direction.]
- Teach the “Tap Step” (see video link in the resources section). This is a six-**beat** sequence.
 - With eight on the left foot, touch the right foot forward, step back onto left foot and pop right knee up while bending elbows (**beats** 1,2).
 - Step back and place weight on the right foot. Lift and pop left knee while bending elbows (**beats** 3,4).
 - Make a quarter turn to the left by stepping on the left, touching and closing with the right foot (**beats** 5,6).
 - Repeat the six-**beat** “tap-step” three more times to make a complete rotation.
- Perform the dance. At each quarter turn (every six **beats**), stop the movement and ask the class what time of day it is.
 - *Ask: (Start facing **east**), with your arms, how can you show me you are facing east? Remember the Sun begins to rise in the east.*
 - Students will make a movement choice showing arms starting at a low level.
 - For the first quarter turn, (**beats** 1-6), the arms will be stretched overhead to show high noon. The

second quarter turn (**beats** 7-12), arms will be low and to the right side signifying sunset. The third quarter turn (**beats** 13-18), the body will tucked on **beat** 18 to show darkness. Students return to sunrise position on the fourth quarter turn (**beats** 19-24).

- **Beats** must be counted 1-24 to signify each hour of the **Earth's rotation**.
- Repeat the dance three or more times. Videotape.
- *Ask: How many **rotations** did the **Earth** make? How many **days** was this?* [Students respond with the number of full **rotations**, or groups of 24 **beats** they danced. the number of **days** is the same as the number of **rotations**.]

DEBRIEF & REFLECT (*Identify problems encountered, ask and answer questions, discuss solutions and learning that took place. Did students meet outcomes?*)

(5 minutes)

- *Have students respond to the following prompts in their science notebooks:*
 - *Why does the **Sun** appear to move across the sky?*
 - *In what direction does the **Sun** appear to move across the sky?*
 - *What causes **day** and **night** on the **Earth**?*
 - *How did dance help you understand **day** and **night**?*

EXTENSION (*Expectations created by the teacher that encourage students to participate in further research, make connections, and apply understanding and skills previously learned to personal experiences.*)

- View the videotape and discuss how the dance could be made clearer. Ask students to revise work.
- Use the globe or Internet to discover antipodes (opposite locations on the globe) to explore day and night.
- Explore time of day in other cities different from San Diego. Discuss where the sun and shadows would appear at that time of day as compared to San Diego's time of day.
- Create a Folk Dance
 - Divide the class in half. One half will represent the Sun and one half will represent the Earth.
 - Place one half of the class, representing the in a sitting or standing position on the **east** side of the performance space in a tight group. Ask them to create movement representing the shining of the sun using **axial movement** (jazz hands {fingers spread far apart}, flashing, swaying side to side, etc.) that can be repeated for 24 **beats**.
 - Arrange the other half of the class in a circle on the **west** side of the space.
 - Use a globe to show students that San Diego and the Indian Ocean are on opposites sides of the **Earth**.
 - Select one student (or do this yourself) as the **axis**.
 - Hand a sign labeled "San Diego" to the student in the circle who is directly facing **east**.
 - *Say: _____'s (student's name) front of his/her body represents San Diego on the Earth.* (Have student hold sign level at chest).
 - Hand a sign to another student directly opposite from the student labeled San Diego, labeled "Indian Ocean".
 - *Say: _____'s (student's name) front of his/her body represents the Indian Ocean on the **Earth**.* (Have student hold sign level at chest).
- *Ask:*
 - *If San Diego is directly facing the Sun, is it day or night?* [Day]
 - *What time of day is it in the Indian Ocean?* [Night]
- *Say: (to the students representing the Earth) Let's use a sliding step to show the **Earth rotating** on its axis. Let's see what happens after 12 **beats*** (Note: If students are having a difficult time getting half way around the circle in 12 beats, just have them slide until the student with the "San Diego" sign is facing **west** and stop the movement.)
 - In 12 **beats**, the student holding the "San Diego" sign will be on the back side of the circle, facing west.
 - (Stop the movement). *Ask: Is it day or night in San Diego? How do you know?* [Night. Expect answers like: San Diego is facing the **west**. The sun has set. San Diego is not facing the **Sun**.]
 - *Is the **Sun** still shining? How do you know?* [Yes. The **Sun** never stops shining. It's the **Earth's**

rotation that makes **day** and **night**.]

- *Is it day or night on the Indian Ocean? How do you know?* [**Day**. Expect answers like: The Indian Ocean is facing the **east**. The **Sun** has risen. The Indian Ocean is facing the **Sun**.]
- Continue counting and moving through to beat 24. Stop the action and ask the same questions.
- Repeat two more times, stopping the action and asking the questions. Switch groups.
- Videotape the demonstration.

**PERFORMANCE RUBRIC
CARDINAL DIRECTIONS AND THE EARTH'S ROTATION**

- 4 Student correctly execute the steps, quarter turns every six beats, arm placement for each quarter turn and perform without hesitation. Rhythm is continuous and smooth.
- 3 Student can execute the steps but may get confused with arm placement while turning. They might need some coaching or show hesitation as they perform the 24 beats.
- 2 Student has difficulty with memorization of the steps, arm placement, and turns. Students will stop and start or need to move very slowly through the exercise but can complete all 24 beats.
- 1 Student has to be coached throughout the exercise.

Student Name	Comments	Score			
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1
		4	3	2	1