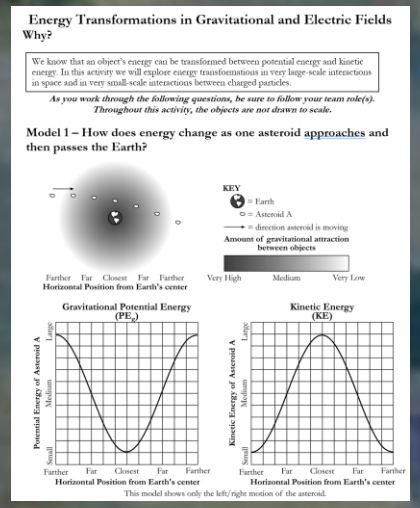
It's Not the Same Thing:
Writing POGIL Activities for Secondary Art and Science Courses


Energy Transformations in Gravitational and Electric Fields

Why?

We know that an object's energy can be transformed between potential energy and kinetic energy. In this activity we will explore energy transformations in very large-scale interactions in space and in very small-scale interactions between charged particles.

As you work through the following questions, be sure to follow your team role(s). Throughout this activity, the objects are not drawn to scale.

Model 1 – How does energy change as one asteroid approaches and then passes the Earth?

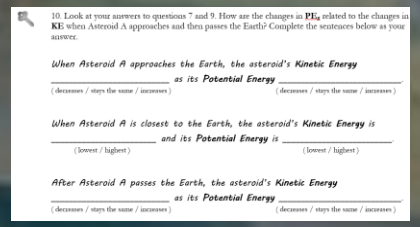
KEY
= Earth
= Asteroid A
= direction asteroid is moving
Amount of gravitational attraction between objects
Very High Medium Very Low

Farther Far Closest Far Farther
Horizontal Position from Earth's center

Gravitational Potential Energy (PE_g)
Potential Energy of Asteroid A
Largest
Medium
Smallest
Farther Far Closest Far Farther
Horizontal Position from Earth's center

Kinetic Energy (KE)
Kinetic Energy of Asteroid A
Largest
Medium
Smallest
Farther Far Closest Far Farther
Horizontal Position from Earth's center

This model shows only the left/right motion of the asteroid.


10. Look at your answers to questions 7 and 9. How are the changes in PE_g related to the changes in KE when Asteroid A approaches and then passes the Earth? Complete the sentences below as your answer.

When Asteroid A approaches the Earth, the asteroid's **Kinetic Energy** _____ *as its* **Potential Energy** _____
(decreases / stays the same / increases) (decreases / stays the same / increases)

When Asteroid A is closest to the Earth, the asteroid's **Kinetic Energy** *is* _____ *and its* **Potential Energy** *is* _____.
(lowest / highest) (lowest / highest)

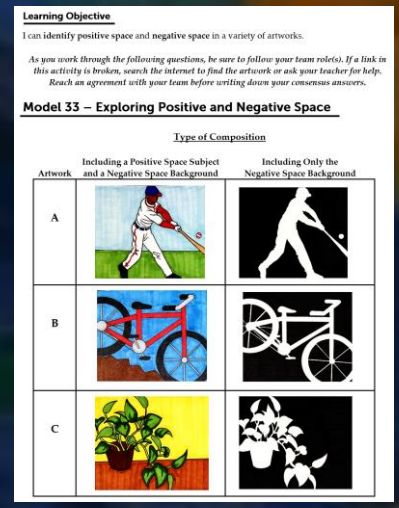
After Asteroid A passes the Earth, the asteroid's **Kinetic Energy** _____ *as its* **Potential Energy** _____
(decreases / stays the same / increases) (decreases / stays the same / increases)

Physics Activities

- 45 to 90 minutes
- "Why?" box as first text
- Robust visual/mathematical models
- Three E-I-A learning cycles
- Mastery of key concept is a symbolic/verbal task
- Application questions engage a team in cooperative problem-solving
- Useful for introducing fundamental concepts
- Followed by team problem- solving or explanation of real-world phenomena

Art Activities

- 10 to 20 minutes
- Learning objective as first text
- Robust visual models
- One E-I-A learning cycle
- Mastery of key concept is a visual task
- Application questions engage an individual student in creating their art
- Useful for introducing fundamental concepts
- Followed by individual or team student real-world art projects


Learning Objective

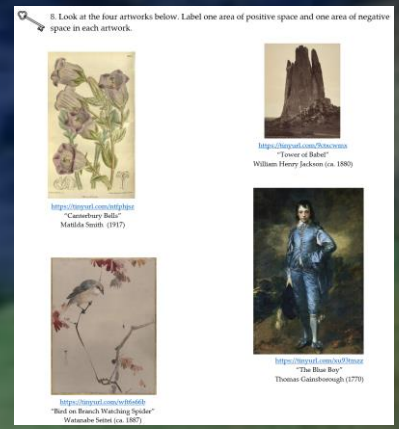
I can **identify positive space** and **negative space** in a variety of artworks.

As you work through the following questions, be sure to follow your team role(s). If a link in this activity is broken, search the internet to find the artwork or ask your teacher for help. Reach an agreement with your team before writing down your consensus answers.

Model 33 – Exploring Positive and Negative Space

Type of Composition

Artwork	Including a Positive Space Subject and a Negative Space Background	Including Only the Negative Space Background
A		
B		
C		


8. Look at the four artworks below. Label one area of positive space and one area of negative space in each artwork.

"Canterbury Bells"
Matilda Smith (1917)

"Tower of Babel"
William Henry Jackson (ca. 1880)

"Bird on Branch Watching Spider"
Watanabe Seitei (ca. 1887)

"The Blue Boy"
Thomas Gainsborough (1770)

Authors

Mare Sullivan, Seattle Pacific University School of Education, Seattle WA

Gwen C. Katz, Freelance author and illustrator

This work was supported by a 2021-2023 POGIL SPUR+ grant.

Background art: "Simultaneous Windows (2nd Motif, 1st Part)" by Robert Delaunay (1912)