

LESSON 6.4 THE VALUE OF A SCHOOL LUNCH

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SOCIAL JUSTICE CONNECTION

Research from the U.S. Department of Agriculture shows that 6.5% of American households with children are food insecure. This means that 2.4 million households contain children who are food insecure. This lesson engages students in analyzing the importance that a free lunch can play in a student's life. Through analyzing needs and wants using fractions, students are encouraged to examine the societal and systemic reasons behind food insecurity. In the closing to the lesson, students are asked to evaluate, discuss, create, and possibly participate in solutions addressing the issue of food insecurity and how the problem influences everyone.

DEEP AND RICH MATHEMATICS

Exploring the nutritional value of their school lunches will require students to understand the situation using proportional reasoning and part-to-part and part-to-whole fraction comparisons. They must make decisions about measuring (including making estimates) in order to define a whole and equal parts of that whole (i.e., a fraction). They will rely on understanding that fractions can only be compared when they describe the same whole to analyze and compare the quantity of fruits, vegetables, and dairy (and optionally, grain and protein) in a typical school lunch.

Resources and Materials

- Worksheet 1: *Wants vs. Needs*
- Worksheet 2: *What Fraction of Your Recommended Daily Value Is in Our School Lunch?*
- Teacher Resource 1: *Incorporating Decimals via Money Calculations* (Optional Extension Activity)
- Student Resource 1: *What Is the Cost of School Lunch?* (Extension Worksheet)
- Video: "The Cost of Food Insecurity in Schools," from the Health Forward Foundation (<https://bit.ly/3rQcw9U>)
- Measuring cups (quarter-cups or half-cups recommended)
- Balance or other weighing tools (optional)

SOCIAL JUSTICE OUTCOMES

- I know that life is easier for some people and harder for others based on who they are and where they were born. (Justice 14)
- I will work with my friends and family to make our school and community fair for everyone, and we will work hard to cooperate in order to achieve our goals. (Action 20)

MATHEMATICS CONCEPTS

- Focus on real-world contexts for understanding fraction concepts conceptually.

MATHEMATICS PRACTICES

- Reason abstractly and quantitatively.
- Use appropriate tools strategically.

- School lunch menu (to help think about which days would be ideal for this unit)
 - + Either from your own school or from Figure 2 in this lesson (from School Nutrition Association, 2012). Before copying this sample, we recommend removing the column that labels the food categories.
- School lunch or access to school kitchen
- Menus from local restaurants (We recommend teachers bring these in or ask students to in preparation for this lesson if you plan to do the extension activity.)

LESSON 1 FACILITATION

Exploring School Lunch

Launch (25 minutes)

- Begin by asking your students, *Who's hungry right now?* There are likely to be a few hands raised.
- Conduct a short discussion about how much time there is from now until lunch/snack time and reflect on what life would be like if students didn't get a lunch break or a chance to eat lunch.
- Distribute page 2 of Worksheet 1 (*Wants vs. Needs*; see Figure 1).

TEACHER NOTE

Throughout this lesson, you can incorporate your own experiences with food insecurity and, if not that, relate the issue of food insecurity in relation to your school or community. Be aware that some of your students may be experiencing food insecurity. Be prepared to hear and validate their experiences while also supporting their needs.

- Conduct a sorting activity in which students place items (sleep, breakfast, games, etc.) into four categories (I need this to survive, This makes my life better, I enjoy this, and I don't need this at all)
 - + *Small-group version:* Cut out sets of the 24 item boxes and have students work in groups to sort the items into the four categories.
 - + *Whole-class version:* Project the table onto the front board. Students write the items on sticky notes, which they then bring up to the board.

