Chapter 6

Cooking Transformations

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Cooking is one of the most popular and satisfying activities conducted in constructivist classrooms. It appeals to children's interests, invites experimentation, and fosters cooperation among children. It also teaches children independent living skills; provides opportunities to integrate math, science, literacy, and social studies in meaningful activities that children find interesting and challenging; and fosters autonomy by allowing children to prepare and eat food in the classroom.

In this chapter we describe how cooking is typically presented in Classroom Types A, B, C, and D; discuss issues that must be resolved before bringing cooking into the classroom; and present seven principles of teaching illustrated with stories, primarily from a Head Start classroom. Finally, we describe how cooking provides opportunities to integrate across curricular domains.

COOKING IN CLASSROOM TYPES A, B, C, AND D

Although food and nutrition are important components of early childhood science curriculum, early childhood educators do not generally consider cooking itself as part of the science program. Many teachers, including those in Types A and B classrooms, tend to conceptualize science solely as content knowledge. Teachers in Types C and D classrooms regard science not only as content but also as a process of individual and cooperative hypothesis generating and testing, experimentation, and problem solving. Constructivist Type D teachers view cooking activities as opportunities to stimulate children's scientific reasoning. The approaches to cooking typical of each of the four types of teachers are described in more detail below.

Classroom Type A

Cooking rarely occurs in Type A classrooms. Children in these classrooms study the food pyramid and learn about the variety of foods within different

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food groups. For example, they may classify pictures of foods into the categories of fruits or vegetables. If cooking does occur, it is typically related to class parties or celebrations of special holidays and is not connected to the science curriculum. For example, children might be given the opportunity to decorate a prebaked gingerbread man with cinnamon candies or raisins at a winter celebration.

Classroom Type B

Teachers in Type B classrooms present cooking experiences as a product-oriented activity to be carried out mainly by the teacher. Although they may allow individual children minimal participation in carrying out the specifications of a batch recipe, such as adding one cup of flour to the bowl or stirring the ingredients, the teacher remains in charge of the activity. Science goals center around the nutritional aspects of food. In many Type B classrooms, teachers use cooking experiences as opportunities for children to address goals in other curricular areas such as following directions, engaging in sequencing activities, "reading" recipes, observing measurement activities, or addressing safety practices—goals clearly not related to the development of scientific understanding and knowledge. Frequently, cooking activities take on the flavor of an arts and crafts experience. For example, after reading *The Gingerbread Man*, children are instructed to replicate the teacher's pattern of a gingerbread man by counting out three cinnamon candies for buttons, two raisins for the eyes, and one piece of licorice for the mouth. This objective centers on children's counting skills and their ability to duplicate simple patterns rather than on the development of scientific knowledge.

Classroom Type C

Cooking serves a broad variety of functions in Type C classrooms. As in Type B classrooms, teachers use cooking activities to promote children's understanding of nutrition and their ability to classify foods by food groups. Cooking opportunities frequently resemble arts and crafts activities, although children are provided more opportunities to make choices and express their individual creativity than children in Type B classrooms. For example, after reading *The Gingerbread Man*, children may be given the choice to cut out and decorate their own gingerbread man. Teachers in Type C classrooms initiate young children in food preparation through cooking experiences such as Ants on a Log, in which children fill celery sticks with peanut butter and place raisins on the top. As children carry out these simple preparations, teachers also introduce basic hygiene and safety measures to young children.

Teachers in Type C classrooms often see cooking experiences as opportunities to enhance and integrate academic areas such as mathematics and literacy. For example, the teacher may write and illustrate the recipe for Ants on a Log, and encourage children to count how many celery sticks and raisins they will need. Teachers in Type C classrooms see cooking as an opportunity for children to engage in hands-on activities in which manipulating and using real objects is considered sufficient for children's development of knowledge. However, children's understanding of the regularities and relationships that can be formulated through the process of cooking is not recognized or supported. Unfortunately, many cooking activities ignore the invisible aspects of chemistry that appear to young children to be magic. For example, when cooking muffins in the classroom, teachers fail to invite children to explore why some muffins rise and others do not. As a result, children cannot see the connections between their actions and the resulting products.

Classroom Type D

Constructivist teachers in Type D classrooms include cooking as part of the science curriculum. Like Type C teachers, they recognize how cooking provides multiple opportunities for integrating curriculum, for increasing children's knowledge of food and nutrition, and for developing children's awareness of the important hygiene and safety measures related to food preparation. Additionally, constructivist educators view cooking experiences as having potential for stimulating children's scientific reasoning. Cooking activities are highly motivating to children and offer them real and purposeful opportunities to develop questions, test out their reasoning, encounter contradictions, and revise their ideas—that is, to construct knowledge. For instance, children have opportunities to notice what occurs when liquid is added to a dry mixture. Because the constructivist teacher does not insist that they follow the recipe, children may notice that their end product does not look the same as a peer's. Teachers encourage children to focus on these invisible aspects of chemistry and attempt to identify what might account for the observed differences.

