



Grades 3-5

FoodMASTER

Using Food to Teach Mathematics and Science Skills

FOOD ON THE FARM Fun with Mathematics

CREATED BY:

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FoodMASTER

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Food, Mathematics And Science Teaching Enhancement Resource Initiative

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ISBN 978-0-9863691-0-0

These resource materials were supported by the Science Education Partnership Award (SEPA) program, a component of the National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Book Design by Cara Cairns Design

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The Science Education Partnership Award (SEPA) Program funds innovative K-12 STEM and Informal Science Education (ISE) educational projects. SEPA projects create partnerships among biomedical and clinical researchers and K-12 teachers and schools, museums and science centers, media experts, and other educational organizations. SEPA K-12 resources target state and national K-12 standards for STEM teaching and learning and are rigorously evaluated for effectiveness. SEPA is sponsored by the National Institutes of Health (NIH).

In 2008, the Food, Math, and Science Teaching Enhancement Resource (FoodMASTER) initiative received a two year award to fund a second phase of research aimed at disseminating FoodMASTER Intermediate nationally. Results from Phase I & II of the parent grant have shown promise for using food as a tool to teach mathematics and science to intermediate students. In 2009, the FoodMASTER Initiative received an additional two years of supplemental funding from SEPA as part of the American Recovery and Reinvestment Act of 2009. As a result of this funding, Food on the Farm was developed as a mathematic-based supplement to the FoodMASTER Intermediate curriculum.

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Introduction

FoodMASTER Intermediate:

Food on the Farm

A food, mathematics and science activity book for grades 3-5

Background

FoodMASTER (Food, Mathematics and Science Teaching Enhancement Resource) is a compilation of programs aimed at using food as a tool to teach mathematics and science. It is our theory that if food is used as a tool to teach mathematics and science, students will be better prepared to demonstrate and apply mathematic and scientific knowledge. Because students encounter food on a daily basis, they have preexisting contextual experiences preparing them for learning new and relevant mathematics and science material.

Food is conducive to hands-on and virtual, inquiry-based, active learning that uses multiple senses to engage students in the learning process. Utilizing food allows for an interdisciplinary approach to learning concepts and ideas in a variety of scientific subjects like biology, chemistry, microbiology, nutrition, health, and more! Additionally, food labs are a dynamic way to teach mathematics concepts such as numbers and operations, algebra, geometry, measurement and problem solving.

The knowledge and skill development that can be inspired by the FoodMASTER approach is limitless. Proper use of measurement tools, data collection and interpretations, application and generalization, classification and organization, graphing and comparative analysis, understanding chemical changes, observing functions of ingredients and controlling variables, pricing, critical thinking, self-directed learning and team building are only a few of the potential knowledge and skill development areas for intermediate grade students experiencing FoodMASTER's mathematics and science investigation labs.

Introduction

Welcome to the FoodMASTER Intermediate program, Food on the Farm edition! The curriculum contained in this packet was developed by FoodMASTER with funding from the National Institutes of Health: Science Education Partnership Award (NIH SEPA) to present intermediate grade students with ten basic topics in foods. Each topic area includes hands-on lessons to take your students on an exciting and innovative exploration of food, mathematics and science. These engaging lessons will have your students developing skills and thinking about learning in a new fashion that is fun and exciting for everyone involved. For each lesson in this manual you will find a summary of the unit, objectives, national mathematics and science content standards, materials needed, and student proficiency questions with answer keys.

The student workbook pages are designed to be kid friendly and easy for both teachers and students to follow. Each "Mathematics Investigation" activity can be adapted to fit a variety of classroom structures. Teachers are encouraged to read through the labs ahead of time and decide on the best format (teacher-directed, small groups, or individual) for completing each lab with their students. Chosen method of

implementation may vary depending on the amount of time, equipment and supplies, and the number of classroom adult supervisors available; as well as safety consideration and learner needs.

