**Course 2: Food Science**

**Project: Kitchen Science to Shelf**

**Essential Question:** How are new candy products created?

**Engagement Scenario**:

The candy industry is booming. According to the National Confectioners Association, “U.S. confectionary sales accounted for $29.4 billion, where 25% of confectionary spending happens around four major holidays – Halloween, Easter, Christmas, and Valentine’s Day.” A local candy company read this data in a recent publication and is eager to increase business at their local shop. To increase revenue, the owners of the candy shop have asked you to develop a new product, which they would like to unveil in time for the major candy holidays. While chocolate represents approximately 60% of all confectionary sales in the U.S., the owners are willing to sell any type of confectionary (e.g., gummy, chocolate, hard candy, caramel, etc.) that will increase sales.

Your team will identify an existing candy product and determine how to change the product so that it can be sold as a new product. To do this, your team will develop a new product strategy and a prototype of the new candy product, which will be evaluated by the “candy shop owners”. To accomplish this task, your team will research how candy is made including the chemistry of candy, candy ingredients from the farm to the table, as well as the marketing aspect of product development. Your team will also conduct a number of experiments to learn about the science behind candy. Once you have identified the type of candy product you plan to create, your team will cook the candy product.

Your team will create a package including the name, nutrition information, ingredients list, health claims (if any), price, and logo. The product should be geared towards a specific target market. You will also create a sales pitch to sell your product to the “candy shop owners”.

Your team will then present your candy product and commercial to the “candy shop owners”, who will conduct a sensory analysis of the candy and select their favorite product, which will be sold in their shop.

**Project Overview**

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| **Day** | **Concept/Description – Product Development** |
| 1 | Students explain the process of making rock candy. Students describe the size and shape of sugar crystals. |
| 23 | Students define food chemistry. Students identify the building blocks of food and compare the molecular structure of lipids, proteins, and carbohydrates. |
| 4 | Students will analyze how the structure of sugar impacts the formation of butterscotch candy. Students analyze and interpret data. |
| 5 | Students separate the project description into tasks to be completed. Students develop questions to be answered about the knowledge and skills necessary to complete the project. |
| 6 | Students describe the difference between crystalline and noncrystalline candy. |
| 7 | Students will describe the relationship between heat, sugar structure, and tensile strength for candy. Students will describe the stages of candy texture. Students perform a cold water candy test. Students make observations of sugar crystal growth. |
| 8 | Students will identify additives in candy. Students will explain the function of additives in candy. Students describe how invertase is used for making cherry cordials. |
| 910 | Students examine the farm-to-table process of candy ingredients. |
| 11 | Students identify a candy recipe. Students analyze the characteristics of an existing candy product. |
| 12 | Students analyze trends in the confectionary industry. |
| 13 | Students describe the meanings of specific nutrient claims. Students identify nutrient claims commonly found on food packages. Students will read and interpret a food label. |
| 14 | Students will define target market and describe the characteristics of a target market.Students identify a target market for the new candy product. Students will create a new product strategy. |
| 15 | Students will describe the four Ps of marketing. |
| 16 | Students will calculate the price of a product. |
| 17 | Students calculate the nutrition label information for the serving size of the new candy product. |
| 18 | Students create an identity for a new product by developing a name and logo.Students develop a new product package. |
| 1920 | Students develop a script. Students record a 30-second (maximum) commercial. |
| 21 | Students create a new candy product. Students follow a recipe to prepare a food item. |
| 22 | Students describe the elements of new product development. Students will give an oral presentation. |

**Day One**

**Key Question of the Day**: How are sugar crystals formed? (Each day the key question should be prominently displayed and used to open the lesson.)

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “What is sugar?”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Explain the process of making rock candy.
* Describe the size and shape of sugar crystals.

**Required Materials for Daily Lesson**

* Weekly Bell-Work journal – Appendix 1 - One per student
* Daily Exit Ticket – Appendix 2 – One for each student
* Sugar Article – Appendix 3 Part 1 and 2 – One per student – Article adapted from:

<http://www.exploratorium.edu/cooking/candy/sugar.html>

* Research Journal - Appendix 4 – One per student
* Lab materials for each team:
* 4 cups of sugar
* 2 cups of water
* Small saucepan
* Hot plate or stove
* Wooden spoon
* Measuring cup
* Candy thermometer
* Mason jar (or something similar)
* Paper towels
* Cotton string
* A weight to hang on the string (e.g., galvanized washer)
* Waxed paper
* A pencil (to suspend the string in the jar)
* Timer
* Flip chart paper
* Markers

**Estimated Instructional Time:** One 50-minute class period

**Opening –** (*Designed to prepare students for learning. Students are prepared for learning by activating an overview of the upcoming learning experience, their prior knowledge, and the necessary vocabulary*.) 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Explain that it’s okay if students don’t exactly know how to define sugar because they are about to learn more about sugar and its composition.
* Give each student a copy of Appendix 3 Part 1 to read the first section of the article.
* Ask students to summarize the section in their own words.

**Middle –** *(Designed to provide a structure for learning that actively promotes the comprehension and retention of knowledge through the use of engaging strategies that acknowledge the brain's limitations of capacity and processing.)* 40 minutes

* Students will work in pairs for this lab, which you can either assign pairs or allow students to select on their own.
* They will only be working in this team for this lab.
* Follow food safety and labs safety precautions.
* Post the lab instructions somewhere in the room using a flip chart so that students have a reference as they work.
* Within their teams, they should create a hypothesis about how long they think it will take before they see the first crystals begin to form, and also what they think will happen to the samples that are covered versus uncovered.
	+ Since we don’t know exactly how long it will take for students to see results, it is best for students to record the data for this lab in their research journals.
	+ Data for the lab should include their hypothesis and daily observations.
* Each team will heat their water in a saucepan over medium heat until it comes to a boil.
	+ They should completely dissolve the sugar in the boiling water, stirring continuously with the wooden spoon until the solution grows clear and it reaches a rolling boil.
* Remove the solution from the heat, and then carefully pour it into the jar. Cover the jar with a small piece of waxed paper.
* Tie the weight to one end of the string, and then tie the other end to the middle of the pencil.
	+ The string should be about 2/3 as long as the jar is deep.
* Gently suspend the prepared string in the solution and let sit at room temperature, undisturbed, for several days. You can check each day until the experiment is finished. A good target timeline is about 7 days.
	+ You can adjust the timeline depending on the results. It could take less or more than 7 days. For this project, it is following a 7-day schedule, but feel free to adjust as you see fit.
	+ You can also have some groups try covering their jars with a paper towel and have some groups leave their jars uncovered to see if there is a difference between crystal formations of covered versus uncovered. If students do leave their jars uncovered, it is recommended that those samples are not consumed for food safety reasons.
* By the time the rock candy is ready, the crystals on the string should be clearly defined, with sharp right angles and smooth faces of various sizes.
	+ These are called monoclinic crystals. The shape is determined by the way the individual sugar molecules fit together, which is similar to the way the shape of a pile of oranges is determined by the shape of the individual orange and the way they stack together.
* After the students prepare their rock candy samples, have them research and respond to the following questions:
	+ What makes the sugar crystals grow?
	+ What happens when you heat sugar?
* After you pose the question for the class, set a timer for five minutes and see who can find the answer the fastest.
* When time is up, allow students to share their responses and have a brief discussion.
* Give students a copy of Appendix 3 Part 2 to read the next section of the article about heating sugar.
* **Students should begin observations of their rock candy today as Day 1.**

**Closing** – *(Designed to promote the retention of knowledge through the use of engaging strategies designed to rehearse and practice skills for the purpose of moving knowledge into long-term memory.)* 5 minutes

* Provide each student with the weekly Exit Ticket handout Appendix 2
* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“How long do you think it will take before crystals begin to grow for your team’s sample?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Two**

**Key Question of the Day**: What is food chemistry?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “What does this tower have in common with this Snickers bar?”
	+ **Teacher TIP!** Create a tower using the Jenga prior to class so that when students enter the classroom, they will see the tower. Have the Snickers bar on the table next to the tower.

