raddish
Kitchen. Table. Family.

Edible Experiments Lesson Plan for Homeschool

Overview

Raddish is designed by a dedicated team of teachers and chefs who believe the kitchen classroom is the tastiest place to learn. We love watching learning come alive when kids mix math, stir science, and taste culture!

Paired with the materials found in your Edible Experiments box, this lesson plan divides your box into 3 45-90 minute lessons you can use and adapt to support your homeschool study, pre-k – middle school. Depending on your timeframe and child's age and engagement, these can be taught together or separated for a longer lesson. Please refer to the curriculum provided in your box: recipe guides, activity cards, skill card, and introduction card. Happy cooking! Happy learning!

Lesson 1: One Pot Pasta Primavera and The History of Pasta

Activity Time: 45-90 minutes

Learning Outcomes

- Students will explore the many different shapes of pasta.
- Students will sort pasta and then describe what is similar and what is different.
- Students will hypothesize and read about the meaning of the names of different pastas and why they were created in those shapes.
- Students will read or listen to differing histories of the origin of pasta and decide which one or which parts of each they believe to be true.
- Students will retell the history of pasta.
- Students will choose a country or culture and research how pasta is used there.
- Students will locate on a map where their chosen country is and point to geographical reasons why the pasta is made that way.
- Optional:
    - Students will learn how to make homemade pasta
    - Students will use pasta shapes to explore math concepts:

- Younger students- patterns and sorting
- Older Students- the need for standard units of measurement and triangle math

- Students will make and share One-Pot Pasta Primavera.

Materials

- Recipe guide, ingredients, and tools listed within.
- History of Pasta Information- websites provided in the lesson plan
- Different shapes of pasta (at least 5)
- World atlas or maps
- Pasta Around the World Worksheet (included)

Optional Math Lesson Materials

Younger students

- Pasta shapes
- White glue
- Paper

Older Students

Lessons from Scholastic on Non-Standard Units of Measurement (1st and 2nd Grade), The Triangle Inequality Theorem and Triangle Angle Sum Theorem (4th, 5th and Middle School)

- Pasta shapes (including spaghetti)
- Mini marshmallows
- Handouts and lesson plans available from www.scholastic.com/teachers/top-teaching/2015/11/four-pasta-lessons-older-kids-1

- **Websites consulted to create this lesson**
  - *www.scholastic.com*
  - *www.internationalpasta.org/index.aspx?id=6*
  - *www.pasta-recipes-by-italians.com/history-of-pasta.html*
  - *www.theatlantic.com/magazine/archive/1986/07/pasta/306226*
  - *www.ilovepasta.org/public/fun-facts*
  - *www.internationalpasta.org/resources/extra/file/pasta%20for%20children%202012/Pasta%20for%20Children2012-Lesson1p4.pdf*
  - *http://www.chowhound.com/food-news/54492/when-pasta-met-sauce/ (An amazing resource with full photographs of the name of each kind of pasta and what kind of sauce it goes best with!)*
  - *You Tube video How Its Made- Pasta (5:28) https://www.youtube.com/watch?v=75bfUmqx82s*

1. **Introduction**
    a. Bring a selection of pasta noodles to the table and invite students to observe and explore the pasta with all of their senses (except for taste).
    b. Lead a discussion on what they observe. Ask questions such as:
        i. What do you notice about the pasta?
        ii. Describe the shapes? How are they similar or different from each other?
        iii. What sounds does the pasta make?
        iv. How does the pasta smell?
        v. Have you eaten any of these kinds of noodles before?
        vi. Do you have a favorite?
        vii. Do you know the name of the noodles?
        viii. Do you eat noodles at home? In a restaurant? What kind? What do you have with the pasta?
    c. Let students know that today they are going to learn about where pasta originated and how it is made.

