Winter Wonderland 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 Winter Wonderland 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 card, and introduction card. Happy cooking! Happy learning!

Lesson 1: Snowcapped Cinnamon Rolls and the Magic of Yeast

Activity Time: 45 minutes

Learning Outcomes

- Students will learn that the properties of substances can change when the substances are mixed, cooled, or heated.
- Students will combine substances to form a new substance with properties that are different from those of the original materials.
- Students will follow oral instructions for a scientific investigation.
- Students will predict the outcome of a simple investigation and compare the result with the prediction.
- Students will record observations and data with pictures, numbers, or written statements.

- Students will learn that yeast is a living organism.
- Students will learn the terms *dormant/inactive, fermentation,* and *substrate.*
- Students will make Snow Capped Cinnamon Rolls.

Materials

- Recipe guide, ingredients, and tools listed within
- *How does Yeast Behave?*

  Experiment #1- Food
    - Experiment Instruction Sheet (included)
    - Worksheet - How does yeast behave? Experiment #1- Food (included)
    - 1 package of dry yeast
    - Water
    - 1 Tablespoon of sugar
    - 1 Tablespoon of corn syrup
    - 1 Tablespoon of cornstarch
    - Measuring cups and spoons
    - Thermometer *(optional)*
    - 3 (6-ounce) transparent glass containers
    - 3 spoons
    - A deep large tray (lasagna pan) or pot

  Experiment #2- Temperature
    - Experiment Instruction Sheet (included)
    - Worksheet - How does yeast behave? Experiment #2- Temperature (included)
    - 1 package of dry yeast
    - 3 teaspoons of sugar
    - 1 spoon
    - Water
    - Ice
    - Kettle
    - 3 (6-ounce) transparent glass containers

Resources

- http://www.kidsdiscover.com/teacherresources/science-of-yeast-for-kids/
- Science Experiments You Can Eat by Vicki Cobb
- http://www.scienceinschool.org/2012/issue23/bread

- The Science Chef- 100 Fun Food Experiments and Recipes for Kids by Joan D'Amico and Karen Eich Drummond
- Kneadlessly Simple https://thegreatgrandknowledge.files.wordpress.com/2015/12/kneadlessly-simple-fabulous-fuss-free-no-knead-breads.pdf

Lesson Plan Adapted From

- Science Experiments You Can Eat by Vicki Cobb

1. **Introduction**
   - **Share**: The recipe you are going to make today uses an ingredient called yeast!
   - **Show** the students a packet of instant or rapid rising yeast. You can open it and let them touch and smell it.
   - **Ask** them some questions to ascertain their level of existing knowledge. Such as:
     - Have you heard of yeast before?
     - Where does it come from?
     - What it is used for?
     - What does it taste like?
   - **Read** the *Baking with Yeast* section of the Snowcapped Cinnamon Rolls Recipe Guide.
     - **Ask:** Does that information fit with what you thought about yeast?
   - **Explain the lesson:** Before we get baking today, let's learn a bit more about yeast and test out how it works and doesn't work to make our baked goods delicious.

2. **More about Yeast**
   - **Share**:
     - Where is yeast?
       - Yeast can be found everywhere in the world around us. Some types of yeast are found on our skin, in the air, and on the skins of fruits and vegetables.
     - What is yeast?
       - Yeast is a one-celled organism that is a relative of the mushroom.
     - How and what does yeast eat?

        - Like mushrooms and other plants without chlorophyll, yeast cannot make its own food and needs to get it from the environment. If yeast finds itself in a situation where it has no food to eat or if the environment is not to its liking, it simply goes *dormant* (goes to sleep) or becomes *inactive*. However, all it needs to wake it up is a bit of food and a nice comfortable environment to wake up in!
        - When yeast is woken up or *becomes active* it starts eating the food around it. The material that a microbe (yeast) uses as food is called a *substrate*. Once it starts eating it basically starts burping! This process of burping is called *fermentation* and it produces two things: alcohol and carbon dioxide.
    - How do we use yeast?
        - Wine makers use yeast because of its ability to make alcohol and bakers want it for its ability to make carbon dioxide. (The two products of *fermentation*.)
    - Why do bakers like yeast?
        - Carbon dioxide (the yeast's "burps") creates air bubbles that make bread light and fluffy - they give it a structure.
- **Explain the experiment:** Today we are going to do two experiments to test how yeast reacts to different food sources and different environments.