Each of the ten FoodMASTER Intermediate: Food on the Farm chapters includes a brief introduction, one lesson in mathematics, one hands-on science activity that can be completed in the classroom or sent home with the student, and a set of corresponding proficiency questions. After reading a brief passage out loud as a class or silently, students will complete fun “Doodle Bugs,” which promote reading comprehension. Students participating in hands-on lessons will develop science and mathematics problem solving skills using real foods to complete “Fun with Food” labs. A flexible and creative classroom atmosphere will enhance the hands-on curriculum.

What it takes to be a FoodMASTER

Are you enthusiastic enough to be a FoodMASTER? The hands-on FoodMASTER activities in this booklet do take the commitment of a special teacher who is willing to take the extra time to bring food and supplies into the classroom. It also requires that teachers manage their classrooms in a more open fashion that they may not be comfortable with initially. However, if you desire to see mathematics and science come to life for your students, you will find this method very enjoyable, rewarding and satisfying. Teachers desiring food based activities with less mess and time commitment may choose to only complete the “Mathematical Investigations.” Either way, you will be filled with satisfaction when you see students applying real-life mathematics and science in the classroom as you hear students share their stories of cooking at home. Previous work with the FoodMASTER method, in an intermediate grade class, indicated that 85% of the students repeated one or more of the activities at home.

We hope that you will find the materials packet easy to use and that it provides you with the knowledge to teach students in your class with ease and simple preparation. However, if you are interested in becoming more knowledgeable about each of the topics in FoodMASTER Intermediate, check out www.foodmaster.org for more information. At this website, you can also obtain access to the full FoodMASTER Intermediate curriculum.

Food Safety Note

It is very important for you to follow and model good food safety behaviors! Your students will learn proper food safety practices in chapter two of the parent FoodMASTER Intermediate curriculum. You will need to continue to reinforce good sanitation and safe food handling practices throughout the curriculum. Please, be sure to remind students to never eat foods until they are instructed and be sure students have washed their hands before preparing or eating foods. Never serve raw or undercooked meats or eggs, unpasteurized milk, spoiled foods, or expired foods. For Mathematics Investigation activities involving eggs, try buying eggs pasteurized in their shells.

Keep your classroom safe by thoroughly washing all kitchen utensils, supplies, equipment, counters, desktops and sinks. You should also maintain a Material Safety Data Sheet (MSDS) for all chemicals and cleaning supplies used or stored in the classroom. Cleaning supplies and sharp objects, such as paring knives and can openers, should be safely stored away for teacher use only. Keep dry food items safe and stored in tight containers and perishable items stored in a refrigerator or for short periods of time in a cooler with ice.

Finally, be aware of any food allergies or intolerances. Students with food allergies could have mild to severe reactions if they taste, touch or in some cases even smell their food allergen. Modify activities, when needed, to prevent allergic reactions and consider providing an appropriate alternate snack for students with food allergies or intolerances.

Equipment and Supply List

Listed below is a complete list of equipment, supplies and nonperishable foods you will need to complete all the FoodMASTER Intermediate: Food on the Farm activities. Needs are based on a classroom with 24 students and assumes 4 students per group. You may need to adjust for more or less students.

NOTE: “Fun with Food” worksheets are designed for students to complete outside of the classroom at home or to be completed in the classroom as a science-based extension to the primary mathematics lesson. For your convenience, amounts listed in instructions of the worksheets are reflective of amounts needed for 1 student and/or student group for completion the activity. Amounts listed in the below lists, however, are reflective of what is needed if the activities were to be completed in class.

Equipment and Supply Purchasing

Equipment and supplies may be purchased well in advance to eliminate multiple trips to the store. Before shopping for new equipment and supplies, check your classroom stock and school supply room. In the lists below, **bold** items are equipment and supplies that are considered “out of the ordinary” for a classroom setting and teachers will need to obtain these items.