2. The History of Pasta
    a. Read about the different historical explanations for where pasta originated.
        i. Sources for Younger Students
            - Short history of pasta for younger students- www.ilovepasta.org/public/fun-facts
            - History of pasta for younger kids www.internationalpasta.org/resources/extra/file/pasta%20for%20children%202012/Pasta%20for%20Children2012-Lesson1p4.pdf
        ii. Sources for Older Students
            - History of pasta for older kids www.internationalpasta.org/index.aspx?id=6
            - Good overall history for older students- www.pasta-recipes-by-italians.com/history-of-pasta.html
            - A very in depth look at the history for older students- www.theatlantic.com/magazine/archive/1986/07/pasta/306226

    b. Have students answer some questions:
        i. Where did the name pasta come from?
        ii. What ingredients were they using to make pasta?
        iii. Where in the world was it invented? How did its use spread? Show on a map
        iv. What famous people, allegedly, influenced the spread of pasta around the world?
    c. Summarizing and Retelling
        i. Have younger students tell you the story of pasta as they now understand it.
        ii. Have older students write a short summary of the history of the creation of pasta. Why do they believe this is the true story?

3. Fun Bites- The Science of Perfect Pasta

Read the Fun Bites Section with your students. Focus on the simplicity of the ingredients and process to make noodles. Return to the Fun Bites Section when you are cooking the One-Pot Pasta Primavera to help explain the cooking process of pasta through absorption.

Pasta making is quite simple with very few ingredients. Show students the video How Its Made-Pasta (5:28) https://www.youtube.com/watch?v=75bfUmqx82s

Extensions

a. Make homemade pasta. A couple of helpful websites-
   i. www.jamieoliver.com/recipes/pasta-recipes/a-basic-recipe-for-fresh-egg-pasta/#91ghyJizErq714xS.97
   ii. www.thepioneerwoman.com/cooking/homemade-pasta/
   iii. You can add tomato paste, pureed spinach or squash, or even cocoa powder to color and flavor your pasta.

b. Experiment with cooking fresh vs. dried pasta. Hypothesize how long they each will take to cook and how much water they will absorb. For an in depth water absorption experiment for older kids http://www.sciencebuddies.org/science-fair-projects/project_ideas/FoodSco_p060.shtml?from=Blog#learnmore

4. Pasta Around the World

From all that you have learned about pasta you know that its use has spread around the entire world. There are many different shapes of pasta with many different names and different uses. http://www.chowhound.com/food-news/54492/when-pasta-met-sauce/

Let students know they will now have the opportunity to research different types of pasta and how they are used in a culture or country of their choice.

Using the Pasta Around The World Worksheet (included), students can do their own research with books or the internet. Consult the International Pasta Organisation for these specific countries:

- Belgium, France, Germany, Italy, Spain, Portugal, Turkey and Iran www.internationalpasta.org/resources/extra/file/pasta%20for%20children%202012/Pasta%20for%20Children2012-Lesson2.pdf
- Brazil, Uruguay, Chile, Argentina, Venezuela, Columbia, Mexico, Costa Rica www.internationalpasta.org/resources/extra/file/pasta%20for%20children%202012/Pasta%20for%20Children2012-Lesson3%202.pdf
- United States and Canada www.internationalpasta.org/resources/extra/file/pasta%20for%20children%202012/Pasta%20for%20Children2012-Lesson4.pdf

5. **Kitchen Prep**
    a. Read the One-Pot Pasta Primavera recipe card together.
    b. Identify and gather ingredients.
    c. Gather tools. Make sure you have a ruler so you can conduct your Edible Experiment on Absorption.
    d. Discuss kitchen safety. Specifically, stove top safety (Visit Raddishkids.com/pages/safety)

6. **Prepare One-Pot Pasta Primavera**
    a. Ask children to read or describe each step.
    b. Together follow the steps in the recipe.
    c. Give each child a turn to chop, tear, slice and measure.
    d. Remember to stop at Step 6 and refer to the Fun Bites to do your absorption experiment.
    e. When the One-Pot Pasta Primavera is ready, eat, taste and share!
    f. While you are eating have students share what they learned about the history of pasta in general or what they learned about pasta in a particular county or culture.

Lesson 2: Scientific Salad Dressing and The Friendly Emulsifying Agent
Activity Time: 30-90 minutes

Learning Outcomes

- Students will observe the behavior of the interaction of liquids of different densities.
- Students will learn the terms *emulsion, emulsifying agent, hydrophobic, hydrophilic,* and *immiscible*.
- Students will learn about mixtures and why they do or do not stay mixed together.
- Students will create a model to show how emulsifiers work.
- Students will use what they have learned about emulsification to create a variety of tasty emulsions.
- Students will realize that emulsions are the basis of many common household products.
- Students will make Scientific Salad Dressing to share with their family.