Figure 1. Wants vs. Needs Card Sort

Lunch	Water	Warm clothes
Sleep	Housing	Friends
Dessert	Games	Exercise
Air to breathe	Recess	TV
Breakfast	Cell phone	Umbrella
Snacks	Pillow	Bathing
Dinner	Allowance	

- Regroup the class for a share-out and discuss: *What makes something “necessary” for survival?* Draw special attention to the importance and role of food in their lives.
- Remind students that it is not just any food that is okay. We need to have a nutritious balance of foods to fuel our bodies. Explain to students that the average 10-year-old child needs 1800 calories per day to maintain a healthy weight, grow, and develop. Ask students for their understanding of what the balance of foods might consist of. Have some students share their ideas.
- Continue by building on student responses. Highlight that these calories should come from a variety of sources, including dairy, fruits, and vegetables. For growth and development, it is recommended that children eat 4 half-cups of fruit, 6 half-cups of vegetables, 6 half-cups of dairy, 5 ounces of protein, and 6 ounces of grain every day. However, not all children can access these foods.

TEACHER NOTE

This is an important opportunity to emphasize the meaning of a fraction as a number that relates a part to a whole. In this lesson, the whole is defined by the recommended daily serving, and parts are measured in units of half-cup or an ounce. For Lesson 1, you might address the possible confusion about using a half-cup as the unit of measurement. For example, you could ask, *How many cups of fruit is 4 half-cups?* while emphasizing the relationships between the half-cup and the whole cup of fruit.

For a simpler version of this lesson (i.e., more appropriate for third grade), focus only on the foods that can be measured using half-cups. If you have access to a balance, then you can include the protein and grains (i.e., more appropriate for fourth grade).

Explore (20-25 minutes)

- Place students in small working groups of three to four. Provide each group with copies of a school lunch menu (either from your school or the menu in Figure 2). Ask students to work together in their small groups to:
 - Categorize the foods into different nutritional categories: fruit, vegetables, dairy, grain, or protein.
 - Discuss what counts as what (e.g., Are sweet potato fries vegetables? Are peas vegetables? What is "orange juice"?). Consensus is not required for this discussion.

Figure 2. Sample School Lunch Menu

Minnesota Sample Cycle Menu

SAMPLE CYCLE MENU GRADES K-5

	MON 1	TUES 1	WED 1	THURS 1	FRI 1
MEAT/MA	Turkey Corndog ^W	Sweet & Sour Chicken ^R	Turkey Sausage	Apple Cider Stew ^R	Turkey Sloppy Joe ^{R,W}
GRAIN		Brown Rice ^W	French Toast Sticks ^{W,2,6R}	Dinner Roll ^W	
VEG	Corn on the Cob	Broccoli	Roasted Squash ^{R,L}	Romaine Salad ^L	Sweet Potato Fries
VEG	Marinated Black Bean Salad	Carrots	Sliced Cucumbers ^L		Celery Sticks
FRUIT	Watermelon Wedges ^L	Fresh Apple Slices ^L	Orange Juice	Orange Smiles	Juicy Pears
CONDIMENTS	Ketchup, Butter	Ranch, Yogurt Dip	Maple Syrup	Ranch, Butter	Ketchup, Hummus
	MON 2	TUES 2	WED 2	THURS 2	FRI 2
MEAT/MA	Cheese Pizza ^W	Hamburger on Bun ^W	Vegetarian Chili ^R	Crunchy Chicken Wrap ^{R,W}	Fish Sandwich ^W
GRAIN			Cornbread		
VEG	Romaine Salad	Lettuce & Tomato		Potato Wedges	Carrot & Celery Sticks
VEG	Beets 'n' Sweet ^{R,L}	Fiesta Beans & Rice ^{R,W}	Fresh Broccoli		Creamy Coleslaw ^L
FRUIT	Juicy Pineapple	Ripe Red Grapes	Applesauce	Orange Smiles	Fresh Kiwi
CONDIMENTS	French dressing	Ketchup, Mayo	Ranch, Butter, Honey	Ketchup	Ketchup, Tartar Sauce
	MON 3	TUES 3	WED 3	THURS 3	FRI 3
MEAT/MA	Chicken Sandwich ^W	Chicken Gravy	Meatballs	Chicken Salad on Roll ^W	Cheese Quesadilla ^W
GRAIN		Dinner Roll ^W	Spaghetti & Breadstick ^W		
VEG	Leafy Spinach ^{1,2,L}	Mashed Potatoes	Tomato Sauce	Carrot & Jicama Sticks	Black Bean Salsa
VEG	Corn Edamame Salad ^R	Spring Salad Mix ^R	Green Beans	Roasted Chickpeas ^{1,4,L}	Broccoli
FRUIT	Fresh Strawberries	Crazy Mixed-Up Fruit	Golden Peaches	Fresh Pears	Fresh Banana
CONDIMENTS	BBQ Sauce, Ketchup	Butter	Parmesan, Butter	Ranch	Ranch