Gwen Harmon, a constructivist Head Start teacher, realized that her 3- and 4-year-olds did not understand why muffins "grew" in the microwave. To them it was magic. One day when they ran out of muffin mix (see Figure 6.1), she posed the following problem: "We have a problem because we have run out of muffin mix. Do any of you have any ideas about what we should do?" The children replied that they needed more "white powder." They got a bag of flour from the pantry and proceeded to make muffins as they had in the past. However, the muffins did not "grow" and tasted terrible. Gwen

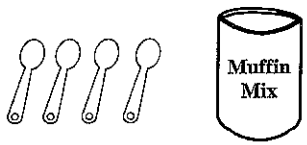
Muffin Mix:

8 cups flour
1 ½ cups dried milk
¾ to 1 ½ cups sugar (see note below)
4 tablespoons baking powder
1 tablespoon salt

Mix everything together and store in an airtight container. Makes enough mix for approximately 45 muffins.

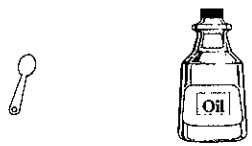
Muffin Recipe

4 tablespoons muffin mix
(see recipe above)



3 half-tablespoons water
(not 3 and ½ tablespoons!)

1 teaspoon oil



Put everything in a small bowl and stir lightly.

Pour into a paper cup.

Bake in a microwave oven on high for approximately 45 seconds
(cooking times may vary).

FIGURE 6.1. Muffin recipe

asked if they had any ideas about how to make the muffins taste better. Over the course of the next few days the children suggested adding other white powders such as sugar and salt to the recipe and while the muffins improved in taste, they still did not grow. At this point, Gwen showed them a new white powder, baking powder. She explained that baking powder helps muffins to grow and added it to the children's muffin mix. As children made muffins that day they congregated around the microwave peering into the window. "Look, it's growing!" "Mine is getting big!" A few days later, children informed visitors to the class that it is the baking powder that makes the muffins grow. Although the children certainly did not understand all of the chemical interactions occurring as the muffins baked (neither do most adults), they no longer saw making muffins as simply magic.

BRINGING COOKING INTO THE CLASSROOM

Before introducing cooking activities in the classroom, several important issues must be considered. These concern the children's readiness for cooking, important safety and hygiene considerations, and other curriculum in place in the classroom.

Young Children's Readiness for Cooking

Even 3-year-olds can do some cooking, with support. Understanding what children are capable of doing will help when choosing appropriate recipes. Sometimes, young children are so fascinated with the ingredients of the recipe they cannot focus on the cooking aspect of the activity. A story from a Head Start classroom illustrates this point.

Near the beginning of the year, Christie Sales and her teaching partner, Gwen Harmon, were anxious to begin cooking, and chose the muffin recipe in Figure 6.1. At group time Christie demonstrated how to make a muffin. She showed the children (ages 3 and 4 years) how to measure by leveling off their measuring spoons with a wooden tongue depressor and how to measure and add water and oil without spilling. During the following few days, she sat at the cooking table during activity time, helping each child who chose to make a muffin. After witnessing successful muffin making and appropriate use of the materials, she decided to allow the children to make their muffins independently, with adults nearby to supervise the use of the microwave.

Checking in later to see how the muffin making was progressing, she noticed that few children were really measuring. Most children were just dumping ingredients in the bowl. Christie explained to Gwen that these were

beginning steps and that experimentation was necessary. She predicted that when the children saw the results—inedible goo—they would begin to follow the recipe. However, a short time later a classroom volunteer called her attention back to the cooking table where one child was holding the bottle of oil upside down and squeezing. The child watched, fascinated, while oil ran everywhere.

As Christie and Gwen reflected on the incident at the end of the day, they realized that the children were not interested in measuring. They were interested in dumping! The teachers decided to follow the children's interest and filled the sand table with flour, bowls, measuring cups, measuring spoons, spoons for mixing, and other large and small containers. The children flocked to the flour table. They made make-believe pies and birthday cakes and muffins. They poured and dumped and leveled. When interest at the flour table diminished, the teachers introduced the idea of making a papier-mâché piñata. They showed the children how to make paste using water and flour. The children experimented with different consistencies and figured out the logico-mathematical relationship that the more water they added, the runnier their paste became. Likewise, the more flour they added, the thicker it became. At this point the teachers decided that the children were ready to make muffins. However, they eliminated the oil from the recipe and made them only with muffin mix and water. The children continued to experiment, but they were no longer dumping. After several weeks, when they were confident of the children's ability to follow the recipe more accurately, they returned the oil to the recipe with great success.

