STEM in Cooking

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Exploring the Beginnings of Chemical Engineers

IOWA REGENTS' CENTER FOR EARLY DEVELOPMENTAL EDUCATION

PURPOSE OF THE EXPLORING STEM IN COOKING

Food assembly has long been a part of early childhood curriculum. There are many examples of how mathematics is embedded in preparation of ants on a log, or sandwiches. What is often overlooked is the STEM within actually cooking experiences. As children make their own servings of pudding, pancakes, muffins, quesadillas, eggs, or play dough, they engage in vocabulary that often has multiple meanings. In cooking we whip, beat, sift, dice…all words that have different meanings in different contexts. There is mathematical thinking such as of more and less, shorter and longer in terms of time, number of scoops or spoonful's and experiences connecting children to the concepts of volume and fractions. Cooking experiences can introduce cultural dishes previously unknown to children, or regularly enjoyed. Finally, cooking experiences immerse children in observations about properties of materials or ingredients, and how those properties may change when heat or cooling is applied to a mixture.

INTEGRATIVE NATURE OF COOKING EXPERIENCES

Science

Process skills of scientific inquiry

- Asking questions
- Planning and conducting investigations
- Gathering data
- Communicating findings

Observing physical changes and chemical reactions

Mathematics

- Measuring
- Quantity and volume
- Numbers
- Fractions
- Geometric concepts
  - Shape size, position direction

Social Studies

- Engaging in the democratic process
- Exploring or discussing gender roles
- Investigating where foods come from
- Looking at foods and cooking techniques from different cultures
- Social/emotional development

Literacy

Vocabulary development is fostered through:

- Conversations during and about cooking experiences
- Reading books about preparing food or cooking
- Following recipes

Phonological awareness is developed by:

- Thinking hard about sounds in spoken words.
- Noticing similarities or patterns in how sounds are represented as they read recipes and write their own recipes.

Purposeful reading

- Following a recipe
- Labeled items (ingredients, storage, etc.)

Purposeful writing

- Making a shopping list
- Documenting one's experiences
- Creating their own recipes

UNDERSTANDING WHAT CHILDREN CAN DO

Rather than children assisting an adult in creating a whole class dish, individual cooking experiences enable young children to experiment, observe changes, and connect their actions in preparation to results. Children need opportunities to cook independently without adults second-guessing their every move (Colker, 2005). Cooking experiences challenge their fine motor development and provide them a variety of skills they will use throughout life.

The criteria for good independent cooking experiences are:

1.) Children must be able to **produce** interactions of ingredients
2.) Results must be ***observable***
3.) Children must be able to **vary** a recipe to experiment and discover results

An effective learning environment is one that inspires children's interests and ideas and allows them to try out their ideas. Adults can be the most effective in their teaching when they are aware of children's developmental levels and previous experiences. For example, before children can be expected to use measuring ingredients efficiently, they need lots of

experiences dumping and pouring. This can take place ahead of time in a sensory table filled with water, or rice, or sand and a variety of transparent or translucent containers including measuring cups and teaspoons.

Chemical engineers do not necessarily get ratios and production perfect on their first try. They learn with each iteration of testing until they eventually determine an acceptable product. Young children need the time and opportunity to do the same. It is important for adults to be supportive of children's ideas in cooking (within reason) and comfortable with children making mistakes in their preparation. Understand that children will make many mistakes but this needs to happen for learning to occur. To accurately understand and assess children's reasoning in cooking experiences, teachers must observe children closely. Children's investigations in cooking experiences are supported by teacher interventions that focus on reasoning rather than right answers.

Beginning the Study Chemistry in Cooking

In this professional learning session, you engaged in experiences cooking items such as playdough, muffins, pancakes, and pudding. These recipes have been broken down to individual recipes and can be accessed on our CEESTEM website (regentsctr.uni.edu/ceestem/recipes). However, your children may have interest in cooking other foods. We have had young children involved in cooking rice cereal treats, popcorn balls, pretzels using a bread machine to make the dough, oatmeal, pumpkin pie, deviled eggs, egg salad sandwiches. All of these required the teacher figuring out how to break a recipe down into individual servings, and how to enable children to cook as independently as possible.

Before introducing cooking experiences to children, it is important for **YOU** to take time to cook using the same ingredients utensils, and appliances. What recipes can be broken down into individual servings that young children can prepare for themselves? This will prepare you for potential problems that children may encounter, give you a clear understanding of what children can do, and become aware of the possibilities for learning that lie within the experience.

Introducing Cooking Experiences to Children

Decide what your goal is for the children. Some examples include:

- What happens when you mix dry and wet ingredients;
- What makes the consistency thick? Runny? Gooey? Crumbly?
- What happens when you measure with a heaping cupful or spoonful?
- What happens when it gets hot?
- What happens when it gets cold?
- Can you reverse what happens after applying heat or cold?

Select the appropriate recipe to meet your goal.
Model in a small or large group.
Discuss safety.
Be deliberate about teaching certain skills such as clean up and handwashing
Allow children to do as much on their own as possible.