Materials

- Recipe guide, ingredients, and tools listed within

For Introduction Activity

- Recipe Guide
- Skill Card
- Oil and vinegar
- Clear jar or glass
- Measuring spoons
- Whisk
- Paper and pencil
- Timer
- Video from YouTube- What are Emulsions? The Fuse School (3:07) https://www.youtube.com/watch?v=bC_czAL24zY

For Model Making

- Either Q-tips or spaghetti noodles and mini marshmallows
- Cardstock or card board
- Scissors
- White glue or tape
- Markers

Websites consulted for this lesson

- www.gcsescience.com/o77.htm
- www.juliantrubin.com/emcyclopedia/chemistry/emulsion_experiments.html
- www.thekitchn.com/food-science-what-is-an-emulsi-45475
- https://www.youtube.com/watch?v=bC_czAL24zY

1. Introduction- Fun Bites- The Science of Salad Dressing

a. Bring a container of oil and a container of vinegar to the table, along with measuring spoons and a clear jar.
b. Have students identify the ingredients and tell you what they know about them.
    i. How do they taste?
    ii. How do they feel on your finger? On your tongue?
    iii. How are they made?
    iv. What recipes do you think you use each of them in? What do they add to the dish?
c. Have students measure out 3 tablespoons of oil and 3 tablespoon of vinegar and pour each into a clear jar or glass.
d. Allow it to sit for 30 seconds and observe. Have students draw and/or write what they see. Oil and vinegar are *immiscible* liquids, meaning they do not mix. Read the Fun Bites- Oil and Water section in order to find out why they do not mix.
e. Read the Skill Card- Whisking together. What are the two uses for a whisk?
f. Next have one student vigorously whisk the mixture for 30 seconds in order to blend it.
g. Have students make another observation. Draw and/or write what the oil and vinegar look like now. This mixture is now an *emulsion*, when two immiscible ingredients are combined. (More on this later!)
h. Have students continue to observe the mixture for the next few minutes. What is happening? Why do they think so?
i. An emulsion of two immiscible liquids will not stay mixed without a third ingredient. Today we are going to learn more about emulsions.

2. Emulsion, Repulsion and their Mutual Friend the Emulsifying Agent

a. You can tell the story below to help students remember and understand the theory behind an emulsion.

Imagine that **oil** and **vinegar** are two people that just met at a birthday party. They do not know each other and they prefer to play or hang out with people that they already know and that are like them. Then **whisk**, a super fun/cool person, shows up and teaches oil and vinegar a new game or dance. For a little while oil and vinegar have fun together but then the game or dance is over and they drift back to playing with the people that they already know and that are like them. It is a disaster. Now the party is back to being two groups instead of everyone having fun together. Enter the birthday girl in her superhero costume as **emulsifying agent!** She knows everyone at the party so she goes up to her friend oil and says, "Hi, do you remember when we went camping together?" Oil says, "Yes, that was so much fun! You are a good friend. They hold hands. Then, still holding hands with oil, emulsifying agent turns to her other friend vinegar and says, "I am so glad that you are here!", and she holds onto vinegar's hand as well. Now oil and vinegar stay mixed together because of their friend **emulsifying agent** and the party is a success!

or for older students or those that want it told to them straight...

An **emulsion** is a suspension of two liquids within each other that are **immiscible** (will not mix) like oil and vinegar. As you saw in the experiment that you did before, the oil floats on top of the vinegar because it is less dense. When you whisk them together tiny droplets of each liquid become suspended within each other. When they are uniformly dispersed (evenly mixed) then you have created an emulsion. However, as you also saw before, the oil and vinegar will ultimately separate again because there is nothing at the molecular level holding the two liquids together. The emulsion that you created was temporary due to the friction of the whisking. To get a permanent emulsion of these two liquids you need a third ingredient to hold the two immiscible liquids together and keep them from separating. Enter the **emulsifying agent**. This third ingredient creates a weak chemical bond with each liquid and becomes like a bridge between them.