Tips for obtaining equipment, supplies and food

- Try applying for small grants
- Ask for donations from your local retailers
- Shop around for sale items
- Check out garage sales or thrift stores for items in good shape (Be sure to thoroughly scrub and sanitize these items before use.)
- Watch for surplus items from school systems
- Include basic items on your classroom supply list
- Ask parents for donations
- Share equipment with family and consumer science classrooms
- Ask administration for support

When purchasing items, it is important to balance price verse quality. It is not necessary to purchase “top of the line” equipment and supplies, but it is important to make sure that the equipment quality is good enough to hold up from year to year to meet your activity needs. We will make some recommendations about items below to help guide your choices and make your purchasing process a little easier.

Equipment

Microwave or Oven

Toaster Oven or Oven

1 double burner

With good planning, the activities can be managed with one low-quality, single-rack toaster oven. However, having a good toaster oven will make the activities even more enjoyable. A microwave could also be substituted for a toaster oven. Some teachers even put a larger oven on their classroom “wish list”. Other teachers use larger ovens already available in their schools. We recommend a medium quality double burner hot plate. In addition, teachers with limited access to refrigerator space may add a small refrigerator to their “wish list.”

Cookware

1 medium pot or deep pan

2 large pots with lids

Baking sheet for toaster oven

Ideally, clear pots with lids will be purchased. However, clear pots are often expensive and difficult to find. Purchasing a cooking set is the most cost effective option and will get you all of the pots and pans you need. We recommend purchasing a stainless steel set that has clear lids, so your students will be able to look inside the pots. Your toaster oven will come with one baking sheet. If you have difficulty finding a baking sheet to fit your toaster oven, try letting students put their items on disposable foil sheets. You can cut, bend or fold sheets to fit the size of your oven. Alternatively, students can place items on foil then transfer items to the baking sheet as it becomes available.

Bowls

6 small bowls

6 medium bowls

6 deep bowls

Any type/quality of mixing bowl will do, but plastic is probably safer and the most cost effective.

Kitchen Measuring Equipment

6 sets of dry measuring cups

6 sets of dry measuring spoons

6 thermometers

Manual or electronic scale

We recommend plastic measuring sets for safety and cost efficiency. You may consider purchasing one thermometer per student.

Utensils

24 knives

24 spoons

6 spatulas

6 whisks

Paring knife

Can opener

Any type/quality of utensils will do. Look for blunt table knives that are not sharp at all and spoons that will be easy for kids' hands to handle. You may consider purchasing a set of 24 forks, spoons and knives. In the long run, this will cut down on costs and storage space needs associated with disposable items. However, using disposable forks, spoons and knives will decrease cleanup time. Remember, you must keep the paring knife and can opener safely stored for adult use only.

Equipment and Supply List (continued)

Other

6 reusable plastic plates

6 vegetable peelers

6-8 glass jars with lids

12 clear plastic containers with lids

6-10 marbles

1 cooler

12 scoops neutral soil

Water

Any quality of equipment here will do as well. If desired, 6 mixing bowls can be used in place of the 6 pitchers; however, you will still need one pitcher. Jars with lids can be difficult to find if it is not canning season, so plan ahead. If you will be purchasing perishable food items and traveling a distance to school, you may consider purchasing a cooler to keep foods safe. A cooler filled with ice can also keep foods safe in the classroom.

Classroom Supplies

24 rulers

24 calculators

1 US map

Hopefully, as a teacher, you will have many of these supplies already on hand.

Disposable items

6 Cardboard or Styrofoam Egg Cartons

Box of Toothpicks

Spoons

Knives

Plates

Disposable items will need to be replaced year after year. Purchase these items in bulk at a discount retailer or try asking parent to donate some of these items to the classroom.

Food Purchasing

When purchasing food items, shop ahead for sales, clip coupons or try discount food stores for better process. To keep food purchasing as simple as possible, we recommend that you purchase all of your nonperishable food items before beginning FoodMASTER. Keep these items stored in tight containers in a cool dry storage area. To minimize the possibility of contamination, do not let students obtain their ingredients directly from the storage supplies. We suggest that you or another adult obtain all the ingredients needed for each lesson and set them out in bowls. Students may then gather supplies and measure from these bowls. We also recommend replacing nonperishable items on a regular basis. Be sure to check expiration dates and label items as to purchase dates.

