

ACTIVITY 1

THE EXPANDING UNIVERSE

Grade Level:

6-12 (adapted)

Content Area:

Math, Science, 21st Century Skills

Objective:

Students will observe a model of the expanding Universe, and learn that the farther away a galaxy is from us, the faster it is receding from us. Students will develop authentic models, and ultimately gather evidence supporting the Big Bang theory.

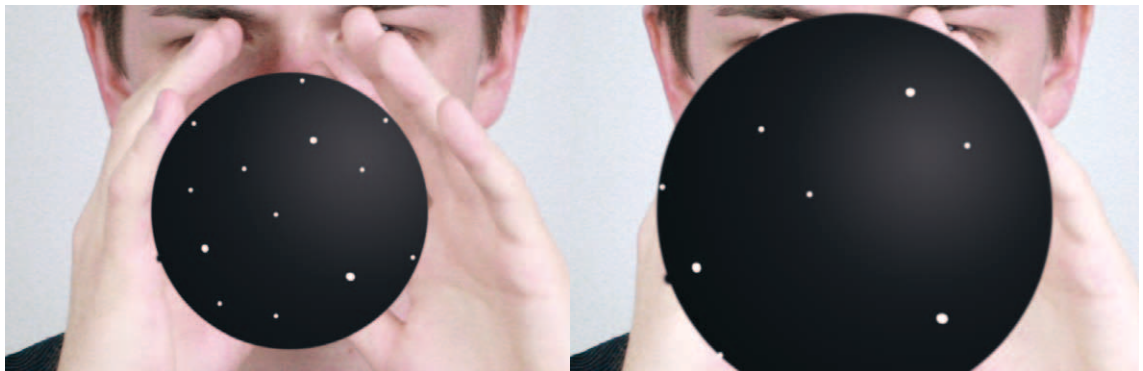
Materials:

- 1 large balloon for every 2 students
- 4 strips of paper cut 2 cm x 30 cm
- Metric rulers
- 1 marker for every 2 students
- Scissors
- Pen/pencil
- Large paper clips
- One copy of this student handout

Background:

In 1929, Edwin Hubble confirmed that the Universe is expanding. If the Universe is expanding, then one can assume that the galaxies that compose our Universe were once much closer together than they are now. If we run the expansion process backward, we get two results. The first is that it probably took approximately 13.7 billion years for the Universe to grow to its present size. Second, the Universe must have begun its expansion in an awesome event that astronomers call the Big Bang.

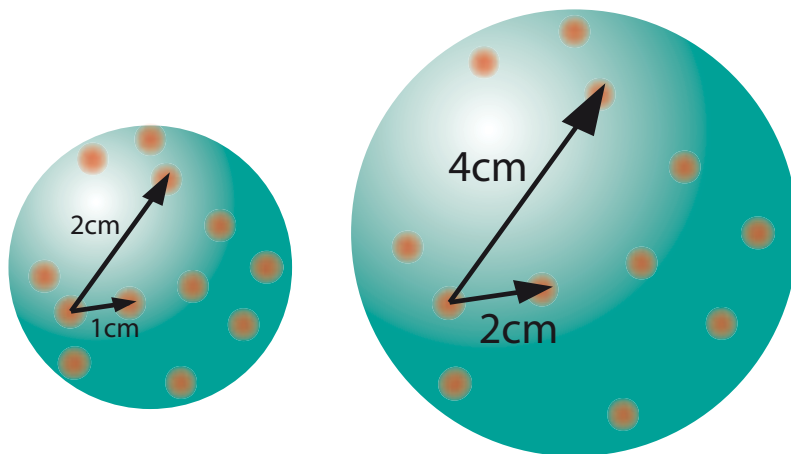
In this analogy the Universe is the balloon, and the dots are galaxies. As the Universe expands, the dots get farther and farther apart. No one dot is at the center but rather space expands away from all of them.



JOURNEY

Procedure:

1. In this activity, you are going to create a model of the expanding Universe. Materials needed include a balloon, ruler, paper strip, a copy of this page, and a marker.
2. Use the markers to make 10-15 dots on the balloon and number 10 of them after the balloon is partially inflated.
3. Inflate balloon with 4 medium breaths to about the size of your fist; do not over inflate the balloon!
4. Bend the end of the balloon down and paper clip it so that no air escapes.
5. Record what happens to the dots in the space provided below. Be very specific; use complete sentences.
6. Measure and record the distance between dot number one (your “home” dot) and the next 10 other dots with the METRIC RULERS. Be careful not to indent the balloon by pressing on it.
7. Now measure and record the distance between dot number one (your “home” dot) and 10 other dots with the paper strip.
8. Double the size of the balloon by inflating it slowly; do not over inflate the balloon! Measure and record the data from the enlarged balloon using both tools.
9. Answer the summary questions below.



COSMIC

PARTIALLY EXPANDED

Dot	Initial Distance from Dot #1 using the ruler	Initial Distance from Dot #1 using the paper strip	Difference
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

FULLY EXPANDED

Dot	Final Distance from Dot #1 using the ruler	Final Distance from Dot #1 using the paper strip	Difference	Change from Before to After
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

Questions:

1. As the balloon (i.e. the Universe) expands what happens to the dots (i.e the galaxies)?

2. If you started with a fully expanded balloon (i.e. the Universe), and ran this experiment in reverse what would happen to the dots (i.e. the galaxies)?

3. Which measuring tool was more accurate? Why?

4. In this experiment your breath caused the balloon (i.e the Universe) to expand, what caused the actual Universe to expand?