**Learning Objectives**

As a result of this lesson, students will be able to:

* Define food chemistry.
* Identify the building blocks of food.
* Compare the molecular structure of lipids, proteins, and carbohydrates.

**Required Materials for Daily Lesson**

* Weekly Bell-Work journal – Appendix 1 - One for each student
* Daily Exit Ticket – Appendix 2 – One for each student
* Jenga – try to include different colors throughout the tower
* Candy bar (use one that has a lot of different ingredients, such as a Snickers bar)
* Yarn
* Construction paper
* Scissors
* Glue
* Small balloons
* Pipe Cleaner
* Any other supplies that could be used to build a structure
* Protractor
* Computer
* Internet
* PowerPoint

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ The both have multiple parts
	+ They are both stacked/have many layers
	+ The parts/ingredients are stacked in different directions
	+ Different colors
	+ Different textures
	+ The ingredients and blocks fit together in different directions
* The point to be made: “The tower and the (insert candy name) are both made up of many parts and pieces. Think about each piece of the tower, or each ingredient of the (insert candy name), as a single chemical element. When those chemical elements are combined, they form compounds. Foods are made up of a variety of chemical compounds, such as salt (NaCl) or water (H2O). By understanding how these compounds fit together to create delicious tasting foods like candy, we will be able to understand how those compounds interact with each other during cooking, and that’s food chemistry.”

**Middle –** 40 minutes

* Review the following concepts with the class:
	+ Food chemistry is defined as “a study of the characteristics of the substances of which foods are made.” In other words, foods are essentially made of “building blocks” of chemical elements.
	+ The chemical elements are combined to form compounds, and almost all foods are composed of compounds, such as salt (NaCl) or water (H2O).
	+ The main food constituents are water, lipids, proteins, and carbohydrates.
* The class will be divided into four groups: water, lipids, proteins, and carbohydrates.
* Depending on the number of students in the class, within each group, they will break into two smaller teams, the molecule team and the research team.
	+ For example, if there are four students in the water group, then half of the water group (two students) will use the Internet to research the structure of the water molecule and any food chemistry-related information they can find about it to share with the class, while the other half of the group (two students) uses the structure model they find to build the actual H2O structure.
* The molecule teams will select the materials they wish to use to build their structure from whatever is provided by the teacher.
	+ The protractor should be used to ensure accurate angles within the bonds
* The research teams will create a brief presentation of the key concepts they find to share with the rest of the class.
	+ Students should find information specifically related to how lipids, proteins, and carbohydrates play a role in food, commons sources of each, and should include key vocabulary terms
	+ The following list provides a guide of information the students should find. It will be best to allow the students to research first and provide hints leading them to these concepts as they go:
		- Water: acids and bases in water, boiling point, freezing point, hydrophilic, hydrophobic, water content of foods
		- Lipids: hydrogenation, antioxidants, oxidative rancidity, free radicals
		- Proteins: part of the DNA and RNA structure, enzymes, proteolytic deterioration, metabolic pathway; major roles in food: “nutrient function where it provides a source of amino acids for the assembly of proteins in our bodies and the enzymatic function, where it alters other components used in the food industry (as in food processing).”
		- Carbohydrates: disaccharide, monosaccharide, polysaccharide, caramelization, types of natural sweeteners
* Once they finish each task (research and building the molecule), the molecule team will present their molecules to their partnering research team, and the research team will present their findings to the molecule team.
* **As students finish, they should make observations for Day 2 of their rock candy.**

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

 “Write two new facts you learned from your teammate’s presentations.”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Three**

**Key Question of the Day**: (Continuation of Day Two) What is food chemistry?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “During the class presentations, I will…”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Define food chemistry.
* Identify the building blocks of food.
* Compare the molecular structure of lipids, proteins, and carbohydrates.

**Required Materials for Daily Lesson**

* Jenga – try to include different colors throughout the tower
* Candy bar (use one that has a lot of different ingredients, such as a Snickers bar)
* Yarn
* Construction paper
* Scissors
* Glue
* Small balloons
* Pipe Cleaner
* Any other supplies that could be used to build a structure
* Protractor
* Computer
* Internet
* PowerPoint

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ Listen
	+ Pay attention
	+ Take notes
	+ Ask questions
	+ Stay focused
* Review presentation etiquette with students and remind them how to be a respectful audience.
* **As students finish, they should make observations for Day 3 of their rock candy.**

**Middle –** 40 minutes

* Begin by reviewing the definition of food chemistry.
* The teams will finish presenting to each other if necessary.
* Each team will then present their molecules and research findings to the class.
	+ During the presentations, students in the audience should take notes about each topic presented. This should be done using a sheet of paper divided into three sections. Students should label each section lipids, proteins, carbohydrates, and take notes about each molecule in the corresponding section.
* Following the presentations, have students from each team identify key terms to use to create a word wall for this project unit.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

 “Based on the class presentations, write two new facts you have learned about the chemistry of food.”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Four**

**Key Question of the Day**: What is the chemical structure of sucrose?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “What are the different types of sugar?”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Analyze how the structure of sugar impacts the formation of butterscotch candy.
* Analyze and interpret data.

**Required Materials for Daily Lesson**

* Computers
* Internet
* Research Journal – Appendix 4 – One for each student
* Video: <http://www.youtube.com/watch?v=Q4CZ81EmAsw&feature=youtu.be> (Sugar Hiding in Plain Sight)
* Lab instructions and data questions adapted from *Gourmet Lab: The Scientific Principals Behind your Favorite Foods* by Sarah Reeves Young, page 279-311, 2011 – Appendix 5 and 5.1 – One for each student
* Lab materials:
* **Teacher TIP!** Materials such as beaker and Bunsen burner can be substituted for culinary equipment since the students will be able to eat the finished product. However, if you prefer that students do not consume the final product, these materials and units of measure are sufficient. If the students WILL consume the final product, use cooking equipment rather than lab equipment. If using cooking equipment, have students convert the dry ingredients from the metric units of measure to cooking units such as cup, teaspoons, etc.
	+ 60 mL of brown sugar
	+ 30 mL butter
	+ 60 mL of sugar
	+ 60 mL of water
	+ 5 mL of vinegar
	+ 1 g of salt
	+ 1.5 mL vanilla extract
	+ Beaker, 400 mL
	+ Thermometer, 150**°**C and non-mercury
	+ 10 mL graduated cylinder
	+ 100 mL graduated cylinder
	+ Balance
	+ Aluminum foil
	+ Waxed paper
	+ Beaker tongs
	+ Bunsen burners and iron rings with wire gauze (or hot plate)
	+ Glass stirring rod
	+ Safety glasses
	+ Aprons
	+ Gloves

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible answers may include:
	+ Sucrose
	+ Dextrose
	+ Maltose
	+ Fructose
	+ Brown sugar
	+ White sugar
	+ Corn syrup
* Explain that there are a number of different types of sugar, and some sugar comes from sugar cane, while other types, like corn syrup, come from corn.
* The point to be made: “Sugar is a major ingredient used in the food industry. Not only is sugar present in some form in most of the foods we eat, but when it comes to confectionary products, sugar is often the main ingredient. The way sugar is processed during cooking also influences the end result of the product.”
* Briefly review lab safety procedures.

