Irish Eats
Homeschool Lesson Plan

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 Irish Eats box, this lesson plan divides your box into three 45-90 minute lessons. You can use these lessons for students from pre-K – middle school and adapt them to suit your needs. Depending on your timeframe, child's age, and their engagement, these lessons can be taught together or separated.

Please refer to the curriculum provided in your box: recipe guides, activity card, and introduction card.

Happy cooking! Happy learning!

Lesson #1: Lucky Leek Potato Soup
& Symbols and You
Activity Time: 45-60 minutes

LEARNING OUTCOMES

- Students will **learn** what a symbol is.
- Students will **learn** that symbols can be used to express ideas.
- Students will **identify** and **read** symbols in their environment.
- Students will **explore** Irish-specific symbols.
- Students will **create** and **design** an individual, family, or town symbol.
- Students will **share** and **explain** their symbol to friends and family.
- Students will **read** and **practice** the Featured Culinary Skill - **Using a Ladle.**
- Students will **make** and **share** Lucky Leek Potato Soup with friends and family.

SYMBOLS AND YOU

Notes for the Teacher:

- It is important to help students of all ages appreciate that even though symbols may represent a culture, there are still many individuals within a culture that do not fit perfectly within any one way of being described.
- Students' ideas about what a symbol might represent are going to differ. Encourage these discussions and explore ideas of confusion about meaning. Ask students how their differences in explanation of meaning could result in problems or new understandings between people.

Teacher Prep:

- Collect Materials:
    - Recipe guide, ingredients, and tools listed within.
    - Images of symbols that are meaningful to your students. (Clip art images)
    - Art Materials for Symbol Creation
        - Pencil and paper for rough draft
        - Optional:
            - Collage Materials (scissors, glue, magazines etc.)
            - Markers, construction paper.
            - Paint and paper.
            - Computer drawing program.

Lesson: Symbols and You

- Introduction: What is a Symbol?
    - Draw or post some symbols up in your classroom space. For example:



    - Ask students to describe the objects that they see. (For example, the Smiley Face is a yellow circle with black ovals and lines on it.)
    - Ask students: Do you think these are simply drawings? Why or why not?
    - Tell the students that these are a special kind of drawing called a *symbol*.
    - Explain: A symbol is a picture that represents something else. The symbol could represent an object or an idea.
    - Teach students that symbols can be found all around us all the time. Symbols have different jobs. A few examples are:
        - Rules (tell us what we can and can't do)
        - Traffic (how to behave in a car or on a bike)
        - National Symbols (stand for an idea like the Statue of Liberty=Freedom)
        - Feelings (a way to let others know how you're feeling- emoticons)

- **Ask** students to **draw** or **describe** symbols that fit into each of these categories.
- **Challenge** students to come up with more categories of symbols. (For example, money ($), superheroes, map symbols (compass), warnings (poison), etc.)
- **Ask** students why they think there are so many symbols all around us?
- Tell the students that today they will be learning more about Irish Symbols and that they will also be creating symbols that represent who they are, their family, or their town.

- Irish Symbols
  - **Display** a picture of a *Claddagh Ring*. Good detailed photos can be found in a Google Image Search.
  - **Lead a think-aloud**. Identify the different parts of the Claddagh.
    - "I see two hands, a heart, and what looks like a crown."
  - **Ask** students: What do you think that each of those things represents? Why?
    - Student answers will vary. (For example, hands might represent friendship to one person but to another they may represent hard work.)
    - **Encourage** conversations about differences in opinion. (see teachers note above)
  - **Ask** students:
    - Why they think that friendship, love, and loyalty are important to Irish culture?
    - Do you think that all Irish people identify with this symbol? Why or why not?
    - How do you think people feel when they are associated with a symbol that doesn't fit who they are? Can you think of an example for yourself?
  - **Read** the Irish Symbols section of the Lucky Leek Potato Soup recipe guide and **discuss** the other symbols listed.
  - **Ask** students:
    - Do you know of other Irish Symbols? (For example: leprechauns, pot of gold at the end of the rainbow, etc.)
    - What do you think those symbols represent?