All serving sizes of fruit are 1/2 cup. Serving sizes of grains are 1-2 oz. Condiments are 1-2 Tbsp.

All serving sizes of vegetables are 1/2 cup (1 cup for leafy greens) unless noted in subscript.

All meals include skim or 1% white milk. Nutrient analysis available on the reverse side.

R = Recipe available at www.health.state.mn.us/schools/greattrays under "Menu Planning"

L = Local food available in many regions of Minnesota

W = Whole grain-rich

Dark Green Red/Orange Legumes Starchy



Minnesota Department of Education

Source: School Nutrition Association (2012). For entire Sample Cycle menu, go to <http://www.health.state.mn.us/schools/greattrays/pdfs/SampleCycleMenu.pdf>

Summarize (10 minutes)

- Regroup as a whole class. Call on students from each group to share out what food items they included in one of the nutritional categories.
- As students share out, check for agreement or disagreement from the class. Note which food items were more contentious and remind students that some foods can fall into two or more categories.
- *Optional homework assignment:* Reflect on the school menu. Do you get a good balance of foods from your school lunch?

LESSON 2 FACILITATION

Is School Lunch Nutritious?

Launch (10 minutes)

- In small groups, ask students to discuss this guiding question: *Does the school lunch provide a good balance of important foods?*
- As a whole class, review how many nutrients an average 10-year-old child needs for a healthy diet. Write on the board: *The average 10-year-old should eat 4 half-cups of fruit, 6 half-cups of vegetables, 6 half-cups of dairy, 5 ounces of protein, and 6 ounces of grains every day.*

TEACHER NOTE

It is important that students understand that the “whole” changes by the type of food. For example, 2 half-cups of fruit are $\frac{1}{2}$ the daily recommended serving of fruit, but 2 half-cups of vegetables are only $\frac{1}{3}$ the daily recommended serving of vegetables. For third grade, you can emphasize writing equivalent fractions that refer to each of the different wholes (e.g., 2 half-cups of fruit can be written as $\frac{2}{4}$ or $\frac{1}{2}$ of the recommended daily serving; 3 half-cups of vegetables can be written as $\frac{3}{6}$ or $\frac{1}{2}$ of the recommended daily serving).

For fourth grade, you can challenge students to express different addition sentences that show how one could get the daily recommended serving (e.g., $\frac{1}{4} + \frac{1}{2} + \frac{1}{4} = 1$ could be used to show eating a quarter-cup of fruit at breakfast, a half-cup of fruit at lunch, and a quarter-cup of fruit as a snack). Use this discussion to re-emphasize that the “half-cup” is the standard unit of measurement, not the fraction of the recommended daily serving (i.e., the whole). *Important:* All uses of fractions should be connected back to the context (i.e., the part-whole relationship) to emphasize the meaning of fractions and their operations.

Explore (20-30 minutes)

- Divide students into small groups with three to four students in each group. Explain that today your class is going to measure for themselves the nutrients provided in the school lunch.
- Distribute Worksheet 2 (*What Fraction of Your Recommended Daily Value Is in Our School Lunch?*) (Note: If your class will be using both half-cups and a balance, use the full handout. If you just want to measure using half-cups, ignore the last page and measure only fruits, vegetables, and dairy.)