3. How does Yeast Behave?

Experiment #1- Food and *Experiment #2- Temperature*

a. Read through the Experiment Instructions (included).
    i. Gather necessary materials.
    ii. Review the Scientific Method and Experiment Safety.
    iii. Read through the Experiment Procedure and ensure understanding of the steps.
b. Read through the Experiment Worksheets with the students (included).
    i. Before starting, have students fill in as much of the Experiment Worksheet as possible.
c. During the experiment, remind students to use all their senses when observing.
    i. Have them record what they see, hear, smell etc. on their Experiment Worksheets.

d. When the experiment is done, ask discussion questions to assess understanding of the concept of fermentation. Have students complete the Experiment Worksheet.

Extension Ideas

- More yeast experiments
  - Blow up a balloon with Yeast- https://sciencebob.com/blow-up-a-balloon-with-yeast/
  - What is the effect of ultraviolet light on yeast production? http://www.all-science-fair-projects.com/project924_109.html
- Try baking a recipe with the slow fermentation method. Try a recipe from the book Kneadlessly Simple (follow the link for recipe pdfs.) https://thegreatgrandknowledge.files.wordpress.com/2015/12/kneadlessly-simple-fabulous-fuss-free-no-knead-breads.pdf

4. Kitchen Prep

a. Read the Snowcapped Cinnamon Rolls recipe card together.
b. Identify and gather ingredients.
c. Gather tools.
d. Discuss kitchen safety. Specifically, oven safety (Visit Raddishkids.com/pages/safety).
e. Read the Featured Culinary Skill-**Kneading Dough.**

5. Prepare Snowcapped Cinnamon Rolls

a. Ask children to read or describe each step.
b. Together, follow the steps in the recipe.
c. Give each child a turn to stir, knead and roll.
d. While the Snowcapped Cinnamon Rolls are rising have students prepare to share the results of their *How Yeast Behaves* Experiments.
e. When the Snowcapped Cinnamon Rolls are ready, eat, taste and share!

Lesson 2: Winter White Mac and Cheese and Weather Forecasting
Activity Time: 90+ minutes

Learning Outcomes

- Students will learn that changes in weather occur from day to day and across seasons, affecting Earth and its inhabitants.
- Students will learn that the weather changes from day to day but that trends (of rain, snow, etc.) tend to be predictable during a season.
- Students will learn the term *forecasting*.
- Students will learn about the history of weather forecasting.
- Students will learn what tools meteorologists use today to predict the weather.
- Students will observe the weather by using the five senses.
- Students will build and use simple tools (e.g., thermometer, wind vane, barometer, and rain gauge) to measure weather conditions and record changes from day to day and across the seasons.
- Students will repeat observations to improve accuracy and learn that the results of similar scientific investigations seldom turn out exactly the same (because of differences in the things being investigated, methods being used, or uncertainty in the observation.)
- Younger students will communicate observations orally and through drawings.
- Older students will communicate observations orally, through drawings, charts and writing.
- Students will make Winter White Mac and Cheese to share with their friends and family.

Materials

- Recipe guide and ingredients and tools listed within.
- Backyard Weather Station Data Collection and Results Reporting Worksheet (included)

- Weather Forecasting Using Your Senses Worksheet http://content.teachengineering.org/content/cub_/activities/cub_weather/cub_weather_lesson04_activity1_forecasting_worksheet.pdf
- Clouds Reference Sheet http://content.teachengineering.org/content/cub_/activities/cub_weather/cub_weather_lesson04_activity1_cloudsrefsheet_v2_tedl_dwc.pdf
- Variety of household items to make a backyard weather station. Listed below with each weather tool.