- "Symbols and You" Activity Instructions
  - **Tell** the students that now that they have seen and explored some examples of Irish Symbols, their job is to create their own symbol that represents one of the following:
    - yourself
    - your family
    - your neighborhood, city, or town
  - **Tell** the students that the symbols could represent anything that makes them, their family, or their neighborhood special or unique.
  - **Provide** students with:
    - Paper and pencil for rough draft

        - Optional books (see list below)
        - **Support** in figuring out what they want to represent
    - Have students **share** their rough draft with you and then **decide** what medium they want to use for their final copy. Some ideas are:
        - Markers
        - Paints
        - Collage
        - Digital
        - a flag or shield diagram
    - Have students **display** their finished symbol and **present** what it means to them.

Extension:

- Symbol Scavenger Hunt- this game can be played anywhere: in the house, walking to the park, in the grocery store. You can have students simply call out when they see a symbol and then have them explain its meaning. Or you can have them draw or take photos of symbols and write their meanings down.
    - A great symbol game for road trips is a road sign travel bingo game. Such as the one available at http://www.thrivingfamily.com/~/media/AC2E91BEC0EA4B7DB632A5C7C212B4B5.pdf
- Explore different flags around the world and what their symbols mean.

Cooking Lucky Leek Potato Soup

Kitchen Prep

- Read the Lucky Leek Potato Soup recipe card together.
- Identify and gather ingredients.
- Gather tools.
- Read the **Featured Culinary Skill, Using a Ladle**
- Discuss kitchen safety. Specifically, Stove Top safety (Visit Raddishkids.com/pages/safety).

Prepare Lucky Leek Potato Soup

- Ask children to read or describe each step.
- Together, follow the steps in the recipe.
- Give each child a turn to peel, ladle, and puree.
- While the potatoes are simmering, display your symbols for your friends and family to admire.
- When the Lucky Leek Potato Soup is ready, eat, taste and share!
- While your friends and family are eating, teach them what you learned about Irish Symbols and discuss how you created your own symbol and describe what it means to you. Challenge your friends and family to think about what symbol they would create for themselves.

RESOURCES

- **Books**
- Symbols of Native America by Heike Owusu
- O, Say Can You See? America's Symbols, Landmarks, And Important Words Paperback by Sheila Keenan
- Memory String by Eve Bunting
- Symbols -- Encyclopedia of Western Signs and Ideograms by Carl G. Liungman
- Fritz Scholder Book of Symbols for Children by Fritz Scholder

Websites

- 10 Picture Books for Scaffolding Symbolism http://www.teachersforteachers.net/?p=1797
- www.littlegiraffes.com
- www.worldmapsonline.com
- www.thrivingfamily.com
- www.atozkidsstuff.com

Lesson #2: Cottage Pie
& Dance Around the World
Activity Time: 60-90 minutes

LEARNING OUTCOMES

- Students will **learn** about the history and execution of Irish folk dance.
- Students will explore the basic elements of dance: *level, direction, speed, locomotor, axial.*
- Students will **explore** the basic features that **distinguish** one kind of dance from another (e.g., speed, force/energy use, costume, setting, music).
- Students will **create** movements that reflect a variety of personal experiences (e.g., recall feeling happy, sad, angry, excited).
- Students will **research, name, describe** and **perform** folk/traditional dances from the United States and other countries.
- Students will **describe** the **similarities** and **differences** in various dances (e.g., direction changes, steps, type of energy and tempo).
- Students will **read** and **practice** the Featured Culinary Skill **Peeling Produce.**
- Students will **make** and **share** Irish Cottage Pie with friends and family.

