



Having children prepare healthy treats offers them fun activities in counting, fractions, and measuring.

Eating up mathematics

Young children regularly learn important math concepts from examining the world around them. As a matter of fact, for the first five years of life, they construct math through everyday interactions with parents and caregivers (Geist 2008). Daily activities, such as snack time and lunch, can serve as mathematical opportunities. When children distribute plates or crackers, they learn one-to-one correspondence. When they have a bowl of raisins, a parent can ask, How many? and count them with the child. And when cooking food, the mathematical opportunities increase exponentially.

Funded by the National Institutes of Health (NIH), FoodMASTER (www.foodmaster.org) has developed a number of activities to help teachers of young children recognize the mathematical opportunities found during lunch and snack time. Quantity relationships, such as more and less; composing and decomposing numbers by grouping; patterning; and measurement are a few of the mathematical concepts for students to experience in FoodMASTER's preschool activities (Phillips et al. 2004). This article shows how two of these activities, Open-face sandwiches and Healthy cereal choices, offers students not only a fun, tasty, and healthy treat but also a lesson in counting, fractions, and measuring.

Developmental milestones

The preschool years are the first steps of children's learning journeys. Their mathematical understanding takes a big leap forward as they strengthen their ability to represent using manipulatives, symbols, and signs. As early as the age of two, children can hold up fingers to indicate a quantity, regardless of accuracy. By age three or four, children are learning to count. The FoodMASTER program uses cooking activities to support the construction of counting and understanding numbers. A two-year-old's budding love of imaginative play and

ability to imitate others in the environment makes a play kitchen invaluable. Children can group and categorize types of food and use the items in the kitchen as a basis for counting. For example, such a simple question as, How many eggs do you have in your pan? can elicit an excited response of "Two."

Most young children can also tell you which number comes next in a sequence. For example, if you count *one, two, three, four, five* and ask what comes next, the child could say "Six." However, at this stage, understanding the corresponding quantity is not a certainty. Two- or three-year-olds can determine what to say next, but they are still constructing the concepts linked to those numbers. Think of children who can say their ABCs but still have trouble understanding that "ellemino" are all separate letters. With math and quantity concepts, rote counting usually comes before the ability to understand conceptually.

In addition to developing number sense, using food can also develop geometric thinking, as we will see in the Open-face sandwiches activity (see fig. 1). Children can learn to recognize and name shapes that have different sizes and orientations. Children are also learning and using such directional words as *up, down, over, under, and between*.

Developing number sense

In an activity focused on healthful cereal choices, the teacher pointed out separate bowls of Toasted O's; whole-grain corn squares and whole-grain Goldfish® crackers; raisins; and dried plums, apricots, bananas, and pineapples. After washing their hands, the children were told that they could take some pieces from the bowls. We noticed that as they began to interact with the food and place it on their plates, the children used mathematical concepts, such as classification, patterning, and seriation. Some children sorted the fruit on their plate by type; some outlined shapes with the raisins; and others lined up the different fruits from smallest to largest. All the while, they were exploring the ingredients and making comments about how they looked and what shape they were, as well as wondering how they might taste.

Sorting the fruit by some characteristic is *classifying*, and putting items in a row from

FIGURE 1

Using food can help preschool-aged youngsters develop number sense and geometric thinking, learn to recognize and name shapes of different sizes and orientations, and learn and use directional words.

Classroom Activity

Open-face Sandwiches

1 slice BROWN whole wheat bread, lightly toasted
1 slice WHITE whole wheat bread, lightly toasted
Easy-to-cut soft spreads, such as soy butter, light whipped cream cheese, or fruit spread
Choice of garnishes appropriate to holiday or seasonal theme —
Possibilities include sliced black olives, chopped herbs, sliced fruit, grated carrot or beets, thinly sliced bell pepper, chopped tomatoes

1. WASH HANDS for 20 seconds (sing Happy Birthday song 2 times).
2. Use large holiday or seasonal cookie cutters to cut shapes from both kinds of bread.
3. Use plastic knives to spread topping; use garnishes to decorate — for example, for St. Patrick's Day, use clover-shaped cutter and garnish with chopped parsley; for spring, use egg-shaped cutter and garnish with grated carrot; for zoo theme, use animal-shaped cutters and garnish with sliced olives for eyes.
4. Spreading can be a challenge — remind children to "push down and spread out." It will be easier if bread is lightly toasted.
5. Children may enjoy eating leftover bread bits, or you may cube them and use to feed wild birds.