Safety and Hygiene

As most adults realize, cooking exposes young children to potential dangers—primarily heat, sharp objects, and germs. As teachers, our task is to minimize these dangers so that children can safely engage in cooking. Safety and hygiene are excellent examples of content that is appropriate to tell children directly because this is not something they can easily discover on their own. Young children have difficulty understanding the necessity to wash hands, utensils, and cooking surfaces because germs are not observable, and neither are the effects of not adhering to good hygienic practices. It is possible to cultivate germs in culture dishes and thus make them visible to children. However, making a connection between germs in a culture dish and good hygiene practices for cooking is beyond the comprehension of most young children. They simply do not understand why they should wash their hands before cooking or refrain from licking the mixing spoon. Even when the teacher explains the rules, these injunctions may feel arbitrary to young children. The teacher must simply insist upon them as rules for cooking.

Safety rules must also be discussed with children and enforced, and teachers must arrange the cooking environment to be safe. Disposable plastic knives are surprisingly effective for cutting up fruits and vegetables (although no knife is totally safe). Microwave ovens are much safer than conventional or toaster ovens; consequently, when a recipe requires heat, we prefer using a microwave. Electric skillets can be used in early childhood classrooms with supervision, and can be made safer. Christie constructed a wooden frame that fits over an electric skillet so that when children inevitably rest their arm on the edge of the skillet, they do not get burned. One wonderful idea that came from a child is to use children's heavyweight mittens as pot holders. They are the correct size for children and are readily available.

In addition to telling children the safety rules, teachers must provide supervision for all cooking activities that involve risk. In practical terms, this means that if one is introducing a new piece of equipment that requires close supervision at first (say, a blender), one should not have another activity taking place during activity time that also requires close supervision.

Concurrent Curriculum

Because cooking activities are extremely popular, it is especially important to provide an abundance of other interesting and engaging activities in addition to cooking. Otherwise, what will happen is a crush of children all wanting to cook at the same time. This can be a disaster and can discourage even the most experienced teacher from ever again including cooking in the classroom. To avoid this, be sure that children have other activities to capture their interest while they are waiting for a turn at the cooking center. Depending on the recipe, this may also mean the same cooking activity will need to remain available for several days or even weeks until all children have had the chance to make it several times or until interest wanes.

PRINCIPLES OF TEACHING

We have synthesized our years of conducting and observing cooking activities with young children into seven principles of teaching discussed below.

1. Choose Recipes That Offer Something Challenging for Children to Do

To do this, one must have a good understanding of what the children are capable of doing and what they would find challenging. While recipes such as Cracker Spiders (a sandwich made with 2 round crackers and peanut

butter, with 8 pretzel stick legs sticking out)—a category we refer to as "cooking crafts"—are occasionally appropriate, they are generally challenging only to the youngest children. These recipes may serve other useful purposes such as providing children with the incentive to try unfamiliar and healthy foods. However, a steady diet of such recipes will not serve to promote the reasoning and construction of knowledge we have as our constructivist goals.

The general goal of constructivist cooking activities is the construction of physical and logico-mathematical knowledge. One must therefore make a thorough analysis of the recipes in order to understand what opportunities they afford children to construct regularities and relationships. As pointed out earlier, regularities are those things that always happen. They can be thought of as general laws. For example, heat changes things. This is true most of the time with cooking. Heat makes some things (such as eggs) harder, while it makes other things (such as potatoes) softer. Once they have noticed regularities, children can move on to construct relationships between what they do and the outcome they obtain. For example, children have the opportunity to discover that the longer you cook an egg, the harder it gets. This is a cause and effect relationship between the length of cooking time and the consistency of the egg. Cause and effect relationships are at the heart of scientific reasoning.

One clue to selecting a recipe that offers opportunities for scientific reasoning is whether or not the recipe is foolproof. A recipe is foolproof when nothing in it varies. With nothing to vary, nothing can happen except what is predetermined, and therefore little reasoning is necessary. Recipes such as Cracker Spiders and Ants on a Log tend to be relatively foolproof. Generally, these recipes involve placement of uncooked or precooked foods in certain arrangements so that the food preparation resembles a craft activity rather than a cooking activity. Children have few opportunities to construct cause and effect relationships in these recipes.

2. Make Recipes That Children Can Read on Their Own

Recipes should be selected and designed so that children can follow them with little help from the teacher. Depending on the age of the children, this may mean creating recipes with illustrations and few words. The fruit smoothie recipe in Figure 6.2 is a very simple recipe that can easily be illustrated. As children become familiar and comfortable in "reading" recipes, the text accompanying the recipe may be lengthened. Repeated exposure to the same recipe assists children in recognizing words that regularly appear, such as *cup*, *mix*, and *spoon*, and for some children results in a base of sight words related to cooking. For younger children it is not necessary to label the cup as one-fourth cup. It can simply be represented as one small cup. As

