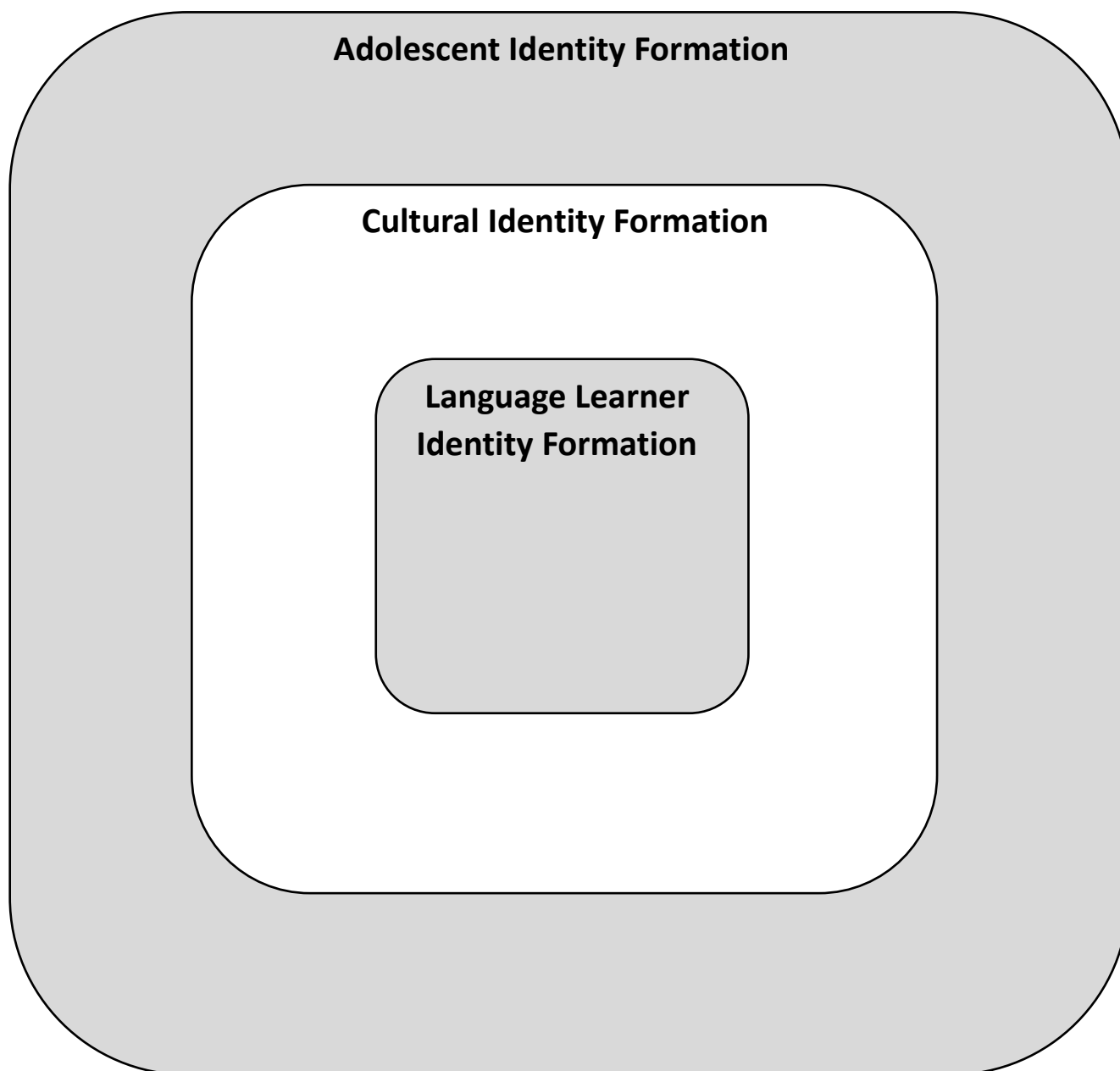# Cooking, Currency & Culture:
Inviting Student Stories into Middle School Math

Research Excerpts

As you listen to the quotes shared, record any key words or phrases that resonate with you in the corresponding parts of the diagram.

Adolescent Identity Formation

Cultural Identity Formation

Language Learner Identity Formation

Sample Tasks

Grade 6 Example 1: Bread Recipe

1. A bread recipe calls for 2 cups of whole wheat flour for every 6 cups of white flour.

   a. Complete the ratio table.

Number of Cups of Whole Wheat Flour	Number of Cups of White Flour
$\frac{1}{3}$	1
1	3
2	6
4	12

   b. Complete the following statements.

   For every 1 cup of white flour, the recipe calls for ___$\frac{1}{3}$___ cup of whole wheat flour.

   For every 1 cup of whole wheat flour, the recipe calls for ___3___ cups of white flour.

   c. How are the first two rows of the table similar?

   One of the numbers in each row is 1.

> **Teacher Note**
>
> Consider revising problem 1 to use a food recipe that is more relevant to your students. Prior to the lesson, ask your students to research a recipe from their family or culture related to bread or a similar staple food. Then have students create their own ratio table reflecting the ratio relationship between two of the ingredients in their recipe. Invite students to share the recipe and their work with their classmates.