Checkerboard Sandwiches

1 slice BROWN whole wheat bread
1 slice WHITE whole wheat bread
Easy-to-cut sandwich fillings, such as soy butter and fruit spread

1. WASH HANDS for 20 seconds (sing Happy Birthday song 2 times).
2. Spread sandwich fillings on bread slices and put together to make sandwich.
3. Cut sandwich into three horizontal strips. Cut each strip into 3 squares. Turn four or five of the squares upside down.
4. Arrange squares on plate, alternating colors as needed to resemble a checkerboard. Let children experiment with making different patterns.

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smallest to largest is *seriation*. Using the same materials, the children could create, describe, extend, or expand patterns. For example, if a child put out two raisins and one banana, the teacher could say, "Hey! You made a pattern," and then help the youngster extend the repeating pattern.

For young children, the formal idea of fractions is still a hard-to-grasp concept. However, they can see that when you have one strawberry and you cut it down the middle that you suddenly have two pieces. Evenly distributing

a piece of food, like a granola bar or a cookie, can also give youngsters experience with understanding *wholes* and *parts of wholes*.

After these preschoolers had looked at and had tasted all the ingredients (unless they had absolutely refused to), the teacher showed them how to make their own bags of trail mix to take home. The youngsters were told they could mix between one and four scoops of any items they wanted as well as create a name for their trail mix. Most names were along the lines of "Michael's Trail Mix." However, some children were more creative, with such suggestions as "A Bag of Goldfish Eating Raisins" and "Banana Raisin Surprise."

Students received a sheet of paper with the name of each ingredient on it. As they placed each item into their bags, they counted the scoops by placing a tally mark on the paper next to the name of the ingredient. This exercise focuses on counting and recording numbers. On the basis of the number of scoops for each ingredient, each student then created a recipe to include in the class cookbook.

The process of making the cookbook also

involves math concepts. The children discussed how many recipes to put on each page, how big the book was going to be, and how many pages it would have. They had to decide how many copies of the book to make so that everyone who would want one could get one. Students and teachers alike were so engaged by their fun food activities that the mathematics became a natural part of their everyday activities.

Developing geometric understanding

The everyday process of making a sandwich includes many positional words:

One piece of bread goes on the *bottom* of the sandwich. Then we put a piece of ham on *top* of the bread, and—if you like—add mustard on *top* of the ham. Then put another piece of bread *over* the ham. Now the ham is *between* the two pieces of bread.

Cutting the sandwich into different shapes, possibly even changing the shape each day, can

A messy but tasty lesson helps children explore various shapes and numbers.



support children's understanding of shapes.

Children also make strides in algebra and patterning. As mentioned, children can sequence events in time by the age of three. By four, children can re-create patterns or make their own repeating pattern (Geist 2008). Again, the sandwich-making activity, where steps happen in a sequence, is a good example. Ask students if it makes a difference in which order you do each of the steps. If they say no, then have a humorous interaction trying to make a sandwich by starting with the mustard.

Peg, a teacher of three-year-olds, enjoys using food in the classroom. She embraced these activities with a great deal of excitement. Peg started the lesson by having students wash their hands and sit at a table. Even the act of hand washing can involve mathematics. To help students focus on washing for an appropriate amount of time, Peg often encourages them to count down from ten or twenty.

While sitting at their tables, students received one slice of bread each. The teacher and researchers then gave each child a spoon, a small bowl of jelly, and a bowl of softened, reduced-fat cream cheese (see fig. 2). All the children approached this task very seriously. Peg noted how intensely they seemed to be concentrating on their motor skills and trying to spread the cheese and jelly just right. She asked, "Now, if we want to make a sandwich, what do we need to do next?"

When a child answered, "Put one slice of bread on top of the other," Peg questioned further: "What if we put the other piece of bread under the one with the jelly on it?"

"Ms. Peg," laughed a second student, "You are just being silly!"

"Am I? Why is that?"

"Because *that* is not a sam'ich! The bread has to go like this [*putting bread on the top*]."

The children then received bowls of assorted cookie cutters. Each child took a little different approach. Some pressed the cookie cutter down as hard as they could; others pushed the cutter into the bread and left it in place while they pulled pieces of bread from around it. One of the researchers instructed, "Here you go! You can choose the cookie cutter that you want."

"I want the circle!" cried Maddie.

FIGURE 2

FoodMASTER has developed a number of activities to help teachers recognize the math opportunities in such quotidian activities as snack times, lunch times, and cooking food.

Classroom Activity

Healthful CEREAL Choices

Eating whole-grain breakfast cereals is one of the best ways to include nutritious whole grains in the diet, but some whole-grain cereals are also very sugary. Children can learn to enjoy unsweetened cereals through positive experiences with cereals prepared in a variety of different ways.

