

Strategies to Create a Coherent Science Content Storyline

Analysis Guide D1: Selecting and Using Content Representations

Main learning goal: Because Earth is a sphere, sunlight hits the curved surface more directly closer to the equator and less directly closer to the poles. Variations in the angle at which sunlight strikes Earth’s surface at different latitudes create uneven heating.

Description of content representation: Tray-and-globe model. Students view an image of trays at a tangent to a sphere (representing Earth). If a flashlight beam (representing the Sun) hit’s the surface straight on or perpendicular to the tray—like at the equator—it covers less surface area on the tray. If the tray is positioned at a tangent to the sphere and light hits the surface at a higher or lower latitude (at an angle), it covers a greater surface area and therefore creates less heating.

Part 1: Selecting the Content Representation

Is the Content Representation ...	Yes	No
1. Scientifically accurate?		
2. Closely matched to the main learning goal?		
3. Presenting science ideas in ways that are comprehensible to students?		
4. Reinforcing or introducing student misconceptions?		
5. Addressing common student misconceptions?		
6. Distracting students from the main learning goal with too many details or new terms?		

Part 2: Engaging Students in Using the Content Representation

Is the Content Representation Used in a Way That Involves Students In ...	Yes	No
1. Modifying or creating the content representation?		
2. Analyzing the meaning of the content representation?		
3. Critiquing the content representation?		

Part 3: Suggestions for Improvement

Strategies to Create a Coherent Science Content Storyline

Analysis Guide D2: Selecting and Using Content Representations

Main learning goal: Because Earth is a sphere, sunlight hits the curved surface more directly closer to the equator and less directly closer to the poles. Variations in the angle at which sunlight strikes Earth’s surface at different latitudes create uneven heating.

Description of content representation: Diagram of the Sun’s incoming energy. Individual arrows represent parallel rays of solar radiation striking Earth’s surface. Students count the number of lines at various latitude intervals, which represent the intensity of light energy.

Part 1: Selecting the Content Representation

Is the Content Representation ...	Yes	No
1. Scientifically accurate?		
2. Closely matched to the main learning goal?		
3. Presenting science ideas in ways that are comprehensible to students?		
4. Reinforcing or introducing student misconceptions?		
5. Addressing common student misconceptions?		
6. Distracting students from the main learning goal with too many details or new terms?		

Part 2: Engaging Students in Using the Content Representation

Is the Content Representation Used in a Way That Involves Students In ...	Yes	No
1. Modifying or creating the content representation?		
2. Analyzing the meaning of the content representation?		
3. Critiquing the content representation?		

Part 3: Suggestions for Improvement

Strategies to Create a Coherent Science Content Storyline

Analysis Guide D3: Selecting and Using Content Representations

Main learning goal: Because Earth is a sphere, sunlight hits the curved surface more directly closer to the equator and less directly closer to the poles. Variations in the angle at which sunlight strikes Earth’s surface at different latitudes create uneven heating.

Description of content representation: Two-flashlights-and-globe model. Two flashlights are directed at a globe representing Earth. The beam from one flashlight points directly toward the equator, and the beam from the other is directed toward one of the poles (at higher or lower latitudes).

Part 1: Selecting the Content Representation

Is the Content Representation ...	Yes	No
1. Scientifically accurate?		
2. Closely matched to the main learning goal?		
3. Presenting science ideas in ways that are comprehensible to students?		
4. Reinforcing or introducing student misconceptions?		
5. Addressing common student misconceptions?		
6. Distracting students from the main learning goal with too many details or new terms?		

Part 2: Engaging Students in Using the Content Representation

Is the Content Representation Used in a Way That Involves Students In ...	Yes	No
1. Modifying or creating the content representation?		
2. Analyzing the meaning of the content representation?		
3. Critiquing the content representation?		

Part 3: Suggestions for Improvement

Strategies to Create a Coherent Science Content Storyline

Analysis Guide D4: Selecting and Using Content Representations

Main learning goal: The consistent tilt of Earth on its axis produces opposite seasons in the Northern and Southern Hemispheres.

Description of content representation: Earth-Sun model. Students use a Hula Hoop (representing Earth's orbit), a Styrofoam ball (representing Earth), and a lightbulb (representing the Sun) to simulate Earth's orbit around the Sun.

Part 1: Selecting the Content Representation

Is the Content Representation ...	Yes	No
1. Scientifically accurate?		
2. Closely matched to the main learning goal?		
3. Presenting science ideas in ways that are comprehensible to students?		
4. Reinforcing or introducing student misconceptions?		
5. Addressing common student misconceptions?		
6. Distracting students from the main learning goal with too many details or new terms?		

Part 2: Engaging Students in Using the Content Representation

Is the Content Representation Used in a Way That Involves Students In ...	Yes	No
1. Modifying or creating the content representation?		
2. Analyzing the meaning of the content representation?		
3. Critiquing the content representation?		

Part 3: Suggestions for Improvement

Strategies to Create a Coherent Science Content Storyline

Analysis Guide D5: Selecting and Using Content Representations

Main learning goal: The consistent tilt of Earth on its axis produces opposite seasons in the Northern and Southern Hemispheres.

Description of content representation: Earth-Sun model. Students simulate Earth’s orbit around the Sun and seasonal variations in opposite hemispheres based on Earth’s orbital position in relation to the Sun.

Part 1: Selecting the Content Representation

Is the Content Representation ...	Yes	No
1. Scientifically accurate?		
2. Closely matched to the main learning goal?		
3. Presenting science ideas in ways that are comprehensible to students?		
4. Reinforcing or introducing student misconceptions?		
5. Addressing common student misconceptions?		
6. Distracting students from the main learning goal with too many details or new terms?		

Part 2: Engaging Students in Using the Content Representation

Is the Content Representation Used in a Way That Involves Students In ...	Yes	No
1. Modifying or creating the content representation?		
2. Analyzing the meaning of the content representation?		
3. Critiquing the content representation?		

Part 3: Suggestions for Improvement

Strategies to Create a Coherent Science Content Storyline

Analysis Guide D6: Selecting and Using Content Representations

Main learning goal: Earth’s consistent tilt and the angle at which sunlight strikes the surface at different times of the year cause the Northern and Southern Hemispheres to experience different intensities of sunlight and, as a result, opposite periods of warmer and cooler temperatures (seasons).

Description of content representation: Earth-Sun model. Students simulate Earth’s orbit around the Sun while making sure Earth’s axis is tilted consistently at 23.5 degrees toward the North Star.

Part 1: Selecting the Content Representation

Is the Content Representation ...	Yes	No
1. Scientifically accurate?		
2. Closely matched to the main learning goal?		
3. Presenting science ideas in ways that are comprehensible to students?		
4. Reinforcing or introducing student misconceptions?		
5. Addressing common student misconceptions?		
6. Distracting students from the main learning goal with too many details or new terms?		

Part 2: Engaging Students in Using the Content Representation

Is the Content Representation Used in a Way That Involves Students In ...	Yes	No
1. Modifying or creating the content representation?		
2. Analyzing the meaning of the content representation?		
3. Critiquing the content representation?		

Part 3: Suggestions for Improvement