Grade 6 Example 2: Signature Recipe Task

Part 1: What's Cooking?

Interview a family member or someone in your household about a favorite dish that reminds them of home or a holiday. Consider using any of the following questions:

- What is special about this dish?

- What memories do you have that are associated with this dish?

- What makes it special to you?

- When would you typically eat this dish? For a holiday or event?

Ask this family member to help you document the recipe. Use precise measurements whenever possible. Consider re-making the dish if needed to help in this process—and if you do, take a photo of the finished product!

Bring your recipe to class and be prepared to share about why you have chosen this dish.

Part 2: Feeding a Crowd

You've shared your signature recipe with the class and everyone can't wait to try it. Let's suppose that you want to make enough of your signature recipe to feed the entire class.

There are _____ students in our class and _____ teacher(s), which makes a total of _____ people.

Make a plan to prepare your signature recipe for the whole class. Consider the following questions to guide your thinking.

- How much of each ingredient will you need?

- In what quantities are the ingredients in your recipe sold? Does that impact how much you need to buy?

- How much would it cost to purchase the ingredients you need?

- How much does it cost to feed each person?

Document your findings to prepare for part 3.

Part 3: Pick Your Project

Determine a way to present your findings from parts 1 and 2. Either select one project option from the options provided or create your own and get approval from your teacher. Refer to the project rubric to guide your thinking.

1. Create a PowerPoint or Google Slides presentation.

2. Make a poster.

3. Make a video.

4. Record a podcast.

5. Create a webpage.

6. Develop and present an oral presentation for the class.

7. Create a screencast video.

8. Create an infographic.

Grade 7 Example 1: Currency Exchange

4. Four friends plan to travel to the United Kingdom. They each exchange US dollars for British pounds at the same exchange rate. The graph shows their exchanges.

a. Write an equation relating the number of British pounds p that someone receives to the number of US dollars d that they exchange at this rate.

$$p = 0.76d$$

British Pounds

Points shown on graph: (200, 152), (375, 285), (450, 342), (600, 456)

Axis labels: British Pounds (p), US Dollars (d)

Teacher Note

Consider revising problem 4 to use a currency other than British pounds that is more relevant to your students. Ask your students to share experiences with or knowledge about another currency, and then create a new graph to reflect several different exchanges of US dollars and that currency.

b. Jonas wants to have 380 British pounds for his trip. If the exchange rate stays the same, how many US dollars should Jonas exchange?

$$p = 0.76d$$
$$380 = 0.76d$$
$$380 \div 0.76 = 0.76d \div 0.76$$
$$500 = d$$

Jonas should exchange 500 US dollars for 380 British pounds.

c. Yu Yan exchanges 300 US dollars. If the exchange rate stays the same, how many British pounds does Yu Yan receive?

$$p = 0.76d$$
$$= 0.76(300)$$
$$= 228$$

Yu Yan receives 228 British pounds in exchange for 300 US dollars.

Grade 7 Example 2: Making a Mural

Making a Mural

Students create a scale drawing at a different scale to model a real-world situation.

Distribute a ruler and a sheet of grid paper to each student.

Direct students to problem 3. Read the problem aloud and answer any student questions about the task. Then have students complete problem 3 in their groups.

Circulate as groups work, and ask the following questions as needed to offer support:

- How can you find the measurements of the picture? Of the original artwork?
- Does it make sense to use a scale or a scale factor?
- What scale or scale factor did you choose for your mural? Is that an appropriate scale or scale factor? Why?
- How can you determine the minimum area of the mural?

3. Your class has been chosen to paint a mural on a cafeteria wall. The mural will represent the artwork shown. This picture is a scale drawing of the original artwork, and 6 inches of the picture represents 3 feet of the artwork.

UDL: Engagement

Consider revising problem 3 to make it more relevant to students in your class. Instead of using the provided artwork, have students research local murals in your community and their significance, and then use a local mural for problem 3. In addition, consider inviting a local muralist to your class to discuss their work and their process for creating large-scale artwork.

The mural must meet the following criteria:

- The mural must be a scale drawing of the original artwork.

- The mural must fit on a rectangular wall that is 40 feet long and 14 feet tall.

- The mural must cover at least 30% of the cafeteria wall.

Identify the scale factor or describe the scale you used to create the scale drawing.

Create a scale drawing that represents the mural on the cafeteria wall. Label the measurements of the wall, of the mural, and of at least two shapes.

Sample:

The picture has a length of 6 inches and a width of 3 inches.

$$6\left(\frac{1}{2}\right) = 3$$

$$3\left(\frac{1}{2}\right) = \frac{3}{2} = 1\frac{1}{2}$$

The original artwork is 3 feet by $1\frac{1}{2}$ feet.

We chose a scale factor of 8 for the mural.

$$8(3) = 24$$

$$8\left(1\frac{1}{2}\right) = 12$$

The mural is 24 feet by 12 feet.

Grade 8 Example 1: Populations

The table shows estimated populations of the five most populous countries in the world in 2022.