Other Cooking Tips

Plan for messes
Do not insist that children follow recipes precisely
Allow them to make mistakes in following the recipe.
Encourage them to figure out solutions to problems they encounter.
Allow children to make the same recipe many times.
Encourage children to create and document their own recipes.

Recommended Resource/Reading

Axelrod, A. (1997). *Pigs in the pantry.* McGinley-Nally, S. (illus). New York: Simon & Schuster. Books for Young Readers.
Christelow, E. (1992). *Don't wake Mama! Another five little monkeys story.* New York: Clarion Books.
DePaola, T. (1978). *Pancakes for breakfast.* New York: Harcourt Brace Jovanovich Inc.
DeVries, R., Zan, B., Hildebrandt, C., Edmiaston, R., Sales, C. (Eds.). (2002). *Developing Constructivist Early Childhood Curriculum: Practical Principles and Activities*. New York: Teachers College Press.
L.J. Colker. (2005). *The Cooking Book: Fostering Young Children's Learning and Delight.* Washington, DC: NAEYC.
Maynard, C. (2001). *Kitchen Science*. New York: Dorling Kindersley Limited.
Stevens, J., & Stevens Crummel, S. (1999). *Cook-A-Doodle-Doo!* Stevens Crummel, S. (illus). California: Harcourt Brace & Company.

Electric Skillet Cover

The intent of building this piece is to enable children of a young age to experience cooking food. This wooden cover for an electric skillet is to prevent little hands from contacting hot surfaces. Safety is the primary concern.

Materials list: ¾", No 2 or better, White Pine with tight knots.
There will be NO finish on the COVER. Not even food grade finishes. What will happen to the finish with heat applied is unpredictable.

Tool list: Table saw, Jigsaw or Band saw, Router with ½" radius Round Over bit.

First you must procure the skillet you intend to use. The dimensions must be taken from the actual skillet to prevent exposure to hot surfaces.

These instructions are divided into three parts. First, the sides, which will be referred to as the BOX, second, the TOP, and last, the completed COVER assembly.

First finding the BOX dimensions.

Set the skillet on a table and measure from the extremities of each side. We are building a box that must sit on a table and the skillet must fit inside the box. Using two boards standing on edge and sliding them up against the skillet from opposite sides, then carefully measure between the boards. Repeat from other two sides. Add 3/8" to each dimension. This will provide the inside dimensions of the BOX. The exception is the location of the power cord and its plug. Don't include them in the dimension. They will need to pass through an opening in the side of the BOX. See the sample in the pictures. Next, measure from the tabletop to the top edge of the skillet. Add 1/8" to this. That will be the height of the BOX.

Next cut and build the BOX

Cut boards to size. Remember to add 1 ½" to the length of the front and back boards to allow for the ¾" thickness of the side boards. Next cut the ventilation slots in the two side boards and the back board. Do NOT cut vent slot in the front board. These slots should be 1" high by 1 ½" less than the length of the board. The slot on the end with the electrical cord will have to be enlarged to just clear the electrical cord and plug. After the vent openings are cut use a router with a ½" round over bit to round over the vent openings. A rasp or file could also be used but will require more sanding to get smooth edges. At this point do a dry fit. Stand the boards on edge surrounding the skillet and se that you only have about 3/16" on all sides of the skillet and the sides are 1/8" higher that the skillet. Also note that the end piece will clear the electric cord and plug. If all parts fit properly, glue and clamp or screw them together. Remember to countersink the screws far enough for wood filler. The BOX is complete.

Continue on to the TOP

Find the dimensions.

Measure the outside of the BOX side to side. Add ½" to this for the width of the TOP. Next, measure the outside of the BOX front to back and add ¼" for the depth of the TOP. This will allow for a ¼" overhang on the sides of the cover to lift it off and on and 1/8" overhang front and rear.

Cut the boards for the TOP and edge glue them together. Alternatively clamp them for the next step, which is finding the opening in the TOP. Lay the boards for the TOP face down on the table and place the BOX upside down on top of them. Center the BOX, then set the skillet, upside down, centered inside the BOX. With everything carefully centered, draw as much of the outline of the pan of the skillet as possible.

Remove the skillet and the BOX from the TOP and sketch in the remainder of the outline of the skillet pan. Now draw another line parallel to and 3/8” inside the outline of the pan. This is the cutout for the skillet. This allows the cover about 1/8” overlap of the skillet even when pushed all the way to one side.

Cut and assemble the TOP

Use the Jigsaw or a band saw to cut out the opening. Using a ½” round over bit, round over the top edges of the opening and the outside edges of the TOP. If not already assembled, glue and clamp the TOP boards together.

COVER Assembly

Once the BOX and TOP are individually assembled its time to assemble them into the completed COVER. Center the TOP on top of the BOX. Drill and countersink one screw in each end of each board that makes up the TOP. Remember that there is a cross grain situation so the TOP cannot be glued to the BOX. Fill all screw countersinks and cracks and voids with good quality wood filler. Sand all surfaces smooth. Again, do not apply any finish.

Completed Top, Front & Cord End

Top, Rear and Left End

Showing fit of skillet in COVER