Lesson Adapted From

- Teach Engineering Backyard Weather Station https://www.teachengineering.org/activities/view/cub_weather_lesson04_activity1

Resources

- How do I Become a Meteorologist http://www.infoplease.com/cig/weather/how-do-become-meteorologist.html
- http://weatherlabs.planet-science.com/weather-forecasts/what-is-a-weather-forecast.aspx
- US Climate Data http://www.usclimatedata.com/
- Videos from Youtube:
  - How to Make a Wind Vane (2:10) https://www.youtube.com/watch?v=cnZ5LYI19Vo
  - How to Make a Barometer (3:19) https://www.youtube.com/watch?v=ah8F-xmvB2k
  - Make Your Own Rain Gage (2:35) https://www.youtube.com/watch?v=QOzdcM-YZ2U
  - How to Read a Thermometer (4:31) only the first 2:10 is applicable unless you want to teach students how to convert between C and F. https://www.youtube.com/watch?v=z3lM0zpGXps&t=148s

1. **Introduction- What is a weather forecast?**
    - **Ask:** What were you thinking about when you were getting dressed this morning? Did you look out the window? What clues did you use to decide whether you should wear a t-shirt or a sweater? A raincoat or sunglasses?
    - **Share:** Without even knowing it you were *forecasting* the weather. Weather *forecasting* is predicting what the weather will be like at a certain time in the near future, in a given location.
    - **Ask:** Discussion questions:
        - Why do you think weather forecasting is a good idea?
        - When do you consult the weather forecast?
        - Where do you get your weather information from? (television, app, newspaper, look out the window)
        - Who benefits from forecasting? (farmers, people escaping a storm)
        - When do you see people consulting the weather forecast? (before going hiking, planning a winter get away etc.)
    - **Explore:** Go outside right now and assess the current weather conditions. Then come back inside and give your classmates a weather report.

2. **Weather Forecasting Then and Now**
    - **Share:** Weather Forecasting in the Past – "Then"
        - In the past, humans did exactly what you just did to forecast the weather. They went outside and looked around!
        - However, they took it a step further. They started to notice and in many cases record what the weather was like when their senses told them certain things. They looked for patterns.
        - In 650 BC Babylonia (modern day Iraq) humans predicted the weather from cloud patterns.
        - The ancient Chinese predicted the weather by observing patterns of events. If the sunset was unusually red, it was often an indication of good weather for the following day. Thus the common saying for sailors "Red sky at night, sailor's delight. Red sky in the morning, sailor's warning."
        - Although these ancient methods of weather forecasting were used for centuries, they were not always reliable.

- **Ask:** Why do you think that people back then couldn't count on the weather forecast?
    - **Share:** Another limitation was that information about the current state of the weather could not be communicated to places far away. So, if a community of Babylonians were experiencing a terrible storm, they had no way to warn their neighbors downwind that trouble was coming.
- **Share:** Weather Forecasting Today – "Now"
    - The modern age of weather forecasting began with the invention of the telegraph in 1837.
        - **Ask:** Why do you think the invention of the telegraph has to do with weather?
            - It allowed forecasts to be made by knowing the actual weather conditions in distant places.
    - During the past 100 years, engineers and scientists have worked to design modern forecasting equipment to help predict the weather.
        - Examples: weather balloons, satellites, Doppler radars and more
    - During the 20th century, engineers and scientists designed computers to make computer simulations of the atmosphere (when you see the cloud patterns moving around on the television weather report).
        - These simulations take information about the present weather and use the computational tools of physics and fluid dynamics to predict how the wind and water in our atmosphere are expected to change with different atmospheric conditions (temperature, humidity and pressure).
    - **Ask:** How could weather forecasting save lives?
        - Modern weather forecasting technology provides vital information for advance warnings of natural disasters such as tornadoes, hurricanes and floods. Improved technology has saved many lives and reduced damage to property and the environment.

3. Modern Weather Forecasting Tools

- **Weather Balloons**
    - Weather balloons carry instruments high up into the atmosphere. The balloons, launched every day all over the world, carry a radiosonde high

up into the atmosphere. The radiosonde is a small, battery powered device that collects information about **atmospheric pressure, humidity, and temperature**. These data are then transmitted to a ground antenna via specific radio frequencies.

- **Satellite Technology**
  - Weather satellites are another engineering marvel that enable us to see what the **Earth and clouds look like from space** and give us a more comprehensive view of Earth's **interrelated systems** and climate. They let us see the big picture!
- **Radar**
  - What if you wanted to see *inside* a large cloud or storm to analyze its structure and gauge its potential to cause severe weather? Is this possible?
    - Military radar operators asked this same question during World War II, when they noticed noise in returned radar echoes due to weather elements such as rain, snow and sleet. Now, we have weather radar, a special type of radar that uses radio waves to "see" how precipitation is behaving in a cloud and how it might change.