DANCE AROUND THE WORLD

Notes for the Teacher:

- Why are dance and movement important for children?
    - Through dance, children develop spatial awareness, become less clumsy, and pay more attention to others sharing their space.
    - Children struggling with language can express their feelings with immediacy through dance and movement.
    - By communicating freely with the voice, face, and body, children learn to express ideas with confidence, empathize with others from different cultures and backgrounds, and feel at home in their own skin.
    - Song, music, and dance can help children become more imaginative, self-aware, and collaborative global citizens.
    - If you would like **to learn more** about the benefits of dance on: physical development, emotional maturity, social awareness, and cognitive development explore here: http://www.ndeo.org/content.aspx?club_id=893257&module_id=55419&page_id=22
- Review some basic elements of dance so that you feel familiar enough to demonstrate them to your students:
    - *Level*: high, medium, and low
    - *Direction*: forward, backward, left, right, diagonally, turning
    - *Speed:* fast, slow
    - *Locomotor*: walk, run, hop, jump, leap, gallop, slide, skip
    - *Axial:* bend, twist, stretch, swing

Teacher Prep:

- **Collect Materials**:
    - Recipe guide, ingredients, and tools listed within.
    - Description of Dance Chart (included)
    - Music for Dancing
    - Atlas or world map
    - Optional books listed below.
- **Watch**
    - Top 10 Traditional Dances Around the World (9:00) https://www.youtube.com/watch?v=mvPWgo3JL9c

Lesson: Dance Around the World

- Introduction: What Makes Movement a Dance?
    - **Set up** the class space today to allow for a maximum amount of space to move.
    - **Ask** students: What kind of dances do you know?

        - Depending on student ages and interest you may expect answers like: ballet, hip-hop, the Hokey Pokey, etc.
    - **Play** some music and give students some broad instruction on how to move to the music:
        - like a snake, elephant, giraffe, etc.
        - slowly, jerkily, smoothly, etc.
        - like you are sad, angry, surprised, etc.
    - Ask:
        - How did it feel in your body to move in different ways?
        - Did moving affect your emotional feelings?
        - What role did the music have in the way that you moved?
    - **Share** the basic elements of dance with your students, demonstrating how they can move through these elements:
        - *Level*: high, medium, and low
        - *Direction*: forward, backward, left, right, diagonally, turning
        - *Speed:* fast, slow
        - *Locomotor*: walk, run, hop, jump, leap, gallop, slide, skip
        - *Axial:* bend, twist, stretch, swing
    - **Tell** your students that dance has history in its creation and can often tell a story about a people's culture.
    - **Tell** students that today they are going to **learn** about Irish Dance. Then they will have an opportunity to **research** about dance from another culture, teach others about it, and learn some dance moves!

- The Culture of Irish Dance
    - **Read** the Culture of Dance Section of the Irish Cottage Pie recipe guide.
    - (Optional) **Read** Flying Feet: A Story of Irish Dance by Anna Marlis Burgard and Dees McCloskey
    - **Watch** the Irish Dance video at raddishkids.com or others:
        - Step Dancing from 1963 (1:51) https://www.youtube.com/watch?v=fYvU7oBBgKA
        - Michael Flatley & the Chieftans (1:45) https://www.youtube.com/watch?v=auYkScAuYSI
        - Innova Irish Dance Company- Britain's Got Talent 2014 (2:24) https://www.youtube.com/watch?v=jeQJ25XtM-Y
    - **Ask** students what they noticed about:
        - direction changes (direction)
        - steps (locomotor)
        - type of energy
        - tempo (speed)
    - **Discuss** how the dancing made them feel. Prompt the students to use the terms above or the basic elements of dance practiced in the introduction.

        - For example, "The fast speed that the dancers moved made it feel really exciting." or "The high steps and bouncy jumps really matched the feeling of the music."
    - **Record** the students' **analysis** of Irish Dance in the Description of Dance Chart (included).
    - Tell students that next they will be able to **choose** a dance from anywhere in the world, **learn** a little about its history, **analyze** the basic dance elements, and even **perform** a few steps!