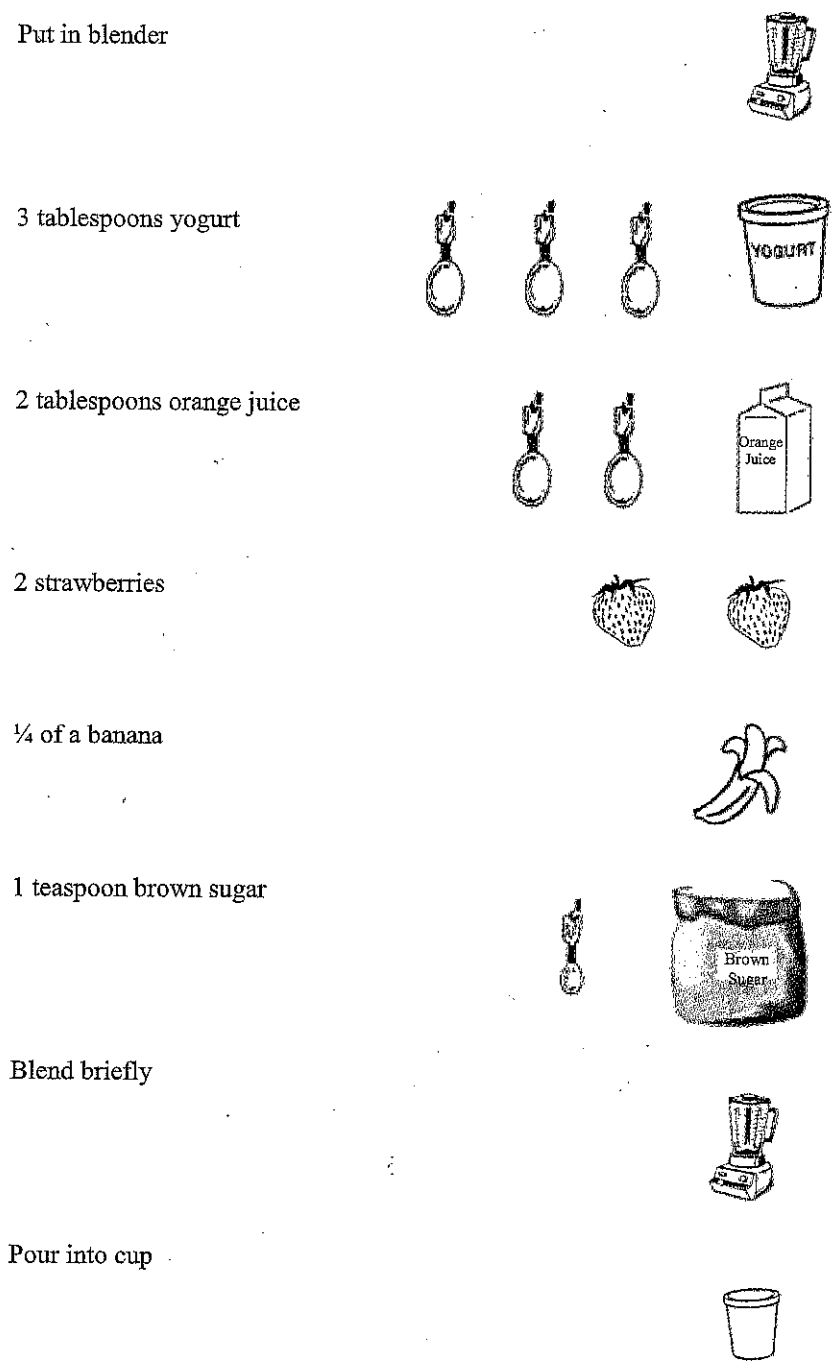


FIGURE 6.2. Fruit smoothie recipe

children progress to more complex recipes, the size of the illustrations can guide the children in following directions. In the muffin recipe (Figure 6.1), the size of the spoons ranges from big to small. Words such as *big*, *medium*, and *small* can be substituted for specific measurements of *tablespoon*, *half-tablespoon*, and *teaspoon*.

Recipes may be presented as posters, laminated recipe books with one direction per page, or loose-leaf recipes with one direction per page placed in sequence at the cooking station. The sequenced pages could be attached to a line with clothespins. These can be used over and over and are fairly inexpensive to make, especially if you have access to a computer, a printer, and a laminator. In Figure 6.3 we list books of children's recipes that we think are excellent. Having a recipe to follow gives children a reason to decode words and attempt to read. It also emphasizes children's autonomy in that children can regulate their actions in relation to the recipe.

3. Plan Cooking Activities That Mainly Can Be Done in Small Groups or Individually

Occasionally the teacher may want to do a whole group cooking activity such as making stone soup after reading the folktale *Stone Soup* (Brown, 1947; Forest, 1998; McGovern, 1968, 1986). In general, however, it is better to allow children to work with one or two other children (or even alone). This way, they have more opportunities to be autonomous and experimental.