4. **Backyard Weather Station**

- **Explain:** We are going to start by weather forecasting like humans did back in 650 BC.
- *For Younger Students:*
  - Fill in with pictures, writing or dictation the 5 senses worksheet.
    - Weather Forecasting Using Your Senses Worksheet: http://content.teachengineering.org/content/cub_/activities/cub_weather/cub_weather_lesson04_activity1_forecasting_worksheet.pdf
- *For Older Students:*
  - Assess the weather by looking at the clouds in the sky and compare what they see to the clouds reference sheet. Fill in the second page of the Weather Forecasting Worksheet above.

    - Clouds reference sheet: http://content.teachengineering.org/content/cub_/activities/cub_weather/cub_weather_lesson04_activity1_cloudsrefsheet_v2_tedl_dwc.pdf

- **Explain the project:** You can make your own awesome weather measurement devices out of household items!
    - Students will have the choice (dependent on ability, supplies, and time available) to make one or more of the following weather tools, place it outside and use the *Backyard Weather Station Data Collection and Results Reporting Worksheet* (included) to record data and make a weather forecast using the results.

Wind Vane

Materials

- Youtube Video- How to Make a Wind Vane (2:10) https://www.youtube.com/watch?v=cnZ5LYI19Vo
- 2 paper plates
- Straight pin
- Scissors
- Card stock or part of another paper plate
- Plastic straw
- Pencil with a new eraser
- Glue
- Modelling clay or Play Do
- Compass (you can use your phone)
- Backyard Weather Station Data Collection and Results Reporting Worksheet (included)

Barometer

Materials

- Youtube Video- How to Make a Barometer (3:19) https://www.youtube.com/watch?v=ah8F-xmvB2k
- Jar
- Balloon
- Scissors

- Straw
- Tape
- Glue
- Rubber Band
- Pencil and marker
- Needle (or just cut the straw at the tip so that it makes a pointer)
- Piece of cardstock or card board
- Backyard Weather Station Data Collection and Results Reporting Worksheet (included)

Rain Gauge

Materials

- Youtube Video- Make Your Own Rain Gage (2:35) https://www.youtube.com/watch?v=QOzdcM-YZ2U
- 2L clear plastic drink bottle- flat bottom is ideal but not necessary
- Tape
- Scissors
- 2 Paperclips
- Ruler
- *In the video they say jelly (jello) but I recommend using playdough or modelling clay to make the bottom of your rain gauge level on the inside. This is for accuracy and ease of reading measurements.*
- Backyard Weather Station Data Collection and Results Reporting Worksheet (included)

Temperature

Materials

- Youtube video- How to Read a Thermometer (4:31) only the first 2:10 is applicable unless you want to teach students how to convert between C and F. https://www.youtube.com/watch?v=z3lM0zpGXps&t=148s
- Outdoor thermometer
- Climatology data for your area (easily found here http://www.usclimatedata.com/)
- Tape

- Backyard Weather Station Data Collection and Results Reporting Worksheet (included)

Extension Ideas

- Create a weather report to give to your friends and family. Examples:
  - A newspaper report
  - The television weather report
  - A dramatization of the weather or of what you should wear and do in this kind of weather.
- Make another weather tool- An Anemometer to measure wind speed.
  - How to Make an Anemometer (8:02) https://www.youtube.com/watch?v=f6t4dkMUOZ0
- Learn more about Barometers:
  - Youtube- The History of the Barometer and how it works TedED 4:45 https://www.youtube.com/watch?v=EkDhlzA-lwI
- Learn what you would have to do to become a Meteorologist: http://www.infoplease.com/cig/weather/how-do-become-meteorologist.html

5. Kitchen Prep

a. Read the title page together.
b. Identify and gather ingredients and tools.
c. Read the **Featured Culinary Skill – Using a Box Grater** on the Winter White Mac and Cheese recipe guide.
d. Discuss kitchen safety. Specifically, stove top safety (Visit Raddishkids.com/pages/safety).

6. Prepare Winter White Mac and Cheese

a. Ask children to read or describe each step.
b. Give each child a turn grating, whisking and measuring.
c. While the Winter White Mac and Cheese is baking students can prepare to share their Backyard Weather Station Forecast for their family and friends.
d. When the Winter White Mac and Cheese is ready, eat, taste and share!