- "Dance Around the World" Activity Instructions
    - **Show** students Top 10 Traditional Dances Around the World (9:00) https://www.youtube.com/watch?v=mvPWgo3JL9c
    - **Tell** them they can **choose** from the dances in the video or choose others that interest them. For example:
        - The Haka (Maori/New Zealand)
            - Latest All Blacks Haka Intimidates the French (1:26) https://www.youtube.com/watch?v=PptTeyYShdw
        - Hip Hop (USA)
            - The History of Hip Hop (4:20) https://www.youtube.com/watch?v=wz8nevBIzvs
        - Sirtaki (Greece)
            - The Best Greek Zorba (sirtaki) Dance (2:11) https://www.youtube.com/watch?v=FPrUZx9AKSc
        - Bhangra (or 8 other dances) (India)
            - A Level Project: Bhangra Documentary (5:48) https://www.youtube.com/watch?v=PKkdqQCOBIE
        - Or any other culture or country
    - **Tell** students to research their chosen dance:
        - Where was it created? (Find on a map)
        - When was it created?
        - Who created it?
        - Was there a purpose for it? (Wedding dance, religious, battle, etc.)
    - Next have students **watch** videos of their chosen dance being performed
        - Ask them to **analyze** the dance using the basic elements of dance and then **record** their observations in the Description of Dance Chart (included).
        - Ask students to **distinguish** how the basic features of their chosen dance differs from Irish Dance (e.g., speed, force/energy use, costume, setting, music).
        - If you have a number of students learning about different dances, **complete** the Description of Dance Chart (included) for all of the dances together and have the students **share** their analysis with one another.
    - Encourage students to learn a few steps or a whole routine of their cultural dance.

Extension:

- Label dances from around the world onto a map.
- Make a costume to go with your dance.
- Go and see a traditional dance performance or visit a dance school to watch a class.

Cooking Cottage Pie

Kitchen Prep

- Read the Cottage Pie recipe card together.
- Identify and gather ingredients.
- Gather tools.
- Read the **Featured Culinary Skill, Peeling Produce**
- Discuss kitchen safety. Specifically, peeler and knife safety (Visit Raddishkids.com/pages/safety).

Prepare Cottage Pie

- Ask children to read or describe each step.
- Together, follow the steps in the recipe.
- Give each child a turn to peel, cut, and season.
- When the Cottage Pie is ready, eat, taste and share!
- While your friends and family are eating, teach them about the basic elements of dance (maybe demonstrate the elements), teach them about the history of Irish Dance, and how it differs from the type of dance that you researched. Perform the dance moves you learned and invite your guests to try some steps or just stay for a dance party!

RESOURCES

- Books
- Picture Books
    - Balerina by Peter Sis
    - Flying Feet: A Story of Irish Dance by Anna Marlis Burgard and Dees McCloskey
    - Giraffes Can't Dance by Giles Andreae
    - Dancing in the Wings by Debbie Allen
    - Dinosaur Dance by Sandra Boynton
    - How Can you Dance by Rick Walton
- Chapter Books
    - To Dance: A Ballerina's Graphic Novel by Siena Cherson Siegel
    - Hip-Hop High School by Alan Sitomer
    - The Flamenco Academy by Sarah Bird
    - Haka by Patricia Grace
- Non-Fiction
    - It's Bigger Thank Hip-Hop: The Rise of the Post-Hip-Hop Generation by M.K. Asante Jr.
    - Capoeira:Roots of the Dance-Fight-Game
    - The Story of Irish Dance by Helen Brennan