TEACHER NOTE

For measuring fruits, vegetables, and dairy, we recommend measuring using half-cups as the unit. You might ask fourth graders to use $\frac{1}{4}$ -cup measuring cups in order to provide opportunities for addition of fractions with common denominators.

- Either through taking a field trip to the cafeteria or by bringing in a few samples from today's lunch meal, have student groups measure and record the quantities of the nutrients from the school lunch that day in the handout.
- In order for students to measure these nutrients, they will first need to categorize the meal into nutritional categories. Student groups may come up with different measurements based on what they determine "counts" as part of that nutritional category.
- Students will then complete the rest of the handout. Students should draw or explain the food item, color in the correct fraction of boxes, and then fill in the blank to complete the sentence.
- In their groups, ask students to discuss: *How does the school lunch help students meet their daily requirements?*

Summarize (10 minutes)

- Regroup students for a whole-class discussion. Suggested discussion prompts are as follows:
 - + *Which food(s) did we not measure? What nutrients might they be providing?*
 - + *Is there anything else in our food that we might want to eat more or less of? (vitamins, sugars, fiber, etc.)*
 - + *How much of the daily nutrients are left over for the student to get elsewhere? Ask students to calculate this using either subtraction or addition with the change unknown (i.e., $a + ? = b$). This also helps reinforce the idea that claims need to be backed with numbers and facts. Mathematically, this creates opportunities for students to reason*

about the size of fractions with like and unlike denominators by referencing the whole (i.e., the recommended daily serving). Questions such as *What do students need to eat more of, outside of school?* can only be answered by establishing whether “more” refers to the number of half-cups/ounces (i.e., the parts) or the fraction of the daily recommended serving (i.e., the whole).

LESSON 3 FACILITATION

Food Insecurity

Launch (20 minutes)

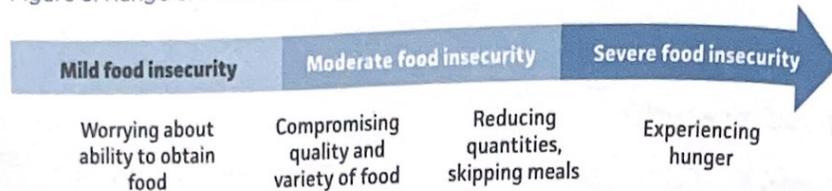
- In small groups, have students reflect on the activities of the previous two lessons. As a guiding question, ask: *How much of the daily nutrient requirements are met by the school lunch?* Encourage students to use their handouts and calculations to support their claims.
- Hold a whole-class discussion that focuses on access to important nutrients.
 - + *When it's not a school day, what do you do for lunch?*
 - + *If you skipped school lunch, what fraction of your total recommended daily [fruit/vegetable/dairy/etc.] would you likely consume today?* (To answer this question, students will likely work with the equation $1 - [\text{lunch amount}] = \text{remaining fraction}$ or they will look at which boxes they did not color in on the handout. However, their calculations may differ depending on what they said they do when they skip school lunch.)
 - + *Does your typical dinner help you meet the rest of the requirements?* (Sharing out is optional here. Be mindful that not all students come from food-secure homes.)
- Explain that not everyone can access enough food at home and that schools across the nation are looking to provide free breakfast (and lunch) to students to help.
- Decide what fractions of the nutrients should be consumed and when (e.g., *What fraction of your daily recommended values might you get from breakfast? From dinner? From what types of foods?*)
- Depending on time, you may want to have students look up nutritional values from foods they typically (or like to) eat. This can also be assigned as homework.

Explore (20 minutes)

- For this portion of this lesson, bring in the language and concept of *food insecurity*.
- Watch the video “The Cost of Food Insecurity in Schools” from the Health Forward Foundation (<https://bit.ly/3rQcw9U>).

- Reinforce the fact that over 2 million American households are not food secure. This means that many, many children may go to bed hungry. Or even if the children get enough food, the adults do not.
- To help think about the range of food insecurity, review Figure 3 with your class.