Lesson 3: Evergreen Salad and Evergreen Tree Exploration and Identification
Activity time: 60 minutes

Learning Outcomes

- Students will compare and sort common objects by their physical attributes (e.g., color, shape, texture, size, number)
- Students will learn roots are associated with the intake of water and soil nutrients and green leaves are associated with making food from sunlight.
- Students will learn that plants and animals have structures that serve different functions in growth, survival, and reproduction.
- Students will discuss and chart the differences between deciduous and evergreen trees.
- Students will identify and categorize different evergreen trees.
- Students will learn what a dichotomous key is and how to use one.
- Students will make Evergreen Salad.

Materials

- Recipe guide and ingredients and tools listed within.
- Chart paper and markers
- Scissors
- Clipboard or notebook
- Ziplock bags (medium size)
- A walk around the neighborhood in a park or to a Christmas Tree Lot.

Resources

- http://serc.carleton.edu/sp/mnstep/activities/27038.html
- http://fyi.uwex.edu/uphamwoods/files/2014/10/Tree-Identification-Lesson-Plan.pdf
- http://www.layers-of-learning.com/dichotomous-key/
- http://dnr.wi.gov/eek/veg/treekey/noneedle.htm

1. **Introduction- What is the Difference?**
   - **Show:** Bring a leaf from a deciduous tree to the lesson and some evergreen needles. Have students investigate the items and tell you what they notice/observe and what they know about the leaves. Write down their ideas on chart paper.
   - **Ask:** Discussion questions about leaves and needles
     - What do you notice about the shape? Texture? Smell? Color?
     - What do you notice about the size? Weight? Length?
     - What do you think these items are?
     - Where do you think they came from?
   - **Review:**
     - *Older students:* Review the information they came up with.
     - *Younger students:* Read back their observations.
   - **Chart** the similarities and differences:
     - Use a table chart or a Venn Diagram.
       - A **Venn diagram** would have two circles that overlap in the middle. One circle labeled "deciduous leaf" and the other labeled "evergreen leaf/needle." Explain that the center section where the circles overlap are the things that are the same for both the deciduous/broadleaf and the evergreen leaf/needle
       - A **table chart** might look something like this:

Deciduous/Broadleaf	Both	Evergreen/Needle
Flat Falls off in the autumn Soft	Leaves Green Make food for the tree Grow on trees Are food for animals	Narrow pointy sharp

   - **Share:** In December, in many parts of the world the only trees that keep leaves on them are evergreen trees. Evergreen trees have needles for leaves! Today we are going to learn more about why evergreen trees keep their leaves all year and how to identify some different evergreen trees.

2. **Why do Evergreen Trees Stay Green in the Winter?**
   - **Share:** The main reason that deciduous or broadleaf trees drop their leaves in winter is because underground water supplies may freeze so roots can't suck water up. If these trees kept their leaves in the winter, they would lose water through their leaves on sunny days. Since they can't get more water from the ground, eventually the deciduous trees would dehydrate and die.
   - **Ask:** From what we noticed about the evergreen needles above, how are they better suited to last through the winter?
     - **Share:** Evergreen trees have adapted to conserve water loss without shedding all their leaves at once through these characteristics:
       - Needles have fewer pores to lose water out of.
       - Many have a thick waxy coating.
       - A large number of needles capture a lot of sunlight but lose little water.
       - Because they keep their leaves they don't have to expend energy each year to regrow a completely new set.
       - Size of needles allows them to hold less snow so that they are less likely to break under the weight of winter snow.

3. **Different Kinds of Evergreen Trees and Ways to Identify Them**
   - **Share:** One way that you can identify trees is by using something called a **Dichotomous Key**. A Dichotomous Key is a tool to help identify an object such as a tree using the process of elimination.
     - When using a Dichotomous Key, you answer questions about the object always beginning with number one and following the directions as you go along.
     - Each question should create a situation where the object fits into exactly one of the categories. You choose between them (it cannot possibly fit into both!) until you end up with only one possibility.
     - For a kid-friendly example check out: http://www.layers-of-learning.com/dichotomous-key/
   - **Share:** Looking at the needles/leaves of the evergreen tree is another big help in figuring out what kind of tree it is.

- **Examine:** If you look at the leaf shapes in the above picture you will see:
  - Left: "awl"
  - Center: "needle"- including flat, square and bundled needles
  - Right: "scale"
- **Categorize:** Types of trees that fit into each of those leaf shapes are listed below.