**Middle –** 40 minutes

* Students should read the background of the lab (Appendix 5.1)
	+ Review the key vocabulary and create a project word wall.
	+ Address any questions from the class.
* Students should work in teams of 2 or 3 (depending on the class size), and each team will be conducting the lab with a different variation of materials. There will be:
	+ One team using acid
	+ One team using different types of sugar
	+ One team creating crystallized sugar
	+ These may be duplicated depending on the number of teams in the class
* Assign students to their teams and explain which procedure they are going to test.
	+ Have students circle their procedure and cross out the others so that they follow the correct directions.
* In their teams, students should write a hypothesis about the types of characteristics they would expect to find in candies with a crystal sugar structure.
* Then, students will create their data tables. Each team should agree upon a data table and have it approved by the teacher. Data tables should include a section for each type of candy that will be made during the lab, and include a section for the sensory analysis (texture, taste, aroma).
* As students being the lab using Appendix 5, be sure they constantly stir the sugar while it is heating until it is dissolved. If it turns dark brown, the sugar is burning and the heat should be lowered.
* **Teacher TIP!** If the solution bubbles up, this is normal, and stirring should only happen at the top layer of the solution. When the vanilla is added to the solution, it may boil back up due to the temperature difference, so it may help if students wait about 60 seconds to add the vanilla. To prevent the sugar from drying onto the glassware, immediate place the materials in hot water (not cold water, as cold water will cause the glass to crack).
* Students may cut their butterscotch after about 5-7 minutes.
	+ If it cools completely and hardens, they may break it up into a “bark.”
* Each team will have a sample form the other teams and perform a sensory analysis of the different samples. During this time, students will fill in the data tables that they created.
* After each team has cleaned up from the lab, students can spend time responding to the data analysis and conclusion questions in their research journals (Appendix 4):
	+ What are two observations that you could use to identify whether acid was used in the production of a candy? Explain, citing the specific senses that allowed you to make that observation.
		- Answers will vary, but may include: candy was smooth to the touch, taste, appearance. When placed in mouth, it is slippery, which leads you to believe there is no crystallization, meaning the candy may have been produced with an acid that prevents the sugars from forming crystals.
	+ What are two observations that you could use to identify whether different sugars were used in the production of a candy? Explain, citing the specific senses that allowed you to make that observation.
		- Answers will vary, but may include: candy was smooth to the touch, taste, and appearance. These are the same observations from Question 1. Those responses are correct because you cannot distinguish how crystallization was prevented.
	+ Based on what you know about sugar, list two situations in which sugar would be the ideal food source. When would sugar not be an ideal food source?
		- Answers will vary, but may include: when a person is lacking energy and needs a quick pick-me-up. For example, when you are taking a test, eating a mint may give you a sudden burst of energy. Sugar is quickly metabolized by the body and delivers energy where it is needed. Any situation that requires strength and energy for an extended period of time are not ideal for using sugar as your source of energy. This could be playing a sport, running a marathon, acting in a play, etc.
	+ What other items go through crystallization? Give two additional examples of materials that crystallize.
		- Answers will vary, but may include: Salts and minerals go through crystallization, so does ice.
	+ What do you think would have happened if you had stretched and pulled the sugar while it was cooling? What properties would you expect to see in sugar that had undergone these physical manipulations?
		- The physical movement will alter the chains of sucrose while they are still hot. This is what happens when taffy is made. Properties of taffy include striations in the appearance, and softer more malleable texture and fewer crystals.
* Debrief the lab student’s thoughts from the sensory analysis, followed by a brief discussion of the responses to the questions and conclusions.
* **As students finish, they should make observations for Day 4 of their rock candy.**

**Closing** – 5 minutes

* Show the video: <http://www.youtube.com/watch?v=Q4CZ81EmAsw&feature=youtu.be>
* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“Summarized what you learned about the sucrose molecule in one sentence.”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Five**

**Key Question of the Day**: Do you understand our project?

(Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* Give each student a piece of candy.
* “What is your favorite candy? Why?”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Separate the project description into tasks to be completed.
* Develop questions to be answered about the knowledge and skills necessary to complete the project.

**Required Materials for Daily Lesson**

* Computers
* Internet
* Projector
* Project Management Log – Appendix 6 – One for each student
* Project Description – Appendix 7 – One for each student
* Highlighters
* Candy (can use one type or a variety) – One piece per student
* Video: <http://www.youtube.com/watch?v=XrbobH3SYKI> (The Science Behind Candy)

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Allow volunteers to share stories about their favorite candy.
* Explain that, “Just listening to all of your comments today, we know that candy is a treat we all know and love. The local candy shop would like our help in creating a new candy product to sell for the four peak holidays, which will help increase their business revenue.”

**Middle –** 40 minutes

* Pose the following question to the class, “Why do people like candy?”
	+ Show the video: <http://www.youtube.com/watch?v=XrbobH3SYKI>
* Take just a few minutes to debrief the video and ask the class if they agree or disagree with what was described about why people like candy.
	+ Emphasize that many of the factors listed in the video such as texture or flavor are key in creating a good product that the consumers will like.
* Distribute copies of the project description and give students time to read.
* Distribute highlighters. Have students highlight everything that is a task they will have to complete.
* As a class, list the tasks each team will have to complete.
* Create teams of two or three (depending on the size of the class) – you can do this purposefully or allow the students to choose. Give each team time to review the project description again and answer:
* What will your team need to accomplish?
* What terms or phrases do you not know?
* What do you have to present?
* Circulate and monitor team’s progress on this.
* Assign teams
* **As students finish, they should make observations for Day 5 of their rock candy.**

**Closing** - 5 minutes

* Explain that before students can become expert candy makers and create their new products, they have to master their understanding of the chemistry behind making candy. So much of candy making depends upon the science behind the process of cooking, so in order to make a high quality product that will taste great and appeal to consumers, they have to understand the science behind cooking the candy, which is why we’ve spent the past few days exploring sugar and candy, will continue to do so throughout the project.
* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What questions do you still have about the project?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Six**

**Key Question of the Day**: How is candy classified?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “We have already discussed our favorite candies. Now, let’s take that thinking to the next level. Make a list of all of the different types of candy you can think of.”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Describe the difference between crystalline and noncrystalline candy.

**Required Materials for Daily Lesson**

* Computers
* Internet
* Post-It notes
* Flip chart
* Tape
* Sugar Article – Appendix 3 Part 3 – Article adapted from:

<http://www.exploratorium.edu/cooking/candy/sugar.html>

* Index card
* Highlighter

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ Gummies
	+ Chewing gum
	+ Chocolate
	+ Jawbreakers
	+ Lollipops
	+ Responses may also include specific brand names such as “Skittles”
* Explain to students, “There are many different types of candy as we have just discussed. From gummies to chocolates, the ingredients classify each candy into two groups. First, let’s find out what the two groups are.”

**Middle –** 40 minutes

* Give students a copy of the article Appendix 3 Part 3 and an index card.
* Students will have about ten minutes to read the article and highlight terms in the article they think are important vocabulary words.
	+ Depending on the number of students in the class and their reading levels, the time for this can be reduced or increased.
* On one side of the index card, students should write either a question about the article or a reaction to the article, and on the other side, they should make a list of the key vocabulary words they identified in the article with a summary of the definition for each term.
* Discuss the article with the class and emphasize the terms crystalline and noncrystalline.
	+ Ask volunteers to share the notes from their index cards during the discussion and answer any questions. Add key terms to the word wall.
* Write the term “Crystalline” on one flip chart and “Noncrystalline” on another flip chart.
	+ Hang each flip chart paper somewhere in the room.
* Give each student a small stack of Post-It notes.
* Students will have about ten minutes to use the Internet to research the types of candies that fall under the crystalline and noncrystalline categories, which will become the reference of types of candy for the remainder of the project.
	+ Crystalline: chocolate, fudge, fondant, nougat, marshmallows, pralines
	+ Noncrystalline: hard candy, toffee, caramel, gummies, brittle
* Students should write each candy type on a Post-It note and place the note on the corresponding flip chart.
* Once students have completed this task, bring the class back together for a quick debrief.
	+ Review the types of candies that were identified as crystalline and noncrystalline.
* Students should spend the remainder of the class with their teams to determine what type of candy they would like to make, based on what they learned about crystalline versus noncrystalline candies.
	+ They will be doing some reverse engineering for this project, so they have to select a candy that already exists, and it has to be something they can easily replicate since they will eventually be cooking their candy. Teams will need time to do some research on the product they select to determine if it can be easily replicated.
	+ **Teacher TIP!** Have each team get their selected candy approved by you so that you can ensure that there is a recipe out there to make the candy and that the process isn’t too complicated beyond the means of the resources you have available. A recipe for candy such as Skittles cannot be recreated. Keep in mind you will have to ensure you have all the ingredients and cooking supplies needed for each team, so it is very important that you consider this when approving the candies selected by each team.
* Each team should have their selected candy approved by teacher.
* **As students finish, they should make observations for Day 6 of their rock candy.**

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“In your own words, summarize the difference between crystalline and noncrystalline candy.”