b. You can now have students watch a short video that helps to solidify the concept of an emulsion. Video from YouTube- What are Emulsions? The Fuse School (3:07) https://www.youtube.com/watch?v=bC_czAL24zY
c. Ask students some follow up questions to check for understanding:

i. What happens when oil and water are mixed together? What kind of liquids are they?
ii. What does immiscible mean?
iii. What are some common everyday emulsions?
iv. What is the world's most common emulsion?
v. What are the two components of an emulsifier?
vi. What does hydrophilic mean? Hydrophobic? What parts love water?

3. Model of an Emulsifier Molecule

a. Gather materials as listed above and have students create and label an emulsifier molecule. The last screen in the You Tube video has a great example of what an emulsifier molecule would look like as does this website www.gcsescience.com/o77.htm
b. What to include in your model:
   i. Title and perhaps a legend.
   ii. Water (symbolized in some way)
   iii. Oil (same as above)
   iv. Emulsifiers (that is what the q-tips are)
   v. Hydrophilic (water loving) head (absorbent part of the Q-tip)
   vi. Hydrophobic (water fearing) tail (the stem of the Q-tip)
c. Have students explain their models and display them.

Extensions

a. Explore recipes that use emulsifiers. For example, hollandaise sauce and mayonnaise.
b. Hunt for other emulsified goods in your home. For example, lotions and paints.

4. Kitchen Prep

a. Read the title page together.
b. Identify and gather ingredients and tools.
c. Discuss kitchen safety, in particular knife safety. (Visit Raddishkids.com/pages/safety)

5. Prepare Scientific Salad Dressing

a. Ask children to read or describe each step.
b. Give each child a turn cutting, measuring and mixing.
c. Stop at Step 6 to review the experience you had with the oil and vinegar then proceed on to Step 7 using honey as your emulsifying agent. Is it doing a good job being a mutual friend to both oil and vinegar to keep them together?
d. Once the Scientific Salad Dressing is ready Eat, Taste and Share!
e. While you are eating, share what you learned about emulsions and what role they play in the meal that you are eating! Use your model of an emulsifier molecule to help explain.

Lesson 3: Whipped Chocolate Mousse and Bubbles Not Just For Party Bags
Activity time: 45 minutes

Learning Outcomes

- Students will learn the science behind why liquid cream whips up into a fluffy solid.
- Students will learn why whipping cream or heavy cream is needed instead of milk.
- Students will learn that it is air bubbles that make whipping cream thick and fluffy.
- Students will learn the science behind the strength of a spherical bubble.
- Students will experiment with bubbles to understand the ideas of surface tension, evaporation and light refraction.
- *Optional- students may make bubble art or other bubble experiments.
- Students will make Whipped Chocolate Mousse.

Materials

- Recipe guide, ingredients, and tools listed within
- Milk
- Half and Half
- Whipping or heavy cream

Experiment #1 Surface Tension

- Liquid dish soap
- Pie plate or tray
- Two short glasses of water

Experiment #2 Evaporation and Super Bubble Solution

- Liquid dish soap (like Joy or Dawn)
- Distilled water (tap water works, but distilled makes better bubbles)
- 2 containers with lids
- Measuring cup
- Measuring spoons
- Glycerin (you can find this at drugstores) or light corn syrup
- Drinking straw
- Tape and marker

Optional for Bubble Art

  - Tempera or poster paint in 3 or 4 colors
  - White construction paper
  - Bubble solution
  - Bubble wand or drinking straw

- 3 or 4 small containers (for mixing colors)
- Teaspoon

Resources consulted for this lesson plan

- *www.cleaninginstitute.org/clean_living/bubblemania.aspx*
- *www.kidsdiscover.com/teracherresources/bubbles-for-kids/*
- *www.proteacher.com/redirect.php?goto=1053*
- *www.popsugar.com/food/Difference-Between-Heavy-Cream-Whipping-Cream-13491580*
- *www.scifun.chem.wisc.edu/HOMEEXPERTS/SOAPBUBL.html*
- *www.preschool-plan-it.com/bubbles-theme.html*
- *www.education.com/science-fair/article/square-bubble/*