- Websites

- http://www.ndeo.org/content.aspx?club_id=893257&module_id=55419&page_id=22
- Irish Dancing Culture
  - https://www.youirish.com/culture/traditional-irish-dancing
  - http://www.bbc.co.uk/irish/articles/view/741/english/
  - https://www.celtic-weddingrings.com/celtic-traditions-irish-dance
- Flamenco
  - https://wiki.kidzsearch.com/wiki/Flamenco
  - https://www.myinterestingfacts.com/flamenco-dancing-facts/
  - https://wonderopolis.org/wonder/what-is-flamenco-dancing
- The Haka
  - http://www.thedancelady.com/free-resources/for-teachers/lesson-plans/curriculum/key-stage-2/create-a-haka/
- Videos
  - Latest All Blacks Haka Intimidates the French (1:26) https://www.youtube.com/watch?v=PptTeyYShdw
  - Top 10 Traditional Dances Around the World (9:00) https://www.youtube.com/watch?v=mvPWgo3JL9c
  - Step Dancing from 1963 (1:51) https://www.youtube.com/watch?v=fYvU7oBBgKA
  - Michael Flatley & the Chieftans (1:45) https://www.youtube.com/watch?v=auYkScAuYSI
  - A modern example Innova Irish Dance Company- Britain's Got Talent 2014 (2:24) https://www.youtube.com/watch?v=jeQJ25XtM-Y
  - Bhangra
    - 15 Most Used Bhangra Fusion Steps (6:11) https://www.youtube.com/watch?v=ACR-ch6wQWg
    - A Level Project: Bhangra Documentary (5:48) https://www.youtube.com/watch?v=PKkdqQCOBIE
  - Hip Hop
    - The History of Hip Hop (4:20) https://www.youtube.com/watch?v=wz8nevBlzvs

Lesson #3: Sticky Toffee Pudding
& Cooking with Chemical Reactions
Activity Time: 60 minutes

LEARNING OUTCOMES

- Students will **explore** the idea of **reactions**.
- Students will **learn** that cooking causes chemical reactions.
- Students will find that chemical reactions result in new substances, are irreversible, and cause an energy change.
- Students will apply their understanding of chemical reactions to baking Sticky Toffee Pudding.
- Students will examine each step of the recipe to determine what chemical reactions are happening.
- Students will touch on acid-base and Maillard reactions.
- Students will **read** and **practice** the Featured Culinary Skill **Blender Safety.**
- Students will **make** and **share** Sticky Toffee Pudding with friends and family.

CHEMICAL REACTIONS OF CAKE

Teacher Prep:

- Collect Materials:
  - Recipe guide, ingredients, and tools listed within.
  - For buttermilk chemical reaction:
    - Milk
    - lemon juice
    - liquid measuring cup
    - timer
    - spoon
  - Chemical Reaction Information Poster (included)
  - Optional:
    - The Maillard Reaction and How to Make Brown Butter (included)
    - An experiment on acids and bases (see Create a ph Indicator and Experiment with Acids and Bases)
- Watch
  - How to Make Buttermilk (1:20) https://www.youtube.com/watch?v=kX4ZUbS6PH0

Lesson:

- Introduction: What is a reaction?
  - **Ask:** What do you think the word reaction means?
  - **Ask:** Can you think of examples of reactions?
    - Examples:
      - When I tell a joke you laugh (hopefully).
      - When you push on something it moves away from you.
      - When you dump your blocks on the floor they spill everywhere and make a mess.
  - Now that the students have shared examples, ask them to create a **definition** for the word reaction.
    - A reaction is…
  - **Tell** students there are different kinds of reactions.
    - The act of cooking causes chemical change or *chemical reactions* to occur.
  - **Discuss** that chemistry is the science of different kinds of *matter*, and how matter can *change*.
    - In cooking that could be the science of how *milk, acid,* and *heat* can come together to *change* into cheese!
    - In both cooking and in chemistry you need to be aware of *time* and *measurement,* and you end up with a *mixture* (anything made by combining two or more different things).
  - Tell students that today while they are making their Sticky Toffee Pudding, they are going to be a kitchen scientist creating a number of chemical reactions.

- What is a Chemical Change?
    - **Explain**:
        - **Chemical change** is a change that occurs when the particles that make up two or more substances are rearranged to form a new substance that usually can't be undone.
    - **Demonstrate** for students the chemical change of souring milk.
        - Gather materials: milk, lemon juice, liquid measuring cup, timer, spoon
        - Tell students you are going to show them a chemical reaction.
        - Review and follow the experiment: How to Make Buttermilk (1:20) https://www.youtube.com/watch?v=kX4ZUbS6PH0
            - Refer to the chemical change definition above
                - **Ask:** What do you think the two or more substances are in this chemical reaction?
            - **Check** the substance after 30 minutes
                - Ask:
                    - How does it differ from the original?
                    - Can it be separated back into the two original substances?
                - Refer to the chemical change definition above – point out that this fulfills the last part of the definition – …it *forms a new substance and can't be undone*.
        - Chemical Changes:
            - new substances are made
            - the process is irreversible
            - an energy change occurs
            - result in a change in color
            - make smells
            - release gasses
            - give off or take in heat