* Collect the Exit Ticket for the day as students leave the classroom
* Homework is for each team to bring in the candy (or just the package) that they selected for the project.

**Day Seven**

**Key Question of the Day**: What are the stages of candy texture? How are the candy stages related to temperature?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “How does cooking affect the end result of a product?”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Describe the relationship between heat, sugar structure, and tensile strength for candy.
* Describe the stages of candy texture.
* Perform a cold water candy test.
* Make observations of sugar crystal growth.

**Required Materials for Daily Lesson**

* Candy Temperature Chart – Appendix 8 – One per student
* Cold Water Candy Test Instructions – Appendix 9.1 – One per team
* Cold Water Candy Test Article – Appendix 9
* Highlighter
* Flip chart
* Markers
* Lab materials (lab adapted from <http://www.exploratorium.edu/cooking/candy/index.html>):
	+ **Teacher TIP!** The sugar solution made in this lab is NOT meant to be consumed. Therefore, the use of lab equipment and the units of measurement are appropriate for this experiment. Adjustments should only be made if your only resources include kitchen equipment (in which case students should convert from metric units of measurement to cooking units for the dry ingredients).
	+ 30 mL of glucose solution (Karo syrup)
	+ 60 mL of white sucrose, C12H22O11 (sugar)
	+ 15 mL of dihydrogen monoxide, H2O (water)
	+ 1 g of sodium chloride, NaCl (table salt)
	+ Beaker, 250 mL
	+ Beaker, 500 mL (or other container that can be filled with water)
	+ Cold water
	+ Thermometer, 150°C and non-mercury
	+ Graduated cylinder, 10 mL
	+ Graduated cylinder, 100 mL
	+ Balance
	+ Beaker tongs
	+ Bunsen burners and iron rings with wire gauze or hotplates
	+ Glass stir rod
	+ Spoons
	+ Aprons
	+ Gloves

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ Cooking changes the texture
	+ Can affect the flavor
	+ Can affect the quantity (evaporation or breakdown of ingredients)
* Explain that, “When it comes to candy, the temperature plays a significant role in the quality of the final product. For example, burning chocolate could make it go from a smooth liquid to a dry, lumpy semi-solid. So before we can make our own candy, let’s explore what happens to candy during the cooking process.”

**Middle –** 40 minutes

* Students will work in their project teams for this lab
	+ If the class is small and you don’t have enough students for five teams, students can either work independently and each student can test one, or you can have each team test more than one stage.
* **Teacher TIP!** Make sure students understand that this is NOT what it takes to make candy.  Although the steps are similar and the end product will resemble candy, this is NOT the same procedure.  In candy-making, constant stirring would create crystallization, which is not desirable in a hard candy product.  In this lab, the students want to create all the stages of crystallization and see it, so they are stirring the solution throughout.
* **Teacher TIP!** The sugar solution is VERY HOT and will be “stringy” or “drippy” as the students work with it.  Make sure they are very careful as they transfer spoonfuls from the boiling solution to the ice bath/cold water.  If it lands on their skin, it will burn immediately and be hard to clean off due to the stickiness.
* **Teacher TIP!** Have students work in groups to re-write or draw out the instructions, to ensure understanding
* **Teacher TIP!** Test/check all equipment for accuracy, especially thermometers
* **Teacher TIP!** Provide a spoon rest for spoons or stir rods
* **Teacher TIP!** Have students spread foil or parchment paper on a cookie sheet to drop the samples. Instruct students to label the foil or parchment to identify which stage each sample represents.  This will help students retain and understand the differences, also will make comparisons between groups easier
* **Teacher TIP!** If you are using a kitchen lab rather than a science lab (grams to cups/tsp, etc.), consider reviewing conversions with students or providing the conversions for them, otherwise students may end up with incorrect measurements.
* Give each student a copy of Appendix 8.
	+ Students should fill in the Fahrenheit temperature conversions below the Celsius temperatures.
		- Provide formula for conversions: Temperature T in degrees Fahrenheit (°F) is equal to the temperature T in degrees Celsius (°C) times 1.8 plus 32:
			* T(°F) = T(°C) × 1.8 + 32
* Each team will prepare the sugar solution to the temperature assigned by the teacher. The temperature will be one of the five candy texture stages:
	+ Soft ball – 235°F-240°F
	+ Firm ball – 245°F – 250°F
	+ Hard ball – 250°F – 265°F
	+ Soft crack – 270°F – 290°F
	+ Hard crack – 300°F – 310°F
* Each team should develop a hypothesis for what they expect to see happen at the stage they are trying to achieve.
* Remember these **Tips!** for running the lab:
	+ Students should wear eye protection
	+ Provide pot holders/heat gloves to students
	+ Instruct students to set up an ice bath rather than just a bowl/cup of cold water
	+ Instruct students to have multiple ice baths/bowls/cups of cold water for when the temperature rises quickly between stages
	+ Include instructions for cleanup - especially disposal of the hardening/hardened sugar solution
	+ Use smaller beakers or saucepans for faster completion
	+ Use true candy thermometers rather than probe-style (based on teacher preference)
* Each team will use the following procedure to create the sugar solution:
	+ Measure 60 mL of glucose solution using the graduated cylinder and place it into the 250 mL beaker.
	+ Measure 120 mL of white sucrose using the graduated cylinder and place it in the 250 mL beaker. Mix with the glass stir rod.
	+ Use the balance to measure 2 g of sodium chloride and add to the mixture in the 250 mL beaker. Stir the contents together with the glass stir rod.
	+ Create an ice bath in a separate container (water with a few ice cubes).
	+ Set up a Bunsen burner and ring stand with wire mesh on the iron ring. Make sure your Bunsen burner gas intake tube is securely connected to the gas nozzle and that the ring is set about 3 in. above the barrel of the burner. Light the Bunsen burner to create flame that is no more than 3 in. high. It should not be touching the wire mesh.
		- If you don’t have access to gas and Bunsen burners, hotplates work great for this as well.
	+ Use the tongs to place the beaker on the ring stand. Slowly heat the mixture while stirring constantly. If you heat the mixture too quickly or do not stir it, you will burn your sucrose and ruin the candy.
		- **Teacher TIP!** Direct students to start at a low temperature and work up to medium, then high, to avoid scorching the sugar solution
	+ When the solution reaches the desired temperature, turn off the heat.
	+ Take a spoonful of the solution and drop it into the container with the ice bath.
		- **Teacher TIP!** Have students use multiple spoons to drop and retrieve sugar each time, especially as the stages start to change from one to the next faster at the end
	+ Wait a few seconds, and when the sample is cool, using your hands remove it from the ice bath.
	+ Roll the sample between your fingers for a few minutes and describe the texture.
* Post the following questions on a flip chart somewhere in the room. Students should respond to the questions independently on a sheet of paper.
* Have students respond to the following questions:
	+ Was your hypothesis correct? Why or why not?
	+ What happened when you took the sample out of the water?
	+ Describe the texture of your candy sample. How did it feel?
	+ What can you conclude about the relationship between temperature and the texture of the candy? How do you think this affects the final product?
* To debrief the lab, give each student a copy of the article (Appendix 9) about the cold water candy test.
* Give students about 5-10 minutes to read through the article. Using a highlighter, students should highlight the main idea.
* Take a few minutes to discuss the article and the results from the lab.
* **As students finish, they should make observations for Day 7 of their rock candy.**
	+ Debrief the rock candy lab by having students compare their rock candy.
	+ If the rock candy isn’t ready by this time, continue daily observations until there are significant results.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“List two new facts you learned from today’s lab.”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Eight**

**Key Question of the Day**: What are common food additives in candy? Why are they there?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “What are all the extra ingredients on food labels?”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Identify additives in candy.
* Explain the function of additives in candy.
* Describe how invertase is used for making cherry cordials.