Figure 3. Range of Food Insecurity



Source: Contains Parliamentary information licensed under the Open Parliament Licence v3.0.

- The theme of food and justice can be an ongoing discussion during the school year. See Teacher Resource 1 for an optional extension activity incorporating decimals via money calculations to explore food insecurity.

Summarize (10 minutes)

- With your class, discuss:
 - + *What are your thoughts about making school lunch available every day (regardless of if there is school)?*

TAKING ACTION

Position students as advocates for change. Have students brainstorm how they can use what they learned to improve access to quality food to all children in the community. For example, students might write a letter or make a video (see the Educational Video Center resource at <https://evc.org/>) to share with the principal, local school board, state representative, or another individual about the importance of school lunch programs helping students and families meet their daily nutritional needs. They could make informational posters to hang up in the community or flyers to pass out around town. In whatever form of advocacy they choose, students should be instructed to include the language of fractions to support their arguments. You can also encourage students to use visualizations to enhance their product. Furthermore, students may also want to advocate for the following:

- Making lunch available to all students every day regardless of if it is a school day or a student is absent.
- Providing more alternative food options depending on dietary restrictions of the students.
- Making lunch cheaper for students.

- Adding or modifying a breakfast program at the school.
- Establishing an alternative meal program.
- Something else based on their personal concerns for student nutrition.

COMMUNICATING WITH STAKEHOLDERS

We recommend that teachers reach out directly to the cafeteria staff and explain that students are doing an activity measuring their school lunches to see how much of their daily recommended nutritional value they can get at school. Students are not measuring the food as a critique of the school lunch program or the quality of the food. Coordinate with kitchen staff to acquire a few extra meals to bring to the class for measuring purposes or coordinate a field trip to the kitchen to measure food there. To further contextualize the unit and to position the cafeteria workers as sources of knowledge, you may want to reach out to the leaders of the nutritional department to see if any of the menu creators would be willing to come to your class to answer student questions about the decisions behind what goes into a school lunch.

Teachers may want to send a letter to parents/caregivers and/or administrators, such as the following:

On [DATES], our class will be measuring food and using fractions to describe and analyze how much of their recommended daily nutritional value they receive from school lunches. This provides students an opportunity to critically reflect on issues of access to important nutrition as well as fairness and justice using mathematics. Food insecurity is an issue for many Americans, and with COVID-19 it has become even more pronounced. This lesson gives students a chance to reflect on the world and to explore their own privileges, using their own calculations as a basis. Students will also have an opportunity to write a supported letter, using their new facts, on possibilities to expand the school lunch program. I invite you to join our lesson and learn with me and the students about how mathematics helps us to reflect critically on this topic. Please let me know if your students have any allergies or other restrictions for working directly with food items so that I can create a safe and meaningful experience for all students.

ONLINE RESOURCES



Available for download at resources.corwin/TMSJ-UpperElementary

Wants vs. Needs

Instruction for Teachers

Get out sets of these 24 items for your students (the blanks are for students to fill in as they wish, or you can decide what they should be included).

In pairs or small groups, students sort the items into four categories presented on the second page. You may want to instead present the table on the board or screen, and have students write their ideas on sticky notes to place them into the four categories. If a hand is critical, we recommend using a program like Jamboard.

Regroup the class for a share-out.

As a class, discuss: What makes something "necessary" for survival?

To lead into the next part of the lesson, draw special situations to the importance of and role of food in their lives.

Lunch	Water	Warm clothes
Shoes	Money	Friends
Dorm	Games	Exercise
Air to breathe	Music	TV
Internet	Cell phone	Conducta
Shirts	Flora	Belong
Dinner	Attendance	

Worksheet 1: Wants vs. Needs

What Fraction of Your Recommended Daily Value Is in Our School Lunch?

Instructions:

- Draw or describe the food item from the school lunch that provides that nutrient.
- Fill in the blank to complete the sentence.

Example:
Today I got $\frac{1}{2}$ half-cups of fruit at lunch.