- "Sticky Toffee Pudding as Science Experiment" Activity Instructions
    - **Share**: The recipe itself will be the science experiment today. This will require **stopping, investigating,** and **discussing** the science of Chemical Reactions as we bake.
    - Sticky Toffee Pudding- Refer to the Recipe Guide
        - **Step 1**-What role does the oven play in chemical change?
            - It adds heat to the reaction.
        - **Step 2**- Read the Sticky Science section of the Recipe Guide
            - Ask: Do you see the acid-base reaction? What does it look like?
        - **Step 5-7**- How are these steps like a part of the chemical change definition?
            - When mixing together the ingredients for a cake, you are mixing together different kinds of matter.

- When you mix together the date mixture, butter, brown sugar, vanilla, eggs, flour, baking powder, and salt you are mixing several different substances together to make cake batter.
- KEEP A SPOONFUL OF THE BATTER MIXTURE FOR LATER COMPARISON

- Step 8- How does putting this mixture into the oven create yet another reaction?
  - The addition of heat changes the batter from a liquid into a solid.
- Step 9-10- How are these steps like a part of the chemical change definition?
  - When they are mixing together the cream, brown sugar, butter, vanilla, and salt, they are mixing together different kinds of matter to make a new substance, toffee.
- Step11-12- Check for a chemical reaction:
  - Did the reaction give off or take heat?
    - The cake batter needed the heat from the oven to change into cake.
  - Is there a color change?
    - The batter in the pan was lighter in color than the finished cake. This is called the *Maillard Reaction*.
    - * For Maillard Reaction history and experiment, see The Science of Brown Butter (included).
  - Is there any smell?
    - I hope it smells amazing in your kitchen!
  - Were any gases released?
    - Have the students compare the spoonful of batter from Step 7 with a finished piece of cake.
      - Before the oven you have a wet gooey batter. After you have a fluffy cake.
      - As the cake was in the oven some of the ingredients (baking soda and baking powder) released carbon dioxide gas.
        - Ask the students to look for evidence of carbon dioxide gas in the finished cake.
        - All the little holes in the spongy cake are caused by that gas.
  - Can the chemical change by undone?
    - Can you get any of the original ingredients you put in back out of the cake?
      - If you broke the cake down into crumbs could you separate out the flour? Or find the dates?

Extension:

- Try out the Acids and Bases Experiment (included).
- Experiment with the Maillard Reaction (included).
- Search out chemical reactions in other recipes.
- Make sherbet- this is a candy that is made with an acid and a base but they don't react until they reach your tongue! www.sciencekids.co.nz/lessonplans/chemistry/acidbase.html

Cooking Sticky Toffee Pudding

Kitchen Prep

- Read the Sticky Toffee Pudding recipe card together.
- Identify and gather ingredients.
- Gather tools.
- Read the **Featured Culinary Skill, Blender Safety.**
- Discuss kitchen safety. Specifically, Blender Safety, Stove Top and HANDWASHING safety (Visit Raddishkids.com/pages/safety).

Prepare Sticky Toffee Pudding

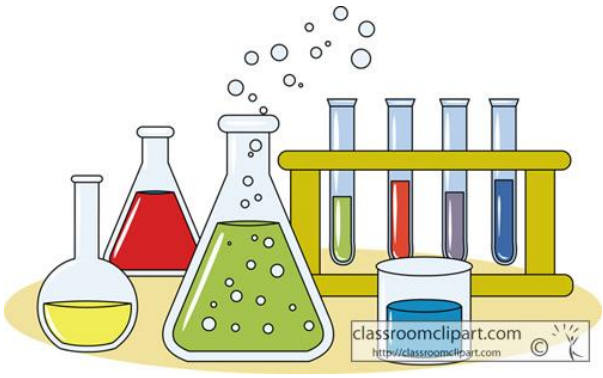
- Ask children to read or describe each step.
- Together, follow the steps in the recipe.
- Give each child a turn to blend, crack, poke and pour.
- When the Sticky Toffee Pudding is ready, eat, taste and share!
- While your friends and family are eating, describe to them the steps you took to make the Sticky Toffee Pudding and what chemical reactions occurred so that they can be enjoying their desert.