**Required Materials for Daily Lesson**

* Food Additives Article – Appendix 10 - One per student
* Highlighter
* Post-It notes
* Flip chart
Markers
* Cherry Cordial Enzyme Lab – Adapted from <http://www.brookfoodscience.com/labs.html> – Appendix 11
* Lab materials:
* Twelve maraschino cherries with stems (dried overnight)
* 1/8 cup of softened butter (2 Tbsp)
* 1/2 tablespoon of light corn syrup
* 1 tablespoon of reserved cherry juice
* 1/2 teaspoon of liquid invertase ***(small quantities are completely safe but allergic reactions are possible)***
* 1 cup powdered sugar
* ½ pound of melted chocolate candy coating (4 blocks in a 1 lb. package of candy coating)
* Large mixing bowl
* Hand mixer
* Small microwave safe bowl or small sauce pan
* Waxed paper
* Twenty candy cups

**Estimated Instructional Time:** One 50-minute class period

**Opening –** (5 minutes)

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ Chemicals
	+ Sugars
	+ Preservatives
* Explain that, “We have all seen food labels where the list of ingredients is several lines long and we can hardly pronounce some of the words. Believe it or not, some of those ingredients are very important to the overall quality of the product.”

**Middle –** 40 minutes

* Give each student a copy of Appendix 10.
	+ This article has a lot of key terms. Be sure to identify a couple to add to the word wall.
* Give students about ten minutes to read through the article independently.
	+ As they read, they should use a highlighter to highlight key terms.
	+ Students should use the Post-It notes to write down the following:
		- A question about the content.
		- A new concept they learned.
		- A concept they didn’t understand.
		- **Teacher TIP!** These questions should be posted somewhere in the room on a flip chart for students to reference
* When everyone has finished this task, students should get into their project teams and take a few minutes to share the items they listed on their Post-It notes. Then, come back as a class and quickly debrief the article.
* Have students review the ingredients list for their existing candy product and identify any of the common food additives from the list by placing a star next to next to each item. They will use this information as part of an activity later in the project.
* Transition by explaining that the lab is going to focus on one item from that list, invertase.
	+ As you explain the purpose of the lab review the definition of invertase and the reaction that will be demonstrated in the lab.
		- *Chocolate covered cherries have a liquid center because of an enzyme called invertase. Invertase is an enzyme that is commonly used to make liquid centers and invert sugar (convert sucrose which is table sugar into glucose and fructose) in candy making. This process can take several days at room temperature to occur. Cake makers use invertase to soften fondant (a super saturated solution of frosting).*
		- *To demonstrate how enzymes (a type of protein) act as a catalyst in a chemical reaction, we are going to make cherry cordials. A catalyst increases the rate of chemical reactions. In enzymatic reactions, the* [*molecules*](http://en.wikipedia.org/wiki/Molecule) *at the beginning of the process, called* [*substrates*](http://en.wikipedia.org/wiki/Substrate_%28biochemistry%29)*, are converted into different molecules, called* [*products*](http://en.wikipedia.org/wiki/Product_%28biology%29)*. In this lab, invertase will be used to soften fondant. Sucrose (table sugar) is the substrate, invertase is the enzyme and the products are glucose and fructose.*
* Students will work in their project teams for this lab.
* The teacher can determine how many cherry cordials each team should make. Be sure that there will be at least one for each student to taste of both the control (no invertase) and the variable (with invertase).
* Have one team complete this lab without using the invertase, so that a comparison can be made between the cherry cordials that have invertase and the ones that don’t. This should help students actually see why the enzyme is needed.
* In a large bowl, students should combine the butter, corn syrup, reserved cherry juice and liquid invertase.
* Beat with a hand mixer until smooth.
* Add the powdered sugar gradually and mix until the fondant (a super saturated solution of sugar) is soft but not sticky.
* Form the fondant into quarter-sized portions and roll them in your clean hands to make them round.
* Flatten the ball between your palms and place a cherry in the center.
* Bring together the outer edges and pinch the fondant together at the top of the cherry, so the cherry is surrounded by the fondant.
* Roll with the palms of your hands until smooth.
* Dip the cherries in the bowl of melted chocolate by first dipping only the bottoms of the cherries.
* Place the cherries back on the waxed paper.
* By the time you are done with the last cherry, the first cherry should be firm and ready for the next dipping.
* Drag the first cherry through the chocolate and coat it completely. Use a teaspoon if necessary to coat the top of the cherry with chocolate.
* Place the chocolate-dipped cherry into an individual candy cup.
* Store at room temperature for 3 to 4 days and then enjoy your cherry cordials. *Storing in the refrigerator will slow down the enzymatic reaction and inhibit the syrup production.*

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“Create a hypothesis: what do you think will happen with the cherry cordials that do not contain invertase? What will happen to the ones that do?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Nine**

**Key Question of the Day**: How do the ingredients end up in the final candy product?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “Where does candy come from?”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Examine the farm-to-table process of candy ingredients.

**Required Materials for Daily Lesson**

* Computer
* Internet
* Access to PowerPoint (if these resources are not accessible, posters can be used instead)
* Rubric – Appendix 12

**Estimated Instructional Time:** One 50-minute class period

**Opening –** (5 minutes)

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ The store
	+ A factory
* Explain that, “We know that we can go to the story to purchase candy when we are in the mood for a sweet treat. But that product has to be prepared before it ends up on the shelf. While the end product is likely made in a factory, each ingredient in the product was derived and processed from an original source somewhere. Think about the candy you selected as your existing product. Where did all of the ingredients in that final product come from?”

**Middle –** 40 minutes

* Ask each team to have their candy/wrapper handy and think about the ingredients in that candy product.
* Ask each team to turn their package over to the nutrition label section and read through the list of ingredients.
* Students should write down every ingredient on the list that is an agricultural product.
	+ Examples may include chocolate, milk, eggs, peanuts (or other type of nut), coconut, sugar, rice crispies, raisins, etc.
	+ They should also consider what they learned on Day Eight and reference Appendix 12 for additional help identifying agriculturally derived ingredients.
* After each team creates a list, ask each member of the team to select one ingredient from that list.
	+ Visit each team to approve their selections and if possible, try to avoid duplicates.
* Once students have their ingredients selected, pose the question, “How does that ingredient get from the farm into that candy bar?” Explain that their task is to investigate the road the ingredient travels to get into the candy from the farm to the grocery store shelf to their hands.
	+ To do this, each student will create a map tracing the life of the ingredient from its origin on the farm, all the way to the supermarket shelf where the consumer would purchase it.
* This map should include everything from agricultural production, harvest, processing, transportation/distribution, or any other steps specific to their particular ingredient.
* Students will use the Internet to research their ingredients.
* They will take the information they find and create a PowerPoint presentation to share with the rest of the class.
	+ By minimizing ingredient duplicates, the class would essentially be teaching each other the farm-to-table path of a variety of ingredients.
	+ The presentation can only be 10 slides, with 20 seconds per slide to discuss the information.
	+ Students should set their presentations to have slide transitions every 20 seconds.
	+ If using posters, students should have a two-minute limit for their presentations.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“Based on your research, what is something unique about the ingredient you selected?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Ten**

**Key Question of the Day**: (Continuation of Day Nine) How do the ingredients end up in the final candy product?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “What questions do you have about your presentations?”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Examine the farm-to-table process of candy ingredients.

**Required Materials for Daily Lesson**

* Computer
* Internet
* Access to PowerPoint (if these resources are not accessible, posters can be used instead)
* Rubric – Appendix 12

**Estimated Instructional Time:** One 50-minute class period

**Opening –** (5 minutes)

* Read the Bell-Work question and solicit responses from the students.
* Address any questions from the students.
* This would also be a great time to review how to use PowerPoint for any students who don’t know how.