Today's school lunch provided $\frac{3}{4}$ of total daily limit.

Source: [Pubtrey.com/@Dawgnorflya](https://pubtrey.com/@Dawgnorflya)

Draw explain your food item:

Total Daily Fruit: 4 half-cups
Today I got ...

Today's school lunch provided $\frac{1}{4}$ of total daily limit.

Draw explain your food item:

Worksheet 2: What Fraction of Your Recommended Daily Value Is in Our School Lunch?

Optional Extension Activity (25 minutes)

Incorporating Decimals via Money Calculations

This theme of food and justice can be an ongoing discussion during the school year. When you are covering concepts such as:

- Multiplication of fractions by a whole number, or
- Using operations with fractions and decimals.

You can revisit food justice and incorporate this extension activity:

- Have students either individually write a paragraph or semi-structured with a neighbor to discuss what they remember about food and nutrition from the earlier activity.
- Distribute copies of the *What Is the Cost of School Lunch?* Extension Handout from Lesson 6.4 to each student.
- Students work individually or in pairs to answer the following questions:
 - How much does a school lunch cost at your school?
 - If you had lunch every day (180 days), how much do you spend on lunch?
 - How much would it cost if you only had to pay $\frac{1}{2}$ of the lunch cost?
- Hand out lunch money and compare the cost of a restaurant's lunch meal and nutritional value with the school meal.
- Compare the cost of buying in bulk versus buying individual wrapped items to show that a school providing this may be more economical than every family buying individually. This activity also brings in environmental concerns, as there may be less packaging.

Teacher Resource 1: Incorporating Decimals via Money Calculations (Optional Extension Activity)

Extension Worksheet

What is the Cost of School Lunch?

- What is the cost of a school lunch?
- If you buy lunch from school every day (approximately 180 days), how much will you spend on school lunch during a school year?
- If you paid half price for the school lunch, how much would you spend buying lunch every day for a year?
- Choose a lunch meal from one of the menus.
 - Which meal did you choose?
 - How much does the meal cost?
 - Estimate: How much of your daily recommended nutrients will you get from this meal?
 - What is the difference in cost between this lunch and the school lunch?

Student Resource 1: What Is the Cost of School Lunch? (Extension Worksheet)

ABOUT THE AUTHORS



Since childhood, **Rebecca Ellis** has been involved with Social Action Tikkun Olam, the Jewish concept of repairing the world, and aims to include social justice in all of her teaching, curriculum design, and assessment development. She recently completed her postdoctoral fellowship with The Connected Biology project, where she researched and developed free and interactive high school evolution education materials. Rebecca was inspired to work on this lesson by her time as an AmeriCorps member at a school where all students received free breakfast and lunch.



Debasmita Basu teaches quantitative reasoning and mathematics at Eugene Lang College of Liberal Arts, The New School, in New York City. Before pursuing her doctoral studies, Debasmita was a high school mathematics teacher in India for 4 years. As a cisgender woman of Color, she aims to design mathematical activities that cultivate students' critical consciousness toward various social and environmental justice issues and help them realize the power and value of mathematics. Previously, Debasmita was involved in the design of two lessons on food deserts and the impact of added sugar on one's health, which motivated her to do this current work.



Bethany Chan is a student in the UOTeach program. She aspires to become a high school mathematics teacher and, eventually, a mathematics curriculum writer. As a first-generation college student and woman of Color, she hopes to inspire more women and people of Color to enter the STEM field through supporting students in realizing the strength of mathematics in lifting up their voices. This particular lesson is connected to her on a personal level, as her mother's job involves providing lunches for a Title I school where many students are provided free breakfast and lunch.



Frances K. Harper taught mathematics and reading across PreK–12 for 9 years in diverse urban settings in Tennessee, Massachusetts, and Kanagawa, Japan. As a white, cis woman and first-generation college graduate, she strives to understand and amplify the perspectives of students and families who have been systematically marginalized in mathematics.