RESOURCES

- Books
  - Chemical Chaos by Nick Arnold
  - Incredible Experiments with Chemical Reactions and Mixtures by Paula Navarro and Angels Jimenez
  - Exploring Chemical Reactions by Nigel Saunders
- Websites
  - http://www.sciencekids.co.nz/lessonplans/chemistry/acidbase.html
  - http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway/carbon_chemistry/cookingrev1.shtml
  - http://education.seattlepi.com/chemical-reactions-occur-during-baking-5263.html
  - http://www.abc.net.au/science/articles/2011/06/30/3256357.htm
  - https://www.delawareonline.com/story/life/2016/01/19/science-cooking/79020910/
- Videos
  - How to Make Buttermilk (1:20) https://www.youtube.com/watch?v=kX4ZUbS6PH0

Description of Dance Chart

TYPE OF DANCE	LEVEL High, medium and low	DIRECTION Forward, backward, left, right, diagonal, turning	SPEED Fast, slow	LOCOMOTOR Walk, run, hop, skip, gallop, slide, leap	AXIAL Bend, twist, stretch, swing	MUSIC Loud, quiet, rhythmic, electronic, calm	SETTING/COSTUME Where are they dancing? Why? What are they wearing? Why?
IRISH DANCE							



Chemical change is a change that occurs when the particles that make up two or more substances are rearranged to form a new substance, which usually cannot be undone.

Chemical Changes often:

- make new substances
- are irreversible
- cause an energy change
    - give off or take in heat)
    - result in a change in color
    - make smells
    - release gasses

Create a ph Indicator and Experiment with Acids and Bases

Acid, Neutral, or Basic?

- It is important to know the acidic or basic nature of a liquid because the nature of the liquid often determines what it can be used for

How do you know if a liquid is acidic or basic?

- Substances can be measured on something called the pH scale. This scale goes from zero to 14. The low end of the scale is for acidic solutions, a 7 is neutral and anything higher than 7 is basic (sometimes called alkaline).
- You can also tell if something is acidic or basic by tasting it. However, that is not a safe way to test all substances! Make sure, especially with young students, that you stress this point.

Acid

- Acids are usually sour and score lower than a 7 on the pH scale.
- Examples:
    - coffee, soda, and lemon juice.
    - Our stomach liquids are acidic so that we can digest food.
    - Car battery fluids are acidic so that electrical energy can be produced.
    - Lactic acid is used as a moisturizer, food preservative and helps fabrics be prepared to take on dies, not to mention make milk into yogurt!

Basic

- Bases are substances that when in water are slippery to the touch and taste bitter. They score higher than a 7 on the pH scale.
- Examples:
    - Household products like baking soda (sodium bicarbonate), laundry detergents and oven cleaner are all basic. They are useful for removing fatty and oily messes.

Neutral

- Distilled water is neutral and would score a 7 on the scale.

Create a pH Indicator

- Watch this video for teacher preparation (don't show to students):
    - The Sci Guys: Science at home- SE2- EP4: Red Cabbage pH Indicator (6:22) https://www.youtube.com/watch?v=I18K2upEHLc
- **Share:** There is a vegetable that you can use to test the pH of solutions around your home - purple cabbage!
    - This cruciferous vegetable contains a chemical called anthocyanin that changes color depending on the acidity of its environment.
        - In an acidic environment it is reddish-pink
        - In a neutral environment it is purple
        - In a basic (or alkaline) environment it turns bluish-green

How to Make Purple Cabbage Indicator

Materials

- a few large leaves of a purple cabbage
- blender
- coffee filter
- funnel
- 4 cups of warm distilled water

To make the indicator:

1. Peel a few large leaves off your head of cabbage.
2. Pour the water into your blender.
3. Add the cabbage leaves.
4. Make sure the lid is on tight. Then pulse until the cabbage is well blended.
5. Place a coffee filter into the funnel and pour the cabbage water through it into a jar, pitcher, or large liquid measuring cup.
6. Your indicator is now ready!

