Raisin Bread Universe

Suggested Grade Level(s): All Grade levels from 7-12
Estimated class time: two 45-minute lab periods

Summary

The students will read the *Cosmic Times 1993* edition and use the articles "Pancake or Oatmeal Universe – What's for Breakfast" and "Inflation in the Universe" to help them make observations. The students will observe a bowl of oatmeal to explain the *lumpiness* and *smoothness* of the universe. Then the students will use raisin bread to describe how the universe went through a period of inflation to expand into its current form today.

Objectives

- The students will compare properties of food to concepts about the expansion of the Universe in order to understand the modern structure of the Universe in relation to the Big Bang theory.

National Standards

- NS.5-8.1 SCIENCE AS INQUIRY
  As a result of activities in grades 5-8, all students should develop
  - Abilities necessary to do scientific inquiry
  - Understandings about scientific inquiry
- NS.9-12.1 SCIENCE AS INQUIRY
  As a result of activities in grades 9-12, all students should develop
  - Abilities necessary to do scientific inquiry
  - Understandings about scientific inquiry
- NS.9-12.4 EARTH AND SPACE SCIENCE
  As a result of their activities in grades 9-12, all students should develop understanding of
  - Origin and evolution of the earth system
  - Origin and evolution of the universe
- NS.9-12.7 HISTORY AND NATURE OF SCIENCE
  As a result of activities in grades 9-12, all students should develop understanding of
  - Science as a human endeavor
  - Nature of scientific knowledge
  - Historical perspectives

Knowledge Prerequisite

The students should be able to make observations using the newspaper articles to guide them. The students should be familiar with the Big Bang theory and how the universe expands.

Teacher Background

The teacher should be familiar with the Big Bang Theory and universal expansion. The teacher should understand the two models of the universe known as the "Oatmeal Universe" and the "Raisin Bread Universe." The teacher should familiarize themselves with two articles from the *Cosmic Times 1993* newspaper – "Pancake or Oatmeal Universe - What's for Breakfast" and "Inflation in the Universe." The teacher should be able to make dough and let it rise, especially being able to work with yeast!*

*Yeast knows when you're afraid of it, be careful!

Materials

- *Cosmic Times 1993* newspaper
- a bowl of oatmeal (for each lab group)
- raisin bread before it rises and raisin bread after it rises (room temperature water and box of raisin bread mix (for each lab group)
- a metric ruler
- your senses

Procedure:

I. Engagement

Place the students in their lab groups and ask them to get ready to use their observation skills. Set out a bowl of oatmeal for each lab group and ask them to make observations about it.

Next, ask the students to read the article "Pancake or Oatmeal Universe – What's for Breakfast?" in the 1993 edition of the *Cosmic Times*. The students should then make a Venn Diagram on a piece of paper to compare and contrast the bowl of oatmeal to the universe in relation to the article that they just read.

II. Exploration

The students should read the "Inflation in the Universe" article next. Now provide each lab group with raisin bread dough before letting it rise.* The students should have a cross section of raisin bread dough that is ready to rise. Have students make observations with a metric ruler. Ask the students to choose clearly visible raisins and to measure the length of the raisin (cm or mm). Next, the students should measure the distance between the raisins. You can have them choose 5-10 raisins for this task so they have a significant amount of evidence to support this theory.

After the students have made their measurements, they should set the dough aside to rise. This will take approximately 45 minutes to 1 hour.

After the dough has risen, ask the students to find the same raisins from their original observations and to take the same measurements again to find the new information. This information can be filled out in a chart (available below).

* Depending on how the dough rises in the recipe's directions, the students will have a limited amount of time to make their first measurements to ensure that the dough still rises. I used a box of prepared raisin bread mix that already had yeast in it. In this way, the only ingredients that are needed are water (room temperature) and the bread mix.

III. Explanation

The students should observe that the raisins remain the same size before and after the dough has risen. The students will also observe; however, that the distances between the raisins have gotten much greater after the dough has risen.

IV. Evaluation

Have the students fill out the chart with the information from their measurements. Use the chart and measurements to have a class discussion about their observations. Compare what the students learned from the article with the information they collected in their labs to see how well the lab has supported what they read in "Inflation in the Universe." Have the students use the following questions as a guideline for their discussion (available below).

Kneading the dough

Raisin Observations for the Article "Inflation in the Universe"			
Raisin Length Before Rising (cm)	Raisin Length After Rising (cm)	Distance Between Raisins Before Rising (cm)	Distance Between Raisins After Rising (cm)

Chart Example:

Raisin Observations for the Article "Inflation Bread Universe"			
Raisin Length Before Rising (cm)	Raisin Length After Rising (cm)	Distance Between Raisins Before Rising (cm)	Distance Between Raisins After Rising (cm)
1 cm	1 cm	2 cm	3.1 cm
1 cm	1 cm	5.7 cm	8.8 cm
1 cm	1cm	3 cm	5 cm
1.1 cm	1.1 cm	1.1 cm	2 cm

The examples of the following pictures were used to make these observations:
Before Rising

After Rising

Below are larger samples of the raisin bread with rulers for students to use:

An image of the baked raisin bread loaf with a ruler:

An image of a slice of raisin bread with a ruler:

A picture of a sliced loaf with a ruler:

Name _____ Date_____

Stimulating Questions for the *1993 Cosmic Times* Newspaper Article "Inflation in the Universe"

1. As the bread is expanding, does anything happen to the size of the raisins?

_____
_____
_____

2. As the bread is expanding, what do you notice about the distances between the raisins?

_____
_____
_____

3. Compare the distances between at least two sets of the raisins from before the bread rose to after the bread rose. How much did they separate?

_____
_____
_____
_____

4. How does the expansion of the dough in making bread compare to the idea of inflation in the Big Bang Theory and the expansion of the universe?

_____
_____
_____
_____

5. How does the size of the raisins compare to the size of the stars and galaxies in the Universe before and after universal expansion?

_____
_____
_____
_____

6. How does the distance between the raisins compare to the distance between stars and galaxies in the Universe before and after universal expansion?

_____
_____
_____
_____