Awl like	Needle Like	Scale Like
Junipers Siberian Cypress	Yew Hemlock Fir Douglas Fir Spruce Pine	Cedar

- **Ask:** Using these needle classifications, can we discover what type of tree species our needles are from?

4. **Tree Scavenger Hunt and Identification**
   - **Explore:** Go on an evergreen tree hunt! Search your neighborhood or visit a nearby park or forest. At this time of year, you could even go visit a Christmas tree lot!
   - **Collect samples**: For each tree put the following things in a Ziplock bag or in a jar:
     - A twig that includes needles
     - A cone or fruit if present
     - A bark rubbing- to do a bark rubbing all you need is a crayon with the paper taken off and a piece of paper. Place the paper against the trunk of

the tree and with the wide side of the crayon rub back and forth to reveal the pattern of the bark on the paper.

- **Investigate** the samples:
  - Describe the **needles**.
    - Are they short; long; stiff; soft?
    - Explain how they are arranged on the twig. Do they grow in clumps or grow singly from the twig?
    - How do the needles smell when you crush them?
  - Describe the **twigs**.
    - Describe the color. Are they whitish-grey or yellowed like spruce; greenish or orangey-brown like white pine; or greenish and waxy like the balsam fir?
  - Describe the **cones**.
    - Do they seem to stand up straight on the branch like the fir or do they hang from the branch like the pine and white spruce?
    - Describe the shape of the cones. Are they long and narrow or short and blunt? Are they open or closed?
- Identify your evergreen finds!
  - Use an online dichotomous key to help you: http://dnr.wi.gov/eek/veg/treekey/noneedle.htm

Extension Ideas

- Make a map of your neighborhood or park and label the evergreen trees you have identified.
- Research one evergreen tree in depth.
- Place each sample in a glass jar. Stick a piece of masking tape to the bottom and label the tree type. Then have your friends and family try to guess what kind of evergreen it is.
- Create a dichotomous key for a different subject. For example, identifying whether a bug is an arachnid or an insect.
- Draw an Evergreen Tree:
  - How to Draw an Evergreen Tree for Kids (2:16) https://www.youtube.com/watch?v=jjJhhkISZcA

5. **Kitchen Prep**
    a. Read the title page together.
    b. Identify and gather ingredients and tools.
    c. Read the **Featured Culinary Skill – Knife Skills** on the Evergreen Salad recipe guide.
    d. Discuss kitchen safety (Visit Raddishkids.com/pages/safety).

6. **Prepare Evergreen Salad**
    a. Ask children to read or describe each step.
    b. Give each child a turn cutting, measuring and mixing.
    c. Students can decorate the table with their evergreen tree samples and test their friends and family to identify them. Or simply place their collection decoratively on the table.
    d. Once the Evergreen Salad is ready gather your family and friends together to Eat, Taste and Share!

How Does Yeast Behave?

Experiment Instructions

Materials

Experiment #1- Food

- Worksheet- How Does Yeast Behave? Experiment #1- Food (included)
- 1 package of dry yeast
- Water
- 1 Tablespoon of sugar
- 1 Tablespoon of corn syrup
- 1 Tablespoon of cornstarch
- Glass measuring cup
- Measuring spoons
- Thermometer *(optional)*
- 3 (6-ounce) transparent glass containers
- 3 spoons
- A deep large tray (lasagna pan) or pot
- A timer *(optional)*

Experiment #2- Temperature

- Experiment Instruction Sheet (included)
- Worksheet- How Does Yeast Behave? Experiment #2- Temperature (included)
- 1 package of dry yeast
- Sugar
- Water
- Ice
- Kettle
- 3 (6-ounce) transparent glass containers

Review the Scientific Method

- OBSERVE- Use your 5 senses
- QUESTION- What would happen if…?
- HYPOETHESIS- I think…
- TEST- Do the experiment
- CONCLUDE- I learned… was your hypothesis true
- REPORT- Share what you learned

Review Safety Procedures

Always have adult supervision and discuss kitchen safety (Visit Raddishkids.com/pages/safety).

Experiment #1- Food

1. Collect the necessary materials.
2. Read through the procedure and review the worksheet with the students.
3. Have students fill in their hypothesis before you begin.