**Middle –** 40 minutes

* Give students a little bit more time to finish creating their presentations and doing their research.
* When ready, allow each student time to present.
* When the presentations are complete, debrief by discussing all of the ingredients and their farm to table paths:
	+ What did they have in common?
	+ What were major differences?
	+ Are any of those ingredients produced in your local area? If so, where? Would you be more likely to use the local ingredients versus store-bought?
	+ What role do government agencies play in this process for the different ingredients?

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“List two new facts about the ingredients you heard about today.”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Eleven**

**Key Question of the Day**: How are we going to make a new candy product?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “What are the characteristics of a good recipe?”

**Learning Objectives**

As a result of this lesson, students will be able to:

* Identify a candy recipe.
* Analyze the characteristics of an existing candy product.

**Required Materials for Daily Lesson**

* Computers
* Internet
* Candy wrapper (from the candy the teams selected earlier in the project)
* Flip chart
* Tape

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ Thorough instructions
	+ Full list of ingredients
	+ Detailed description of the steps
	+ Clearly stated measurements of the ingredients
* Explain that, “Today we will conduct research to identify a recipe to use to create your new candy product. When looking for a recipe, it’s important to consider all of the characteristics you described.”

**Middle –** 40 minutes

* First, each team should take about five minutes to analyze the existing candy product they selected and answer the following questions:
	+ Predict how you think the existing candy product you selected was made.
	+ What is unique about the product?
	+ Why did you select this particular type of candy?
	+ Why do you think your candy selection was a good choice to work with?
* During the analysis of their candy product, students should review the nutrition label and ingredients list to thoroughly understand the product profile.
* Bring the class back together as a group an ask students to share some of their responses to the questions they answered in their teams.
	+ Use a flip chart to record the responses. Hang them around the room as a reference for the remainder of the project as a reminder for students.
* Next, students should use the computers and Internet to find a recipe that could be used to recreate the candy they selected.
	+ Note that the recipe has to be as close to the original product as possible, since students will later determine how to adjust it to create the new product.
* When each team finds a recipe they want to use, they should have it approved by the teacher.
	+ If the recipe is too complicated, lacking instruction, calls for too many ingredients or supplies that are not accessible, encourage students to continue their search for a more appropriate recipe.
* Teams should document the source where they found the recipe they plan to use, as well as the actual recipe in their research journals (Appendix 4).
	+ **Teacher TIP! Check the serving size of the recipe before giving final approval.** If the recipe makes a large batch, students can have the option to cut the recipe in half so they are making a smaller batch, which will use fewer ingredients.
* **Cherry Cordials Day 3** - Be sure to take a few minutes to allow students to conduct a sensory analysis of the cherry cordials.
	+ In their research journals, they should note the flavor, texture of the filling, aroma, and mouth feel of each final product.

**Closing** – 5 minutes

* Debrief the cherry cordial lab by discussing the results.
* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What happened to your cherry cordials?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Twelve**

**Key Question of the Day**: What are the current trends in the confectionary industry?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “Have you noticed any new candy products in the stores lately? If you have, what are they?”

**Learning Objectives:**

As a result of this lesson, students will be able to:

* Analyze trends in the confectionary industry.

**Required Materials for Daily Lesson**

* Computers
* Internet
* Flip chart
* Markers
* Article – Appendix 13
* Resource - <http://www.candyindustry.com/articles/85425-confectionery-trends-in-the-united-states>

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Responses may vary depending on what is new and popular at the time this lesson is being taught.
* **Teacher TIP!** If possible, have a couple of these items ready to share with the class. This will add a lot of value to the discussion if the students can actually see the packages and discuss the new characteristics of the products.
* Explain that, “As we start to think about how we will be modifying our recipes to create a new and exciting product, it’s important to know what is currently happening in the candy industry. Since we have already chosen the base recipe we plan to use, it’s time to start thinking about the modifications that will make the products new and marketable for the candy shop.”

**Middle –** 40 minutes

* Each team will get a section of the article (Appendix 13) to read.
* After teams read their section, they will create a flip chart poster with the key points from that section to share with the rest of the class.
* They will hang their flip charts around the room as an artifact for the remainder of the project, as a reminder of industry trends.
* Following the team presentations, give each team time to discuss what they might change about their starting product based on what they learned about the industry trends.
* Students may use computers and the Internet to do additional research in order to help them decide how they will modify their existing product.
* The goal is not for them to make a final decision, but to start to identify a few options.
	+ The final decision will come after they learn about nutrient claims and target audience in the upcoming days.
* Students will record the information discussed about this in their research journals.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What other factors, aside from industry trends, may play a role in product development?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Thirteen**

**Key Question of the Day**: What do the nutrient claims on food labels mean?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet (Appendix 1)
* “What are some claims you commonly see on the packages of your favorite foods?”

**Learning Objectives:**

As a result of this lesson, students will be able to:

* Describe the meanings of specific nutrient claims.
* Identify nutrient claims commonly found on food packages.
* Read and interpret a food label.

**Required Materials for Daily Lesson**

* Computers
* Internet
* Food labels or packages
* Article – Appendix 14 - <http://www.clemson.edu/extension/hgic/food/pdf/hgic4061.pdf>

**Estimated Instructional Time:** One 50-minute class period

**Opening –** 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ Fat free
	+ Zero trans fats
	+ Low fat
	+ Sugar free
	+ High protein
* Explain that, “There are a wide range of claims that companies use on their products to appeal to consumers. But do we even know what these claims really mean? How do you know you can believe the claims on the packages?”
* Allow students to share their responses and have a brief discussion.
* Ask students if they can define any of the claims they shared. Then explain that, “We are going to explore these claims and what they actually mean, so that you can start to think about how this will relate to the new candy product you are creating.”

**Middle –** 40 minutes

* Have a variety of food packages displayed at the front of the room.
* Give students a copy of the article Appendix 14: <http://www.clemson.edu/extension/hgic/food/pdf/hgic4061.pdf> along with a Post-It note.
* Students will read the article in their groups each student will have an assigned section of the article to read. After students finish reading their section, they should share a summary of what they read with their team.
* On the Post-It note, while reading the article, students should write one thing they understand that makes complete sense, one thing they are questioning, and one thing they completely do not understand.
* Then within the groups, students can review the questions and information on their Post-It notes.
* Once the class is finished reading and discussing the article, come back as a class. Ask the following reflection questions:
	+ What are your reactions to this article?
	+ What did you find most interesting?
	+ What are you now questioning?
	+ What surprised you the most?
	+ Did this article come from reliable resource? How do you know? (Briefly explain why the source is credible and the role of the Cooperative Extension Service)
* Transition by explaining that, “Based on what we just read, how will you know if the claims on the packages are actually true to the product inside of the package? The answer is on the food label in the list of ingredients.”
* Ask each group to grab a package from the display (should be from the previous day and does not have to be the product from the engagement scenario). Explain how to determine if the nutrient claim is accurate:
	+ First look at the front of the package. What is the nutrient claim?
	+ Next, look at the ingredients list. Locate that ingredient in the list. For example, if it says made with whole grains, locate whole grains in the ingredients list. If it says high protein, locate the protein content on the nutrition label. All of the answers will be on the nutrition label or in the ingredients list.
	+ If the ingredient is towards the end of the ingredients list, then that means the food product contains very small amounts of that ingredient. If it is towards the beginning, like one of the first few ingredients, then it contains a higher quantity of the ingredient.
* Students should now look at the package, identify the nutrient claim, and then try to determine, based on the facts in the article, if the claim is true for that product.
* Solicit responses from the class. Take a poll, ask students to raise their hand if they believe their claim was accurate, and do the same if they believe it was misleading.
* For the rest of the class period, teams should discuss the nutrient claims and determine if they plan to use one, which one they will use and why.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“How do you feel about nutrient claims? Are they an accurate representation of the product?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Fourteen**

**Key Question of the Day**: What is a target market?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “What is a target market?”