1. Introduction- Fun Bites- The Science of Whipped Cream

a. Pour small tastes of milk, half and half and whipping cream or heavy cream for each student. Label the glasses a, b, c.
b. Have the students observe the three glasses.
   i. Do they look different or similar? Is there any variation in color or thickness?
   ii. Do they smell different?
   iii. Do they taste different? How does it feel on your tongue?
   iv. Which one would you prefer to drink a whole glass of?
   v. What do you think is different between the three glasses?
c. Explain that what they were observing were regular milk (between 0-3% milk fat), half and half (10.5-18% milk fat) and whipping cream or heavy cream (30-36+% milk fat)
d. Together read Fun Bites- The Science of Whipped Cream.
e. It is the air bubbles, protected by the fat molecules of the cream, that make whipped cream stable (stays thick) and fluffy. If you tried to whip up milk there would not be enough fat molecules to hold the bubbles in and it would not get thick and fluffy.
f. Today you are going to study the science behind the bubbles that will make your Whipped Chocolate Mousse delicious!

2. Bubbles!

a. Ask students what they know about bubbles and the science behind how it forms and why it is a sphere.
b. Today you are going to do a few experiments to explore the science of why bubbles are round (surface tension), why bubble pop (evaporation) and why you see rainbows in a bubble (light refraction).

Experiment #1- Surface Tension and Soap

Gather materials listed above. (So there will be no disappointment, let students know that bubbles will not be blown in this experiment.)

a. First, put one glass of water in the middle of the pie plate or tray.
b. Slowly pour water from the second glass until the first glass is so full that the water forms a dome above the rim of the first glass.
c. Now carefully poke just the tip of one finger a little way straight down through the middle of the dome of water in the full glass and see what happens.
d. Finally, put a small drop of dish soap on the tip of your finger and repeat the step above. This time what happened?

Surface Tension Explained

Water is made up of tiny molecules. The molecules are attracted to each other and therefore stay together. The molecules on the very top of the water stick together even closer to make a force called **surface tension.** This force is what caused the water to be able to rise up above the rim of the glass without spilling. Why did the dome not break when you stuck your finger in? The **surface tension** was strong enough that it just went around your finger. The water molecules hung on tight to one another and nothing spilled. What happened when you put your soapy finger into the water? The soap on your finger broke the **surface tension** and some of the water molecules did not stick to each other anymore and the water spilled!

What does this have to do with bubbles? Well it is the force of **surface tension** that actually creates bubbles. Soap needs to be mixed with water to make bubbles that can float through the air. When you add soap, the water becomes flexible and it can hold the shape of a bubble when air is blown into it.

Experiment #2- Super Bubbles and Evaporation

Gather materials listed above. In this experiment the students will make their own bubble mixture out of soap and water. After they test that mixture out they will add a secret ingredient. This ingredient will alter the way the bubbles react leading to a discussion of evaporation.

a. Measure 6 cups of water into one container, then pour 1 cup of dish soap into the water. Stir really slowly and gently until the soap is mixed in. Try not to let foam or bubbles form while you stir.
b. Once the soap and water are mixed, go outside and test it. Dip your bubble blower or straw into the solution and let the extra drip off. Blow through the dry end to make bubble. Did you get a lot of bubbles? How big were they? How long did they last before they popped?
c. Now label the second container with the tape and marker, "Super bubbles". Have an adult help pour half of the original mixture into the new container. Measure 1

tablespoon of glycerin or ¼ cup of light corn syrup and add it into the "super bubble" container. Stir gently until the solution is mixed together.

d. Go outside and test this solution. Are these bubbles different from the plain soap and water bubbles? Do they last longer or pop faster? Can you blow a really big bubble?

e. To make even better bubbles, put the lid on the "super bubble" container and let it sit overnight. You can add the glycerin or light corn syrup to the other container as well.