Procedure

1. Fill a measuring cup to ¾ cup with 105ºF-110ºF water.
    - If you don't have a thermometer you can use the "blood temperature" or "body temperature" rule. Put warm water into a container and stick your finger in. If your finger doesn't register a change in temperature (i.e. it doesn't feel cool or warm) then you have body temperature water which is around 100ºF.)
2. Pour the packet of yeast into the measuring cup and stir until just dissolved.
3. Divide the yeast mixture equally between the three glasses (1/4 cup in each)
4. Put 1 Tablespoon of sugar into the first glass, one Tablespoon of corn syrup into the second glass, and one Tablespoon of cornstarch into the last glass.
    - Use a different spoon for each so that you do not cross-contaminate the samples.
5. Set up a warm-water bath for the yeast in the large pan. The water will cool slowly, but the temperature will be warm long enough to help active fermentation.
    - Put enough 105ºF-110ºF water in the pan to come about halfway up the sides of the glasses containing the yeast mixtures.
    - DON'T LET ANY OF THE WATER FROM THE BATH INTO THE GLASSES.
6. Watch your yeast mixtures carefully and observe.
    - Does one start bubbling before the others? Another way to say that is- Which substrate in your experiment starts being fermented first?
    - Does one finish bubbling first?
    - Does the fermentation seem to start and stop? Another way to say it is- Which has the steadiest rate of fermentation?

- Can you smell the alcohol produced by the fermentation? The heat of the oven kills the alcohol produced in fermentation.
- What happens to the bubbles on the fermenting yeast?

Results

- The yeast bubbles in your experiment eventually pop. *Why doesn't that happen to the bubbles in the bread?* Because these bubbles are 'inside' the bread. Flour when mixed with yeast and water, forms a 'balloon' to hold the gas bubbles in a loaf.
- Glucose is the principal food of the yeast we use for baking. When yeast comes into contact with glucose it wakes right up and starts eating- fermentation begins immediately! Glucose is present in corn syrup. Yeast can also get glucose from sucrose (sugar) and starch, but it takes longer to get going, as sucrose and starch need to be broken down into simple sugars before fermentation can occur.

Science Experiments You Can Eat by Vicki Cobb

Experiment #2- Temperature

1. Collect the necessary materials.
2. Read through the procedure and review the worksheet with the students.
3. Have students fill in their hypothesis before you begin.

Procedure

1. Divide the dry yeast from the packet equally between the three glasses and add one teaspoon of sugar to each one.
2. Put ¼ cup of 105ºF-110 º F water into the first glass and stir until mixed. (This is the warm glass.)
    - If you don't have a thermometer you can use the "blood temperature" or "body temperature" rule. Put warm water into a container and stick your finger in. If your finger doesn't register a change in temperature (i.e. it doesn't feel cool or warm) then you have body temperature water which is around 100ºF.)
3. Put ¼ cup of boiling water from the kettle into the second glass and stir until mixed. (This is the hot glass.)
    - Adult Supervision required
4. Put ¼ cup of ice water into the last glass and stir until mixed. (This is the cold glass.)
    - This mixture probably won't dissolve completely.
5. Watch your yeast mixtures carefully and observe.
    - Does one start bubbling before the others?
    - Does one finish bubbling first?
    - Does fermentation happen in all the glasses?
    - Does fermentation happen in the hot glass when the temperature cools down enough?
    - Does fermentation eventually start in the cold glass if you leave it in a warm place?

Results

- In this experiment the substrate (the yeast's food) is constant (or the same) in all three glasses, so that can't account for the difference in

fermentation. Instead you're measuring the change in the environment that you put the yeast in.

- The warm glass is the perfect temperature for the yeast.
- The hot glass killed the yeast cells, so it will never ferment.
    - This is why we don't get as sick as our ancient ancestors. Cooking foods at high temperatures kills microbes (like yeast) that can make us sick.
- The cold glass also killed the yeast.
    - This is one reason why we use freezers to prolong the life of the food we eat today.
    - In a bread recipe, if you mix your yeast with flour first and then add cold (*not ice*) water it slows down the fermentation process allowing more flavor development in the dough over longer time periods.

How Does Yeast Behave?

Experiment # 1 Food

1. **Observe-** write and draw about what you see/hear etc.