Food companies have clever marketing tricks to make cereals look more healthful than they really are, so it's important to compare the Nutrition Facts on cereal packages to make the wisest selections. See the guidelines for label reading that are included in the accompanying *Family Resource* take-home sheet.

Activity Objectives:

Children have positive tasting experience with a variety of unsweetened whole-grain cereals while working cooperatively to prepare and package a simple snack.

Materials:

- Recipe ingredients
- One-cup solid measuring cups
- Large bowl
- Mixing spoon
- Small goody bags

Discussion Points:

- Ingredient shapes, textures, colors
- Compare taste and crunch of one ingredient to another
- When do we usually eat cereal?
- Does cereal make a good snack?
- What else do you usually eat for breakfast? for snack?
- What is cereal made from?
- Do treats have to be sweet?

Children can participate by:

- Filling up measuring cups with ingredients
- Mixing ingredients together
- Transferring mix to individual snack bags

Recipe: Halloween Trail Mix

2 cups toasted-O's cereal, such as classic Cheerios®
2 cups whole-grain corn square cereal, such as Corn Chex®*
2 cups whole-grain goldfish crackers*
1 cup mixed dried fruit

1. WASH HANDS for 20 seconds (sing Happy Birthday song 2 times).
2. Mix all ingredients in a large bowl.
3. Scoop out into holiday-themed goody bags.

Makes 7 cups of snack mix. One serving is about 1/2 cup.

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Serena quietly murmured, "I do not need a cookie cutter. I am just going to cut mine."

One child did not seem to be making a shape, so a researcher asked him, "What shape is that? Do you need any help?"

Cutting the crust off his sandwich, the student replied, "No, I just don't like the crust."

"Look, it's a flower!" observed another student.

With each design that the children crafted, the teacher and researchers asked such questions as the following:



These preschoolers chose and mixed ingredients, then named their own take-home trail mix.

- **How** many pieces do you have now?
- **What** shape does that look like?
- **How** many sides does that shape have?

The teacher gave the children ample time to play with this activity, explore their sandwich, and answer the questions. This lesson is a bit messy, which is to be expected with an interactive food activity. The children had cheese and jelly stuck to their hands—and some had it on their clothes—but they all had a wonderful time exploring and learning various shapes as well as working with numbers.

Extending classroom experiences

Food plays a central role in a family structure, so every lesson created has a take-home component. These are meant to inform parents on what is taking place in the classroom at school and give them tools to reinforce these concepts at home. For example, suggestions to parents include supporting classification by asking students to sort different shapes of pots and pans or different types of foods used in recipes. In the kitchen, many chances to reinforce counting also exist: Ask a child, How many eggs do you have in your bowl? Or you might suggest, Let's count the strawberries together. Asking the child to bring three carrots or two eggs or showing them how to cut one carrot into four equal pieces will generate not only mathematical understanding but also excitement for both cooking and math.

PEGGY NOVOTNY

Before you know it, the whole family is learning math and spending quality time together.

REFERENCES

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essential understandings

Teachers need to understand the big ideas of mathematics and be able to represent mathematics as a coherent and connected enterprise (*Principles and Standards for School Mathematics*, NCTM 2008, p. 17).

The *Teaching Children Mathematics* Editorial Panel agrees and is searching for articles that share ideas and lessons to make the big ideas of mathematics (place value, equivalence, patterns, measurement, shapes and solids, etc.) accessible to all students. We consider the essential understandings of mathematics to be those central ideas that are coherently connected, vertically and horizontally, across mathematical topics and grade levels. Additionally, we are also interested in the ways the big ideas can be connected across various content areas (history, science, visual arts, geography, music, reading, language arts, etc.).

Your article should include, but is not limited to the following:

- A clear description of a “big idea” in mathematics and why you consider it to be an essential understanding
- Illustrations of activities that could be used by elementary school teachers, mathematics coaches, or school-based mathematics specialists to focus on the big idea either across mathematical topics, grade levels, or various content areas
- A description of how the activity or activities reach all students, along with suggestions for differentiating within or beyond the recommended grade level
- Classroom artifacts, such as students’ work, photographs, and excerpts of classroom dialogue
- Reflections on what you found challenging about your work in focusing on a big idea, as well as cautionary advice for others

Limit manuscripts to 2500 words; attach figures and photographs at the end of the document. Submit completed manuscripts to *Teaching Children Mathematics* by accessing tcm.msubmit.net. Author identification should appear on the cover page only.

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