Evaporation Explained

With the first solution of just soap and water, the soap changed the surface tension of the water to help bubbles form. Students probably got some small bubbles that did not last very long. After the glycerin or light corn syrup was added the students may have noticed that the bubbles were stronger than before. The glycerin or light corn syrup mixes with the soap to make it thicker. When the water that is trapped between the layers of soap in a bubble **evaporates** (or dries up) the bubble will pop. The thicker skin of the glycerin bubble keeps the water from evaporating as quickly. The glycerin also makes the bubble stronger which lets students blow them bigger!

Extension Experiment- temperature also plays a role in evaporation. Try out this experiment -Building a Bubblearium www.cleaninginstitute.org/clean_living/bubbleology.aspx

Why do we see rainbows in bubbles?

The colors that you see in bubbles are caused by light that is reflected off the walls of the bubble. When light is reflected the light touches the outside of the bubble and bounces off of it, then it goes to your eye and you see color. As the surface of a bubble gets thinner, you will see different colors. When you first blow a bubble, you will see blue and green, and then purple. Before it pops it will be almost black. Sometimes the surface of a bubble is thick in some parts and thin in others. When that happens, you will see different colors on the bubble at once making it look like a rainbow.

For more in depth explanation of bubble colors

www.proteacher.com/redirect.php?goto=1053

More Bubble Ideas

- Bubble Art- gather materials as listed above. Instructions at www.cleaninginstitute.org/clean_living/bubblemania.aspx
- Blow Painting- www.preschool-plan-it.com/bubbles-theme.html
- Floating Soap Bubbles- using carbon dioxide (from baking soda and vinegar) and a plastic container you can catch a bubble to study it more closely. www.scifun.chem.wisc.edu/HOMEEXPERTS/SOAPBUBL.html
- Is it possible to blow a square bubble? Experiment found at www.education.com/science-fair/article/square-bubble/

3. **Kitchen Prep**
   a. Read the title page together.
   b. Identify and gather ingredients and tools.
   c. Discuss kitchen safety, in particular stove top safety and keeping fingers away from beaters when mixing. (Visit Raddishkids.com/pages/safety)

4. **Prepare Whipped Chocolate Mousse**
   a. Ask children to read or describe each step.
   b. Give each child a turn, measuring, stirring, whipping etc.
   c. Stop at Step 5 and conduct your edible experiment. Then continue with making Whipped Chocolate Mousse.
   d. While the cream is whipping in steps 7 through 9 think about the fat molecules becoming exposed and the bubbles being formed and trapped to make firm peaks.
   e. Once your Whipped Chocolate Mousse is ready gather your family and friends together to Eat, Taste and Share!
   f. While you have everyone together you can explain what you have learned about bubbles and take people outside to try your Supper Bubble Mixture!

Pasta Around The World

Choose a country that you would like to learn more about. Gather books or search for websites that teach about the country and it's food culture. Then answer the questions below.

Resources

Young kid friendly research material from The International Pasta Organisation is available for:

- Belgium, France, Germany, Italy, Spain, Portugal, Turkey and Iran
  www.internationalpasta.org/resources/extra/file/pasta%20for%20children%202012/Pasta%20for%20Children2012-Lesson2.pdf
- Brazil, Uruguay, Chile, Argentina, Venezuela, Columbia, Mexico, Costa Rica
  www.internationalpasta.org/resources/extra/file/pasta%20for%20children%202012/Pasta%20for%20Children2012-Lesson3%202.pdf
- United States and Canada
  www.internationalpasta.org/resources/extra/file/pasta%20for%20children%202012/Pasta%20for%20Children2012-Lesson4.pdf

Questions

1. Using a map or atlas find your country on a map.
2. What is interesting about the geography of this country? Does it have access to an ocean or other body of water? Is it landlocked? Is it mountainous? Do they raise a large number of any particular animals or crops?
3. How do you think pasta made its way to this country?
4. Does its geography or agriculture affect the kind of pasta that's produced there? How?
5. What is the pasta made out of? Rice? Wheat?
6. What are the names or shapes of the pasta most common to this country? What kind of sauces or toppings are customary? What are the names of the pasta dishes unique to this country's food culture?
7. Are there any special holidays when pasta dishes are prepare and served?
8. Optional
    a. Make a pasta dish from this country or culture.
    b. Draw the flag.
    c. Trace on a map how pasta found its way to this country.

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