**Learning Objective**

As a result of this lesson, students will be able to:

* Define target market.
* Describe the characteristics of a target market.
* Identify a target market for the new candy product.
* Create a new product strategy.

**Required Materials for Daily Lesson**

* Computers
* Internet
* Magazine, newspaper or television advertisements
* Product packages or images of products (food, toiletries, household items, etc.)
* Flip chart
* Markers

**Estimated Instructional** **Time:** 50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
* A group of people that something is targeted for
* Explain to students that, “A target market is an identifiable group of consumers with unmet needs or wants. For anything that you purchase whether it be a good such as sneakers or service like a haircut, there is always a target market, and as consumers, we are all part of a specific target market.”

**Middle** – 40 minutes

* Allow each team 10 minutes to research target market and see if they can determine what characteristics make up target markets. They should be looking for demographics including (this is not a complete list):
	+ Age
	+ Gender
	+ Socioeconomic status
	+ Income
	+ Life stage (kids/no kids/married/single)
	+ Geographic location
	+ Lifestyle views (for example: health conscious)
	+ Relationship to the product or trend
* Once they have completed this task, bring the class back together and ask them to share their findings. Create a master list using a flip chart at the front of the room.
* Give each team a variety of items. The items should include some food-related items, in addition to household products, advertisements from magazines or newspapers.
* You can also show television commercials that have a clear target audience by explaining how certain commercials are on certain channels, and take it further by discussing how certain commercials air at specific times of the day because of the typical audience watching television at those times.
* Each team will have 5 to 10 minutes to determine the target market for each item or advertisement.
* When this task is complete, bring the class back together and discuss their findings.
* Next, each team will create their new product strategy. Explain that a new product strategy is, “a detailed plan assembled by a group to achieve agreed-upon objectives. To carry out a plan or strategy, products may be developed within a corporation.” – From Food Science and Safety Second Edition by George J. Seperich
* Continue by explaining, “So, before we can move to the prototype phase of development, the first step is to create your new product strategy. What are you going to change about your existing product? What nutrient claims will be on the package? Who is your target market? Your task is to write a summary of your new product plan explaining why your team made the decisions that you made.”
	+ Post these questions on a flip chart somewhere in the room for students to reference.
* For the remainder of the class, students will work in their teams to write their new product plan and determine who the target market will be for their new candy product. As each team identifies their target market, they should revisit the nutrient claims that they identified from the previous day and determine which ones fit best for the target market of the new candy product. Finally, each team should determine what ingredient they will add to the recipe to change the existing product and explain why they selected that ingredient. They also have to decide how much of the ingredient will be added. For example, if they selected peanut butter cups and decide to add coconut, they have to decide how much coconut to add to the recipe.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“Why is it important to understand the target market for your new product?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Fifteen**

**Key Question of the Day**: What are the key marketing principles?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “What makes a product sell?”

**Learning Objective**

As a result of this lesson, students will be able to:

* Describe the four Ps of marketing.

**Required Materials for Daily Lesson**

* Computers
* Internet
* Flip chart
* Post-It notes
* Markers
* Lab materials:
	+ 1/3 to ½ cup of cold water
	+ 1 package of flavored gelatin (variety of flavors and colors)
	+ 4 packets of unflavored gelatin
	+ Saucepan
	+ Rubber spatula
	+ Glass measuring cup
	+ Baster, funnel, or sterile disposable pipet (optional)
	+ Plastic or silicone mold tray (one tray per team)
		- This recipe will make enough solution to fill about one tray

**Estimated Instructional** **Time:** 50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
* The package **–** colors, logo, design
* The price – inexpensive, big value for small price
* Commercials
* Popularity of existing products from the same brand
* Convenience
* The point to be made is, “Companies are very strategic in how they market their products. It’s up to your team to create a marketing strategy that will encourage the ‘candy shop owners’ to select your product.”

**Middle** – 40 minutes

* Have each of the following items written on their own sheet of flip chart paper and hang them around the room:
	+ Product – What is the product you are trying to sell?
	+ Price – What is the value of the product?
	+ Place – Where will the product be sold? What’s the competition?
	+ Promotion – What is your marketing strategy?
* Explain that these are the four P’s of marketing, which we have to consider when determining how to sell a product.
* Each team should have a few Post-It notes. Teams will rotate to each flip chart station for about a minute each to brainstorm these concepts as they relate to their new products.
	+ The only item that everyone will have similar is the place, since all of the candy is potentially going to be sold at the same candy shop.
* As teams have a response to each P, they should write it on the Post-It note and stick it on the corresponding flip chart. This exercise should take about 4 minutes.
* Bring the class back together and debrief by having a discussion about how the four Ps relate to the development of their new candy products.
* Transition by explaining that, “We are going to practice this with a little activity called the Great Gummy Challenge. The goal of the challenge is for each team to make a batch of gummies and create a 30-second commercial that covers the 4 Ps of marketing. While we haven’t gotten into the nitty-gritty of pricing, for this activity, use your best judgment. More on that to come later.”
* Each team should select the flavor of gelatin and mold they wish to use.
* Each team will make a batch of gummy candies following this recipe:
	+ Place the cold water in a heat-proof glass measuring cup.
	+ Sprinkle the gelatin over the water while stirring with a rubber spatula.
		- The resulting mixture will be a super-thick mass, much like clay, but keep stirring.
* When all of the gelatin is sprinkled on, try to get all the dry bits off the side of the measuring cup and off the spatula (as well as any moist bits) and press onto the surface of the gelatin mass.
	+ Cover the measuring cup with plastic wrap and let the mixture rest for 10 minutes. Fill a medium-sized saucepan half full with water, set over medium heat and bring the water to a simmer.
	+ Remove the plastic wrap from the measuring cup and place it in the water. Let the mass of gelatin melt, stirring occasionally and gently.
	+ When the mixture is clear, turn off the heat and let the mixture sit for 1 to 2 minutes.
	+ Very carefully pour the hot mixture from the measuring cup into the molds. An option to keep things from getting messy is to use a funnel, baster, or sterile disposable pipet to port the mixture into the molds. If pouring from a measuring cup with a spout, it should work just fine.
	+ If the syrup gets too thick, you can reheat it a little. If the candies contract a fair bit as they cool, top them off with a second round of the gelatin mixture.
	+ Place the mold in the freezer for 10 minutes, then in the refrigerator for another 5 to 10 minutes. Peel them out of the molds and serve.
* While the gummies are setting up in the freezer and refrigerator, the teams should be preparing their 30-second commercial.
	+ The commercial should be based on the color, flavor, and shape of the gummies.
* By the time the gummies are ready, teams should be finished planning their commercials.
* Each team will present their commercial.
* Following the commercial, everyone can sample the gummies.
* Have a brief discussion to debrief the lab and review the importance of the 4 Ps.
* Feel free to select a winner of the challenge or have the students vote on their favorite commercial.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What makes gummy candies gummy?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Sixteen**

**Key Question of the Day**: How is the price of the product calculated?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “Yesterday, your exit Ticket question asked, “What makes gummy candies gummy? Let’s discuss this.”

**Learning Objective**

As a result of this lesson, students will be able to:

* Calculate the price of a product.

**Required Materials for Daily Lesson**

* Flip chart
* Markers
* Ingredients list for team recipes
* Pricing Scenarios – Appendix 15
* Gummy Article – Appendix 16

**Estimated Instructional** **Time:** 50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Give students a copy of Appendix 16 to read (from lab manual)
* Then have a brief discussion about the article. Highlight that making gummy candy was another example of the chemistry behind candy.
* Transition by explaining, “We just learned about the 4 Ps of marketing. Today we are going to focus on the P, or price, of food products. How do we determine the price of our new food products?”