Children can also work in pairs to prepare food for the entire class. With the teacher, two children decide the day before what they want to prepare (from a collection of familiar snack recipes); check to see if all of the ingredients are available; and, if necessary, make a shopping list for the teacher. The next day, they prepare enough snack for the entire class and serve it during snack time. This contributes to a sense of community as children take on the responsibility for providing food for their classmates who have a chance to express appreciation to the cooks.

Making individual portions provides opportunity to make comparisons between one's own and a peer's result. This helps children in constructing the relationships described above. An anecdote from Gwen's classroom provides a good illustration of the cooperation and learning fostered between children when they are allowed to cook side by side with little or no teacher intervention. From across the room, Gwen heard Chondra say, "You don't know what you are doing." She looked up and saw Chondra take Jerry's cup full of muffin batter out of his hand and pour it back into his mixing bowl. She stirred it until the batter was smooth and sticky, poured it back into the paper cup, and handed it back to Jerry who placed it in the microwave oven to cook. This may seem like an insignificant incident to a casual

Johnson, B. (1998). Cup cooking: Individual child-portion picture recipes. Beltsville, MD: Gryphon House.

Katzen, M. & Henderson, A. (1994). Pretend soup and other real recipes: A cookbook for preschoolers and up. Berkeley, CA: Tricycle Press. (This beautiful book by the author of the Moosewood Cookbook contains simple and healthful vegetarian recipes with easy to "read" illustrations.)

University of Illinois at Chicago Children's Center. (1985). I made it myself: A cookbook for young children. Chicago: UIC Children's Center. (This simply worded and illustrated cookbook contains 14 recipes that can be separated from the spiral binder. It can be obtained from Epicenter Bookshop, Chicago Circle Center, University of Illinois at Chicago, 750 South Halsted Street, Chicago, Illinois, 60607.)

Veitch, B. & Harms, T. (1981). Cook and learn: Pictorial single portion recipes. Menlo Park, CA: Addison-Wesley. (This book contains illustrated, extremely easy-to-read recipes, many of them single portion.)

FIGURE 6.3. Cookbooks for children

observer, but to Gwen, it revealed much about the two children and the success of her curriculum. It told her that Chondra knows a lot about making muffins and has made a relationship between the way the batter looks before it goes into the microwave and what it looks like when it comes out. She knows that if it goes in without being thoroughly stirred, it will not make a good muffin. This incident also showed Gwen something about how Chondra uses her language and social skills. Rather than taking ownership of his muffin, she handed it back to Jerry after she stirred it. This incident also says something about Jerry and his ability to see another child in the classroom as an expert. Jerry did not complain to the teacher, "She took my muffin," as might be expected from a child this age. Instead, he seemed to recognize her helpful intention and waited patiently while Chondra showed him how to improve his muffin. All of this occurred without any teacher intervention.

4. Do Not Insist That Children Follow Recipes Precisely

Another story about muffin making in Christie's class illustrates how deviations from the recipe can result in construction of knowledge. She always demonstrates how to make a muffin, but children frequently pay little attention to the directions and are inaccurate in their measurements. This often

results in mixtures with too little or too much liquid. When the mixtures have too little water, they are often very powdery and do not rise when they are cooked.

For several days Christie had been observing Jonathan make muffins. Every time, he either spilled most of the water out of his measuring spoon before adding it to the muffin mix or would not fill the measuring spoon all the way to the top. He would pour the crumbly batter into a paper cup, place it in the microwave oven to bake, and in 45 seconds retrieve a muffin that was no taller than it was when he placed it into the microwave. Finally, Christie said, "Jonathan, why do you think you always get such a short muffin?" "It didn't cook long enough," he answered. "Do you have any ideas about how you could make it taller?" she asked. "Cook it some more," he said. Knowing that he would not believe her if she told him this would not work, she asked, "Do you want to try that?" He nodded, put the muffin back in the microwave, and cooked it longer. Soon the room was filled with the scent of burning. When Jonathan retrieved his muffin, it was almost black in the center. He looked at it dejectedly. Christie said, "I see you are upset. Were you surprised your muffin burned?" He nodded. "Would you like to try to make another one?" He nodded again. "You know," she said, "I noticed that Lee makes really tall muffins. Maybe you could ask him what he does to get them to be so tall." Together they went to find Lee. Lee consented to show Jonathan how he makes a muffin. A few days later Christie observed Jonathan making another muffin. He very carefully poured water into his measuring spoon, filling it all the way to the top. Then slowly he moved it over the mixing bowl and poured the entire spoonful into his muffin mix. It appeared that Lee taught Jonathan the importance of measuring accurately.

This story contains an excellent example of how a constructivist teacher respects children's reasoning and fosters experimentation by encouraging them to try out their ideas. Jonathan had watched other children's muffins cook in the microwave. He had observed that as they cooked, they grew taller. He concluded that the longer you cook a muffin, the taller it gets, and that therefore he needed to cook his short muffin longer. By allowing him to burn a muffin, Christie helped him to discover for himself that his idea was erroneous.