Nonperishable Food Supplies

Baking Products

- 6 tablespoons sugar**
- 3 cups light brown sugar**
- 3 quarts of white vinegar**

Spices/Flavoring

- 6 tablespoons salt**
- 3 teaspoons seasoned salt**
- 3 cups baking soda**
- 3 teaspoons cinnamon**

Other

- 1 cup, 2 tablespoons olive oil**
- 6 cups popcorn kernels (from a jar)**
- 6 potatoes with sprouts**
- 6 large cucumbers**
- 6 packages of spinach seeds**
- 1 large package frozen chicken nuggets**
- 1 large package frozen chicken tenders**
- 1 quart low-fat or skim milk**
- 1 cup yogurt (active culture)**

Chapter by Chapter Equipment and Supply List

Equipment and Food Supplies are separated by chapters for easy purchasing and lesson preparation. Perishable food items are **bold** and will need to be purchased just prior to doing the “Scientific Inquiry” lab. Needs are based on classrooms with 34 students and assumes four students per group. You may need to adjust for more or less students. It is recommended that you read each chapter before purchasing items on this list because you may want to make recommended substitutions or adjust for you individual classroom needs.

Chapter 1: Measurement

Mathematics Investigations:

24 rulers

Fun With Food:

6 potatoes with sprouts

6 clear jars 3/4 full of water

Box of toothpicks

Chapter 2: Food Safety

Mathematics Investigations:

24 rulers

24 calculators

Fun with Food:

6 large cucumbers

3 cups white vinegar

6 tablespoons salt

6 tablespoons sugar

3 cups water

6 small covered containers

6 spoons

6 knives

6 deep bowls

6 small plates

6 weights (e.g. canned vegetables)

Chapter 3: Vegetables

Mathematics Investigations:

3 cups vinegar

3 cups water

3 cups baking soda

6 spoons

12 cans/plastic containers

12 scoops soil

Fun with Food:

6 packages of spinach seeds

Water

6 cardboard egg cartons

Neutral soil

Chapter 4: Fruits

Mathematics Investigations:

24 calculators

Fun with Food:

12 apples (Gala apples preferred)

3/4 cup light brown sugar

6 vegetable peelers

1 medium pot or deep pan

1 double burner

1 large spoon for stirring

24 spoons for tasting

Chapter 5: Milk and Cheese

Mathematics Investigations:

24 calculators

Fun with Food:

1 1/2 quarts low fat or skim milk

1/2 cup yogurt

Water

1 large pot with lid

1 burner

6 thermometers

6 spatulas

6 small bowls

6 whisks

1 cooler

6 glass jars with lids

Chapter 6: Meat, Poultry, and Fish

Mathematics Investigations:

24 rulers

24 calculators

Fun with Food:

1 large package frozen chicken nuggets

1 large package frozen chicken tenders

Microwave or oven

24 disposable plates or 6 plastic plates

6 knives

Chapter 7: Eggs

Mathematics Investigations:

6 extra large white eggs

6 medium white eggs

12 plates

6 measuring tapes

1 manual or electronic scale

6 pencils

Fun with Food:

6-12 eggs

6 cups white vinegar

6 clear jars with lids

2 burners

2 pots with lids

Chapter 8: Fats

Mathematics Investigations:

24 calculators

Fun with Food:

4 1/2 cups heavy whipping cream

6 plastic or glass jar with lids

18-24 marbles

6 bowls

Chapter by Chapter Equipment and Supply List (continued)

Chapter 9: Grains

Mathematics Investigations:

24 calculators

Fun with Food:

3/4 cup olive oil

6 cups popcorn kernels (from a jar)

Water

2 burners

2 large pots with lids

6 small bowls

6 dry measuring cups

6 measuring spoons

Chapter 10: Meal Management

Mathematics Investigations:

24 rulers

1 US map

24 calculators

Fun with Food:

6 small baking potatoes

9 tablespoons olive oil

3 teaspoons seasoned salt

Toaster oven or Oven

Baking sheet for toaster oven

6 knives

6 medium bowls

6 measuring spoons