- Have students **brainstorm** and **collect** solutions that they want to test or have a list ready for them to collect. A good range of solutions would include:
    - Distilled water
    - Tap water
    - Lemon juice
    - Distilled vinegar
    - Baking soda
    - A fizzy antacid
- Have the students make a tag or **label** for each solution they want to test.
- **Collect** one clear glass for each solution to be tested. Fill with a half cup of indicator solution.
- Have students **complete** first two columns of the *Acid, Base or Neutral Experiment Worksheet* (included)
- Have students **test** the solutions (either one at a time or all at once) and record
    - the color that the indicator turns
    - whether it is greater than or less than 7 on the pH scale
    - whether the solution is an acid, a base, or neutral
- Older students may want to watch the video The Sci Guys: Science at home- SE2- EP4: Red Cabbage pH Indicator (6:22) https://www.youtube.com/watch?v=I18K2upEHLc

Acid, Base or Neutral Experiment Worksheet

Solution	Hypothesis Acid/Neutral/Base?	Color of Indicator	< or > 7 on the pH scale	Results Acid/Neutral/Base

The Maillard Reaction

The Maillard Reaction happens when you brown a food, like searing a steak, or caramelizing onions. This series of reactions between an amino acid (the building blocks of protein) and a sugar is responsible for brown colors and many aromas and flavors in cooked foods.

The Man Behind the Science of Browning Butter

- **Louis Camille Maillard** (1878-1936) was a French physician and chemist. He made great contributions to the health field and to our understanding of chemical reactions in food.

For the Maillard Reaction to occur you need:

- Protein (meat, butter, etc.)
- Sugar (glucose/simple sugar, fructose/from fruit, lactose/from milk, maltose/from starches)
- An increase in temperature
- Removal of water

What is butter?

- Butter actually contains several things! It contains butterfat, milk solids, and water.

Melting Butter

- When butter is melted, the milk solids (white) and butterfat (yellowish) separate. With the addition of heat, the water—which you can't normally see—changes to its gaseous state of *steam* and *evaporates*.
- Once you melt butter, you can skim the white milk solids from the liquid butter to create *clarified butter*:
    - This product has a higher smoke point which means that you can use it for cooking at higher temperatures without it burning.
- After melting butter, if you continue to heat it (without removing the milk solids) you can create *browned butter*:
    - The milk solids will begin to brown and toast.
    - The butter will go from light brown to dark brown quite quickly. It will have a nutty aroma.
    - In French cooking this brown butter is called buerre noisette.

Uses

- You can use brown butter on your morning oatmeal, on pasta, in chocolate chip cookies, cooled and spread on toast, and more!

How to Make Brown Butter

Making brown butter is all about timing, being watchful, and knowing when to take the pot off the heat. Chefs use brown butter to pump up the flavors of their dishes. Follow these steps and you too can create delicious flavorful dishes!

Materials

- Stick of butter
- Wooden spoon or heatproof spatula
- Pot with a light colored inside- stainless steel works

Instructions

1. Cut butter into chunks.
2. Put pot in stove over medium heat and add butter.
3. Stir to help the butter melt.
4. Keep stirring occasionally as steam rises. (*This is the water evaporating and is a necessary step in the Maillard Reaction.*)
5. Watch and stir occasionally. Move aside the foam so you can see the milk solids in the bottom of the pot.
6. The color will change from yellow to gold to brown. It happens quickly!
7. When it reaches a rich caramel color, remove it from the heat and keep stirring for another minute. This is important because the heat in the pan is continuing the cooking process.
8. Let the brown butter cool to room temperature.
9. Stir it again to mix the browned milk solids back into the butter fat.
10. Store it in an air tight container at room temperature or in the fridge. It also freezes well.