This story also shows how cooking can contribute to the sociomoral atmosphere by promoting cooperation among children. Rather than telling Jonathan how to make a tall muffin, she referred Jonathan to Lee. This accomplished several purposes: It strengthened the relationship between Jonathan and Lee; it showed Lee that the teacher recognized his ability to make muffins; and it showed both boys that children can be teachers too.

5. Allow Children to Make the Same Recipe Many Times

It takes a long time for children to become familiar enough with a recipe to begin to notice and make sense of the regularities and relationships embedded in the activity. This familiarity is also necessary for young children (especially prereaders) to begin to "read" the recipe. The muffin recipe, for example (Figure 6.1), calls for 4 tablespoons of muffin mix, 3 half-tablespoons of water, and 1 teaspoon of oil. After children have had experience making muffins, they become aware of the seriation of the spoons (large, medium, and small).

Because children benefit more from making a few recipes many times than from making many recipes once, this means that one need not invest in massive quantities of recipes. A few basic ones are sufficient until children have mastered these and ask for more. Choice of particular recipes depends on the backgrounds of the children, the types of foods they are accustomed to eating, the foods available, and the budget. We have found that a good collection of recipes for a preschool or kindergarten class includes muffins, fruit shakes or smoothies, pancakes, french toast, quesadillas, dips (both fruit and vegetable), pudding, sauted zucchini, glazed carrots, noodle soup made with ramen noodles, and oatmeal.

6. Encourage Children to Create Their Own Recipes

When children have become familiar with a few basic recipes, they can begin to suggest variations. For example, in Gwen's classroom where the children had many experiences making banana yogurt shakes in a blender, the children decided they wanted to make a different type of shake. They had a class discussion in which they talked about several different options and decided on peaches. One child then suggested that they try ice cream rather than yogurt in the shakes; so they made a shopping list for the teacher, and the next day they made their peach shakes.

Sometimes children are simply curious about what will happen when they mix certain ingredients together. The results of these experiments are usually not successful from a culinary standpoint. This introduces the controversial subject of wasting food. For some people and some cultures, using food for activities other than meals is considered a violation of a primary value. If this is the case, then allowing children to experiment with combining and cooking different ingredients may not be appropriate. However, if wasting some food in the interest of education is acceptable, then allowing children to experiment with cooking different foods in different combinations can be fruitful.

7. Plan for Messes

Cooking generates messes under the best of circumstances. Add in young children whose motor coordination is not fully developed, and you have a recipe for possible disaster. This should not be a deterrent to cooking. Instead, the teacher can develop strategies for minimizing the mess, making clean-up go smoothly, and turning over responsibility for clean-up to the children.

Cooking is best conducted on a noncarpeted floor and, if at all possible, near a source of water. However, this is not always possible. Christie once taught 4-year-olds in a classroom without a water source. She used two small garbage cans with lids. She taught the children to fill one can by siphoning water from the sink in the bathroom and pulling the can on a cart into the classroom. The other can was for the dirty water. She placed the cans on either side of a small table and put a wash basin, a pitcher, soap, sponges, and towels beside the basin. When the children needed water, they used the pitcher to dip clean water and pour it into the basin. When they were finished, they dumped the dirty water into the dirty water garbage can. This system worked quite well.

Lots of cleaning supplies should be available to children—sponges, rags, paper towels. Diluted vinegar in a spray bottle is excellent for clean-up. It is nontoxic, cheap, and effective. A mop and bucket with a mop squeezer attached to it is invaluable for getting children to clean up floor messes and should be standard equipment in every classroom (not just for cooking). A mop handle can be cut off so that it is the correct height for children. Using the mop squeezer to squeeze water out of the mop is a physical-knowledge activity in and of itself. Also, the children love it because it makes them feel grown-up.

INTEGRATING CURRICULUM IN CONSTRUCTIVIST COOKING ACTIVITIES

Many of the skills and experiences that occur as children engage in science activities also enhance children's development in other curricular areas. Specifically, cooking provides opportunities to integrate language arts, mathematics, and social studies (as illustrated by the content web for the muffin-making activity in Figure 6.4). For example, as children follow recipes, they have opportunities to read and make sense of the words and drawings. Oral and written language skills and vocabulary are developed as children express hypotheses, discuss their experiments, and compare their results. In relationship to mathematics, children read numerals, draw one-to-one correspondences between the drawings in the recipe and the materials, seriate measur-

