



The Dark Side of the Universe

Activity 1: Grades 5-8

Making Inferences

From what we can see, the universe doesn't add up. Estimates based on the amount of matter detected from Earth suggest that our universe should be rapidly expanding. But studies of the spectral fingerprints of stars don't show this expansion. That's why scientists believe there is a good deal of matter we can't see. Even though this dark matter is undetectable, its gravitational force produces the universe expansion pattern we detect.

This activity page will offer:

- An exploration in "black box" inquiry
- An arena for critical observation and analysis
- A chance to engage inference skills

Making Guesses

Much of what we theorize about the universe is based on inferences. Scientists make these inferences based on hard data collected from Earth-bound instruments. In this activity, you'll get to act like a scientist and make guesses.

Materials

- Cardboard pizza box
- Scrap cardboard
- Scissors
- Tape
- Marble

Procedure

1. Work in teams of two. Take a cardboard pizza box and pieces of scrap cardboard.
2. Cut strips of scrap cardboard that are as wide as the height of the pizza box.

3. Arrange the scraps into one of the following figures: circle, square, rectangle, triangle, semi-circle or pentagon. Secure the shape with tape.
4. Position this target shape in the center of the box. Use tape to secure it to the box.
5. Place a marble inside the box, between the constructed shape and the box walls.
6. Close the lid and tape it shut.
7. Exchange mystery boxes with another team. By rolling the marble and observing its behavior, make a guess about the hidden shape inside the box. Once you have made your guess, open the box to test your inference.

Questions

1. What sorts of clues did you use to uncover the target shape hidden in the closed box?
2. Does the size of the hidden target affect your ability to identify its shape? Explain.
3. Would a larger box make the task easier or more difficult? Explain.
4. How might placing the marble inside the shape affect the task?

Shakin' It Up

Take several plastic film canisters. Add a spoonful of a material such as dried beans, rice, gravel or salt to each container. Mark the containers and seal them with tape. Exchange sets with another student. Without opening the film canisters, can you infer the contents of each?

Science Fact and Fiction: The Hole Story

Black holes are subjects for great science and even greater science fiction. Astronomers believe that black holes are the super-dense remains of collapsed stars. Since they contain a stellar amount of matter concentrated in a very small area, they have a tremendous gravitational force. This force is so powerful that it can trap light, keeping in all visible evidence of its existence. Based upon what scientists infer about black holes, create a science fiction story about someone falling into one of these collapsed stars. What would happen to them? What would they see? Where would they wind up?

Another Force to Deal With

Could you use unseen magnetic fields to infer the location of magnets? Suppose you were given a steel ball bearing, magnets, tape and a pizza box. How could you use these materials to develop a strategy to locate magnets you couldn't see? Present your plan to your instructor. With his or her permission, perform the inquiry.

Web Connection

Cosmos in a Computer

*[http://archive.ncsa.uiuc.edu/Cyberia/
Cosmos/CosmosCompHome.html](http://archive.ncsa.uiuc.edu/Cyberia/Cosmos/CosmosCompHome.html)*

This site, known as "cosmos in a computer," offers background on the universe, including animated clips of its evolution.

Dark Matter

*[http://astron.berkeley.edu/~mwhite/
darkmatter/dm.html](http://astron.berkeley.edu/~mwhite/darkmatter/dm.html)*

This site presents a basic overview of dark matter.

HubbleSite- Universe

<http://hubblesite.org/discoveries/hstexhibit/universe/>

This site discusses the Hubble space telescope and its role in cosmology.

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1. What sorts of clues did you use to uncover the target shape hidden in the closed box?
(Sounds made by rolling and crashing marble, feeling of the marble as it moved in box.)
2. Does the size of the hidden target affect your ability to identify its shape? Explain.
(Yes, the larger the object, the easier it is to infer shape. That's because marble collisions are more frequent and generate more data.)
3. Would a larger box make the task easier or more difficult? Explain.
(More difficult. Since there would be a greater area for the marble to move within, there would be fewer collisions with the target shape.)
4. How might placing the marble inside the shape affect the task?
(It should be easier since you can roll the marble along the inner walls of the shape.)