Country	Estimated Population
China	1,426 million
India	1,412 million
United States	337 million
Indonesia	275 million

a. What is the estimated total population for the five most populous countries in the world in 2022? Write the answer in scientific notation.

b. In 2022, how many more people were estimated to be in China than in the United States and Indonesia combined?

Extension: Revise problem 1 by having students choose a region or country that interests them and research its population. Allow students to collaborate with each other and use their chosen populations to ask and answer comparison questions like those in parts (a) and (b).

Grade 8 Example 2: Reflections on Navajo Weaving

Math Past

Reflections on Navajo Weaving

When did the Navajo begin weaving?
How are Navajo weavings produced?
What geometric shapes are in Navajo weavings?

Ask your students what geometric shapes they see in the natural world. Responses might include pyramids (mountains), circles or ovals (lakes), cones (evergreen trees), spheres (pebbles), or just straight lines (rivers). An artist who wishes to capture the geometry in nature has only to look around for inspiration.

The American Indians known as the Navajo are such artists. The Navajo people, or Diné, see beauty, harmony, and order in the geometry around them and weave those designs into clothing, blankets, and rugs. Navajo weavers, who are almost all women, must have a keen eye and a good sense of mathematics to execute the intricate designs that exist only in their minds. There are no drawings or written blueprints.

The Navajo have been weaving since the 1700s. Sadly, very few of their earliest textiles have been preserved.

The image shows a folded Chief Blanket, made in about 1840. These blankets are so named because they were quite expensive. Only a chief could afford one!

First phase Chief Blankets (1700–1840s) such as the one pictured feature wool from a type of sheep called a Churro. The stripes on the blankets come in the natural white of the wool as well as stripes dyed brown, indigo, or red.

The Chief Blanket, when unfolded, reveals much symmetry. Ask your students how they could fold the blanket so identical patterns are placed on top of one another. For example, the top edge can be folded down in two different ways. How might students describe those folds in terms of rigid motions?

What about folding the blanket right to left? Ask students how many ways the right edge can fold over such that the patterns coincide. Is there just one way? Suggest that there are infinitely many ways!

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Today, Navajo weaving is alive and flourishing in the Navajo Nation, the largest American Indian Reservation in the United States. The image pictures a rug on a loom in the Teec Nos Pos style being woven by master weaver Elsie Bia (b. 1951).
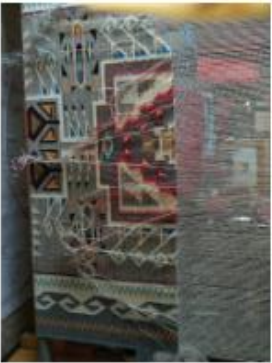
Navajo looms are vertical. As the rug is woven, the completed part is rolled underneath to keep the top row at a comfortable height for the weaver.

The vertical yarn strands are called the warp, and the interlacing horizontal strands are known as the weft.

Each row requires counting warp strands so the correct colors of the weft strands can emerge and recede.

The center of the Navajo Nation is Canyon de Chelly, located in northeast Arizona near the small town of Chinle.

Canyon de Chelly is sacred to the Navajo. It is home to Spider Rock, a sandstone spire that rises more than 700 feet from the canyon floor. In Navajo tradition, the area is where the goddess Spider Woman lived, spun her webs, and taught her people to weave.

In the image, Elsie Bia holds the completed rug from the loom, with the Spider Rock spire in the background.

Here is a complete view of Elsie Bia's completed Teec Nos Pos rug. This magnificent rug is a showpiece for discussing translations, reflections, and rotations. Help your students select areas of the rug to study. Then use rigid motions to verify that the figures are congruent in those areas.

This is what Elsie Bia says about her art:

Weaving rugs is a Navajo tradition …. It takes lots of time, not only to weave but all of the math and counting. I just love what I do, always challenging myself with new patterns and designs.[1]

Note the "math and counting"! As you appreciate the beauty, harmony, and order in the finished rug, cast your mind back to Elsie Bia, as she carefully worked her math and counting to bring her vision to reality.

1   Nizhoni Ranch Gallery, "Master Weaver, Elsie M. Bia."

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Sample Activity Rubric

Choose at least one of the six sample tasks to read and analyze. Then complete the row of the table that corresponds to your sample task. If needed, use the following prompts to guide your analysis.

Math Content Alignment

- What math content does this activity align to?
- How does the suggested cultural activity relate to the mathematics?

Implementation Needs

- How much teacher pre-planning does this activity require?
- How much class time does this activity require?
- What difficulties might you encounter when implementing this activity?

Student Identity Reflection

- How does the prompt relate to students' identity formation? Cultural identity? Language identity?
- What might be some next steps that could follow this activity?

Task	Math Content Alignment	Implementation Needs	Student Identity Reflection
Grade 6 Example 1: Bread Recipe			
Grade 6 Example 2: Signature Recipe Task			
Grade 7 Example 1: Currency Exchange			
Grade 7 Example 2: Mural			
Grade 8 Example 1: Populations			
Grade 8 Example 2: Reflections on Navajo Weaving			

Reflection

- Consider the students in your classroom. How do you see your students developing their sense of identity?

- What ideas do you want to take back to your classroom to implement?

Reflection

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