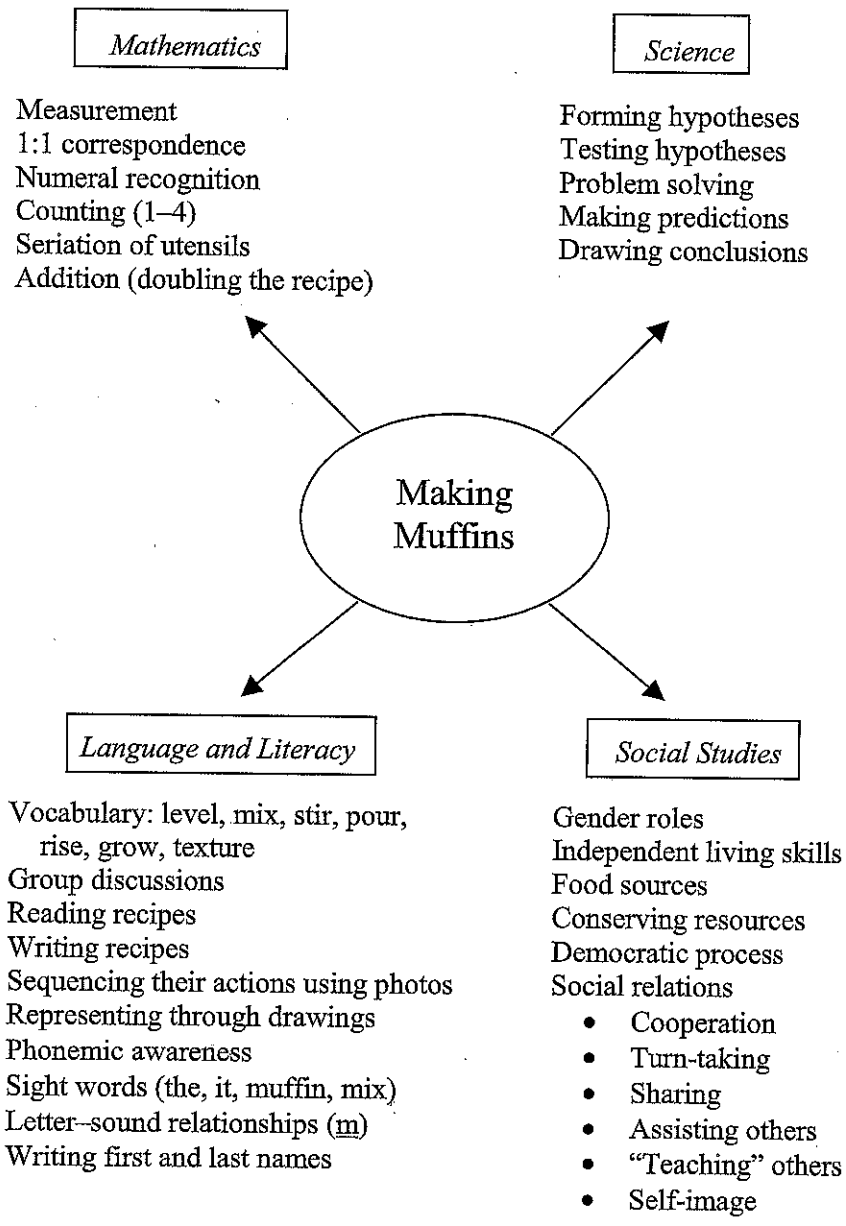


FIGURE 6.4. Web of content domains in making muffins

ing utensils, and engage in the operation of addition as they double a recipe to make enough to share with a friend. Cooking links to social studies content by promoting discussion of gender roles, development of independent living skills, and investigations of the food production and distribution system. In preschool classrooms where cooking is an ongoing part of the curriculum, integration of curriculum is easily implemented.

Literacy

Cooking provides reasons for children to engage in literacy behaviors across a broad range of developmental levels and meet literacy goals such as recognizing and writing their first names.

In Gwen's classroom, children were highly interested in making muffins, and almost everyone wanted to cook daily. Since the cooking center could only accommodate a few at a time, children decided that a sign-up list was a fair way to determine who could be in the cooking center. Jerry, who loved to cook, became very motivated to learn to write his name so that he would have a turn to make muffins. Initially he always asked an adult to write his name on the sign-up board. Gwen routinely requested that he get his nametag so she would know how to write his name. They would look at his card and discuss the letters in his name and she would demonstrate how to make his *J*. By the next week Jerry could write his own *J* and his teacher would print the other letters. A few weeks later Jerry produced his name with only minimal assistance. In addition to writing their names, children in the class learned to recognize classmates' names as they examined the list to find out whose turn was next.

One of the authors (Rebecca) who visited this classroom regularly would sometimes draw pictures or take photos of children during activity time. The children would label the pictured activities and write their names under the ones in which they had participated. This provided many opportunities to discuss the beginning and ending sounds of words and hypothesize what letters represent these sounds. For example, children labeled the cooking activity as "Making Muffins." Darnell was quick to point out that both of these words began with the same sound. When Rebecca said "Mmm, What letter do you think makes this sound?" Bridgit knew that the letter *M* came at the beginning of both words. Very quickly children began to draw attention to other words in their environment that also had letters that were in their own names. Such recognition of letters and the sounds that they represent are critical relationships children must construct in literacy development.

Some children in the classroom made books about their cooking experiences. Bridgit selected photographs that had been taken while she was making muffins, determined the appropriate sequence of the photos, and dictated the following story.