_____

_____

_____

What does the experiment look like at the beginning?

Sugar	Corn Syrup	Cornstarch

2. Question

What happens if I change the kind of food/substrate I feed to the yeast?

3. Hypothesis

Sugar

_____

_____

Corn syrup

_____

_____

Cornstarch

_____

_____

Draw what you think will happen.

Sugar	Corn Syrup	Cornstarch

4. **Test-** Follow the instructions of the experiment.
5. **Conclusion-** What happened? Did your hypothesis come true?

Sugar

_____

_____

Corn syrup

_____

_____

Cornstarch

_____

_____

Draw what happened.

Sugar	Corn Syrup	Cornstarch

6. **Report**- Share your experiment and what you learned with your family and friends.

How does Yeast Behave?

Experiment # 2 Temperature

1. **Observe-** write and draw about what you see/hear etc.

_____

_____

_____

What does the experiment look like at the beginning?

Warm Water	Boiling Hot Water	Ice Cold Water

2. **Question**

What happens if I change the environment that I put the yeast in?

3. Hypothesis

Ice Cold

_____

_____

Warm

_____

_____

Boiling Hot

_____

_____

Draw what you think will happen.

Warm Water	Boiling Hot Water	Ice Cold Water

4. **Test**- Follow the instructions of the experiment.

5. **Conclusion**- What happened? Did your hypothesis come true?

Ice cold

_____

_____

Warm

_____

_____

Boiling Hot

_____

_____

Draw what happened.

Warm Water	Boiling Hot Water	Ice Cold Water

6. **Report**- Share your experiment and what you learned with your family and friends.

Backyard Weather Station Data Collection and Results Reporting

Rain Gauge

- Set in an area outside that has no obstructions to block the rain (overhanging branches, etc.)
- After it rains, use the attached ruler to determine the amount of rainfall in inches.
- *If it is snowing rather than raining in your area leave the funnel part off of your rain gauge and you will have a snow catcher instead. Use the ruler to measure the depth of snow that fell. Then bring it inside let it melt and measure the amount of water that you collected.

Date/Time of Observation	Rainfall in Inches	Notes- what kind of rain? What kind of clouds? Depth of snow?

Barometer

- Usually, **clear weather** results in higher air pressure which pushes down on the balloon making the **needle go up**.
- In the case of an approaching **storm**, the air pressure drops making the air inside the jar push up on the balloon and force the **needle down**.

Date/Time of Observation	Barometer up or down	Notes- what is it like outside? Clear? Gusty? What kind of clouds?

Wind Vane

- Use your wind vane to observe wind direction over time.
- What patterns do you notice between the kind of weather you are getting and the direction the wind is coming in?

Date/Time of Observation	Wind Direction	Notes- is the wind direction stable or changeable? What kind of clouds?

Temperature

- Look at the climatology data for your area to determine the air temperature you would expect for this time of year. This is the **predicted air temperature**.
- Use your thermometer to find the actual air temperature outside. This is the **measured air temperature**.
- Record this data in the table below.
- If the measured air temperature is much different than the predicted air temperature, write notes in the table to explain this difference.

Date/Time of Observation	Predicted Air Temperature	Measured Air Temperature	Notes- Warmer or cooler than predicted? What kind of clouds?

Forecast the Weather Using Your Backyard Weather Station Data Reporting

A **Cold Front** is a warm-cold air boundary where the cold air replaces the warm air.

- Cold fronts usually bring cumulus (and altocumulus) clouds, showers or thunderstorms.
- As the cold front passes, the wind changes direction. Skies begin to clear, and the temperature and pressure usually drop.

A **Warm Front** is the boundary between warm and cold air, where the warm air replaces the cold air.

- Warm fronts bring stratus clouds and some precipitation, either rain or snow.
- When the front passes, the sky clears and the air pressure rises. The temperature also rises as warm air replaces cold air.

With the data from the Backyard Weather Station Data you collected answer the following questions to determine if there is a weather front.

What is the cloud shape? _____

Has the wind changed direction? _____

Have there been signs of precipitation? _____

Has the air temperature risen, fallen, or stayed the same? _____

Has the air pressure risen, fallen, or stayed the same? _____

Do you predict a weather front in your area? _____

Do you predict a cold or a warm front? _____

How should the people in your area prepare for this weekend's weather?

_____

_____