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Unit Rate and Proportional Reasoning Lesson Plan 6th Grade

An understanding of proportional reasoning is not only important for later mathematical understanding of linear equations but is also a key math skill used in life. I've found that students respond better when there are multiple senses involved. As an anticipatory set for this lesson, which may be revised to fit your ingredient list, it is nice to involve taste buds and eyesight. The heart of this lesson plan is connecting function tables (without the use of technical math language yet) with single quadrant , coordinate grid , graphing.

Learning Objective/Goals

- Students will understand that unit rate means "rate for just one".
- Students will be able to complete basic function tables.
- Students will be able to use a coordinate grid to plot equivalent ratios and will be able to see that the result is linear.
- Students will understand that graphs showing proportional relationships (direct variation) pass through the origin.

Supplies Required

- 3 large clear glasses (larger than 2-cup size)
- Food coloring (fairly potent color)
- Stirring stick
- Supplies for each group of 4:
    - 12 mini cups (Dixie cups)
    - 2 pints of milk
    - 3 scoops of Nesquick (or other powdered chocolate milk mix---may alter steps slightly) (this should allow a little extra per group)
    - 1 scooper (could be measuring spoons instead if same size as in container)
    - 1 stirring stick
    - 1 clear 1-cup measuring cup
- Intro to Proportional Reasoning Worksheet
- Running Frenzy Worksheet
- Proportional Reasoning Practice Page

Methodology

Anticipatory Set #1 (Colored Water)

1. Have three large clear glasses at the front of the room on display. They can all be the same size and ideally are unmarked.
2. Start off by filling one glass with 2 cups of water.
3. Put 40 drops of food coloring (make sure it is a fairly potent color) into the glass. Lightly stir.
4. Ask the students what they see and record the action that just took place in a table. They have the same table on their "Intro to Proportional Reasoning" Worksheet.
5. Fill a second glass with 1 cup of water.
6. Ask the students the following questions in a full class discussion:

    - How does the amount of water in this second glass compare with the amount of water that we put in the first glass?
    - If we want both glasses of water to be the same color, how many drops of food coloring should we put in the glass?
    - How did you make this decision?
7. Put 20 drops of food coloring (same color as used in last glass) into the glass. Lightly stir.
8. Ask the students what they see and record the action that just took place in a table. They have the same table on their "Intro to Proportional Reasoning" Worksheet.
9. Fill the third glass with ½ a cup of water.
10. Ask the students the following questions in a full class discussion:
    - How does the amount of water in this third glass compare with the amount of water that we put in the second glass?
    - If we want both glasses of water to be the same color, how many drops of food coloring should we put in the glass?
    - How did you make this decision?
11. Put 10 drops of food coloring (same as color used in last two glasses) into the glass. Lightly stir.
12. Give students a few minutes to fill in their tables and answer the follow up reflection question.

<u>Anticipatory Set #2 (Chocolate Milk)</u>

1. Break students into groups of 4 and pass out the following supplies:
    - 12 mini cups (Dixie cups)
    - 2 pints of milk
    - 3 scoops of Nesquick (or other powdered chocolate milk mix---may alter steps slightly) (this should allow a little extra per group)
    - 1 scooper (could be measuring spoons instead if same size as in container)
    - 1 stirring stick1 clear 1-cup measuring cup
2. Inform them that recipes are written for a reason. They are a statement of ratios. They define how much of one ingredient should be mixed with another ingredient to create a specific flavor. If recipes are not followed, a different flavor is created.
3. Have each student take their 3 mini cups label them in the following way:
    - 8 oz/1 scoop
    - 4 oz/0.5 scoops
    - 8 oz/0.5 scoops
4. Have the students make an 8-oz serving of milk mixed with 1 scoop of Nesquick. Make sure it is measured carefully and stirred well. Pour a small amount of this mixture into the "8 oz/1 scoop" cup.
5. Have the students make a 4-oz serving of milk mixed with ½ scoop of Nesquick. Make sure it is measured carefully and stirred well. Pour a small amount of this mixture into the "4 oz/0.5 scoop" cup.
6. Have the students make an 8-oz serving of milk mixed with ½ scoop of Nesquick. Make sure it is measured carefully and stirred well. Pour a small amount of this mixture into the "8 oz/0.5 scoop" cup.
7. Have students taste their three mixtures and then decide which two taste the same and which one tastes different. Discuss with the class why one tastes different than the others.
8. Have the students write down the rule for each of the three mixtures on the table ("Intro to Proportional Reasoning" Worksheet).
9. Have the students cross out the one that does not have the same rule as the others.
10. Have students find 4 more combinations of Nesquick to milk that would result in the same flavor (in other words has the same rule or is proportional).
11. Give students a few minutes to fill in their tables and answer the follow up reflection question.

<u>Running Frenzy Worksheet</u>

1. Pass out the “Running Frenzy” Worksheet for students to complete in groups of 4. I recommend checking in every 5-10 minutes for accuracy and shared thinking.

Proportional Reasoning Practice Page

1. For in-class practice, pass out the “Proportional Reasoning Practice Page.”
2. Homework/At-home review could be further work on function tables and graphing proportional relationships.

Common Core Standards Addressed

CCSS.MATH.CONTENT.6.RP.A.3
Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

CCSS.MATH.CONTENT.6.RP.A.3.A

Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

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