Making Muffins

By Bridgit

First I put the muffin mix in my bowl. I stirred it.
I licked the spoon.
Then I turned the page [of the muffin recipe book].
I count 1 2 3 4 [as she points to the 4 tablespoons of muffin mix on the recipe].
I count 1 2 3 [as she points to the 3 half-tablespoons of water shown in the recipe].
I put water in it.
I put 5 chocolate chips in.
Then I put it in the microwave.
I took a lick but it was too hot. So I got a drink.
Then it cooled really really long. Then I ate it all.
The End

Bridgit wrote some of the words in her book and helped identify beginning and ending letters that occurred in many of the words that she dictated. When her book was finished, Rebecca pointed out that she had one word in her story that was also in her name and circled the *it* in Bridgit. She asked Bridgit if she could find that word in her story. Bridgit proceeded to locate each *it* in her story and place a circle around it. This activity marked the beginning of sight word recognition for her. Bridgit as well as other children who authored books about cooking read them to classmates and placed copies in the class library. These books became classroom favorites and facilitated development of individual literacy goals.

Mathematics

Cooking also offers opportunities to facilitate mathematical goals across a broad range of developmental levels. Measurement, a common goal required in cooking, was meaningful for some children in Gwen's classroom, while other children were completely unaware of its role. Observations of two children, Emilio and Juan, exemplify the broad range of developmental levels observed in the class. Following the second demonstration Emilio attempted to become quite precise in his measuring. He carefully used a plastic knife to level his four tablespoons of muffin mix before emptying them into the small bowl for mixing ingredients. While measuring the required three

half-tablespoons of water, he first held the spoon above his mixing bowl. When he noticed extra water spilling into the bowl, he became more careful. As he measured his next spoonful, he moved his spoon so the extra water would fall on the table rather than in his mixing bowl. Juan, on the other hand, imitated the actions of measuring without understanding the underlying reasons. Juan would pull out a heaping tablespoonful of muffin mix, hold the spoon over his small mixing bowl, level off the extra mix into his mixing bowl, and then pour the remaining spoonful on top of that! When he measured the water he always added lots of extra water to the mix. In making muffins, he intended to imitate his teacher's actions and those of his peers, but he clearly did not understand the logical reason for measurement. Inevitably, his muffins were very soggy and, according to him, not very tasty.

Operations such as addition and subtraction can also be integrated into cooking activities. The following vignette is a good example of such an opportunity. Bridgit and Summer, two good friends in the Head Start classroom, announced to Gwen they wanted to make a smoothie together. Immediately seeing the possibilities for mathematical problem solving in this situation Gwen asked, "Are you going to make enough for one person or two?" The girls decided they wanted to make enough for two. "Well," Gwen said, "this recipe is only for one person. So, how are you going to make enough for two?" She pointed to the first ingredient. "It says here you need one cup of milk. How many will you need?" "Two," the girls answered. With Gwen's support, Bridgit and Summer went through the remainder of the recipe deciding how many of each ingredient they would need to make enough for two people. When they were finished, they set out two cups and divided the shake into two equal portions.

These early experiences in mathematics provide a foundation for later, more formal investigations.

Social Studies

As demonstrated in the above vignette, social studies topics (including social and moral development) naturally arise in cooking activities. Democratic process is an integral part of a classroom in which children have a strong voice in deciding how life in the classroom should be. For example, when the children in Gwen's classroom decided to change the muffin recipe, they conducted a class meeting and suggested three possible new ingredients: strawberries, blueberries, and chocolate chips. They voted by placing their name cards under their choice. Chocolate chips won.

Cooking also provides opportunities for children to explore gender roles. Teachers can stimulate discussion by posing questions such as: "What kind of cooking happens at your house?" "Who does the cooking?" "Who cooks on the stove inside?" "Who cooks outside on the barbeque grill?" "Who cooks at the city's summer celebration in the park?" Investigations can include visits to nearby eating establishments to meet the cooks. It is entirely possible during these discussions that a child in a preschool or kindergarten class might announce that boys do not cook. Experiences such as those described in this chapter can help to dispel these stereotypes.

Finally, cooking may lead children to question where different foods come from. Investigation of this question can lead to numerous studies such as where food is grown, the roles various people play in the production of food, and how food gets to our supermarkets. Field trips to grocery stores, farmers' markets, and farms follow naturally. Because the questions are of genuine interest to children, they actively participate in identifying the answers.

CONCLUSION

Children are almost universally interested in cooking, and cooking provides them rich opportunities to be experimental. In this chapter we have attempted to show how to implement cooking activities so that they promote children's scientific reasoning and cooperation. At the same time, cooking also provides opportunities to integrate the subject matters of literacy, mathematics, and social studies, and gives children opportunities to be self-regulating. It is our opinion that cooking makes an important contribution to early childhood curriculum and should be a part of every early childhood classroom.