**Middle** – 40 minutes

* **Teacher TIP!** You will have to keep track of the price of each ingredient when purchasing supplies. It will help to save a copy of the receipt. You will have to share this information with the students so that they can calculate the cost of their new candy products.
* Students will work in their project teams for this activity. Give each team a scenario from Appendix 15.
* Allow them time to determine how to solve the scenario on their own before offering assistance.
* The process for calculating the price of the ingredients is:
	+ Determine how much milk and how much chocolate syrup to use to create the 12-ounce beverage
	+ Determine how many ounces are in a gallon
	+ Divide the cost of the milk by the number of ounces in a gallon (128 ounces)
		- Multiply this number by the number of ounces of milk identified by the team
	+ Divide the cost of the chocolate syrup by the number of ounces in the bottle
		- Multiply this number by the number of ounces of chocolate syrup identified by the team
	+ Add the cost of the milk and the cost of the chocolate syrup to total the cost of ingredients for a 12-ounce beverage
* If after about 5-10 minutes teams need help, give them hints about how to perform the calculations.
* Once each team has completed the challenge, come back together as a class and have each team report about their scenario and the cost.
* Explain that, “In addition to calculating the cost of each ingredient based on the serving size, we have to consider the other factors involved in. We are pricing our new candy products based mainly on the ingredients. What are some of those other factors that the ‘candy shop owners’ will have to consider when they price the new candy product?”
	+ Brainstorm a list of factors together as a class. Make a list on a flip chart.
	+ Factors may include:
		- Electricity
		- Rent/overhead costs
		- Bulk/wholesale purchasing of the ingredients
		- Equipment maintenance
		- Hourly salary of employees
		- Labor involved in making the product
		- Any packaging materials
* Give students the rest of the class period to work in teams to calculate the cost of their new candy product.
	+ Teams can divide the task by having each person calculate the price for a few ingredients from the recipe.
	+ They will follow the same procedures from the scenario examples to calculate the price of their products.
	+ They will have to follow the procedure from the milk and chocolate syrup for every ingredient in their recipe, based on the serving size of the recipe.
* Students should keep track of their calculations in their research journals. They should show all work so that the teacher can check to see if the math was done correctly.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What questions do you have about calculating the price of products? How do you feel about the price of your product? Is it fair?

* Collect the Exit Ticket for the day as students leave the classroom

**Day Seventeen**

**Key Question of the Day**: How do I create a nutrition label for a new product?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “What is the purpose of the nutrition label?”

**Learning Objective**

As a result of this lesson, students will be able to:

* Calculate the nutrition label information for the serving size of the new candy product.

**Required Materials for Daily Lesson**

* Computer
* Projector
* Sample Calculations – Appendix 17
* Ingredients for the candy the students will be making (list will vary depending on the products students plan to create
	+ **Teacher TIP!** These ingredients should be purchased prior to this day. If there are perishables like butter, be sure the label can be removed so that students can see the nutrition information. Cooking will be coming soon, so this is a good time to have the ingredients handy. You can also decide if you would like to purchase all of the ingredients for the students, or if you would like students to help by bringing in some of the ingredients.

**Estimated Instructional** **Time:** 50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
* Tell if the food is healthy or unhealthy
* Serving size
* Daily nutritional intake
* Ingredients
* The point to be made is, “These are all correct. Nutritional information tells the consumer how many servings are in the product, as well as the percentage of calories, fat, sodium, sugar, and other nutrients the product takes out of the average daily value. Today we are going to learn how to calculate the nutrition information for your new products.”

**Middle** – 40 minutes

* Have the packages or nutrition labels of each ingredient on display for the class.
* Begin by reviewing how to properly read and interpret a nutrition label, by discussing where to identify the nutritional information such as calories, fat, sugar, carbohydrates, protein, etc.
* Each team should identify the nutrition information on the products they are using to create their new products.
* Once they have reviewed the nutrition information, explain that the number of calories is directly related to the servings of the product in the package. For example, if a two-pack of peanut butter cups says 200 calories for the entire pack, then eating both pieces means you consumed 200 calories. If it says 200 calories for one piece, then eating both pieces in the package would be 400 calories consumed.
* Explain that the numbers on the nutrition label account for each ingredient in the product.
* Each team will have to calculate the nutrition information for the product they are creating by using the recipe they selected to determine the calories, fat, sugar, carbohydrates, protein, fiber, sodium, and cholesterol for their new product.
* See Appendix 17 for instructions on how to perform these calculations.
	+ Feel free to use this with students if they need assistance.
* Each team will have to calculate the nutrition information for their new product by using this procedure.
	+ Within their teams, students can divide up the ingredients so that each student is working on some of the calculations.
* Students should keep track of their calculations in their research journals. They should show all work so that the teacher can check to see if the math was done correctly.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What questions do you have about calculating nutrition information?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Eighteen**

**Key Question of the Day**: What are the components of a product package?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “What is a logo? Why do products have logos?”

**Learning Objective**

As a result of this lesson, students will be able to:

* Create an identity for a new product by developing a name and logo.
* Develop a new product package.

**Required Materials for Daily Lesson**

* Colored poster paper
* Markers (and other available art supplies for creating a package)
* Blank Nutrition Label – Appendix 18
* Empty packages (jars, plastic containers, boxes of different shapes and sizes)
	+ **Teacher TIP!** Students can bring in empty packages or the teacher can be responsible for finding them. Each team will need an empty package and should select one that they feel goes best with the product they plan to make.

**Estimated Instructional** **Time:** 50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ A symbol for a company
	+ Represents and identity
	+ Have logos for recognition of brands
* Explain that, “Great responses! A logo is the identifying symbol for a company. Logos attract attention, identify a company, and explain the product. When you look at a logo, you should immediately get a sense of what the product is. What is the logo on the original candy product you selected?”
* Have a brief discussion about examples of logos.
* Transition by sharing that, “By now, we have been hard at work developing the different aspects of our new products. We have:
	+ Identified an existing product as a model for the new product
	+ Identified recipes with instructions for how to make the existing product
	+ Determined what we will be changing about the recipe create the new product by developing a new product strategy
	+ Calculated the nutrition information for the product
	+ Determined the price

The next few days will be dedicated to the final details leading up to our final lab, which will be the creation of the prototype.”

**Middle** – 40 minutes

* At this point, students should be ready to work toward finishing the package for the new confectionary product.
* Explain that teams should be focusing on:
	+ Create the package for the product – each team should select the container that makes the most sense for their prototype
	+ Creating a name for the product
	+ A logo to represent the product
	+ Finish up any calculations for the nutrition label and price
* Emphasize that creativity is very important. As the candy industry is very competitive, if teams want their product to be selected for the candy shop, they have to be creative and catch.
* The rest of the class period should be devoted to team time.
	+ Teams can divide tasks and determine the best way to be efficient and get the package complete.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What questions do you have about your packages?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Nineteen**

**Key Question of the Day**: What are the elements of a commercial?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “What are the characteristics of a good commercial?”

**Learning Objective**

As a result of this lesson, students will be able to:

* Develop a script.
* Record a 30-second (maximum) commercial.

**Required Materials for Daily Lesson**

* Video recording tool
	+ Students can use their cell phones, Flip cameras, iPads/iPods, or any other devices that are accessible for video recording
* Computer
* Projector

**Estimated Instructional** **Time:** 50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Possible responses may include:
	+ Grabs attention
	+ Entertaining
	+ Informative
	+ Shows an example of the product or service
	+ Includes testimonials from customers
	+ Includes data or statistics about the quality
* Explain that, “Commercials grab attention and entice consumers to purchase their products or services by creating curiosity and interest. Commercials tend to pinpoint a specific need, propose a solution, and demonstrate knowledge about the product. What’s an example of a current commercial that follows this method?”
	+ An example could be a food commercial that shows a person with a craving for pizza (the need), calls and orders a pizza for delivery (the solution), and information about the pizza and ingredients (the knowledge of the product).
* Transition by explaining that, “As you finish up the design of your packages, the next step is to create your commercial. The first set is to prepare your script. Next, take some time to plan and rehearse. The last step should be filming. We are going to switch gears and focus on selling our products to the ‘candy shop owners.’ Your goal will be to convince them that your product is the one they should sell.”

**Middle** – 40 minutes

* Students may still be working on their package designs, and that’s perfectly okay.
* There should be plenty of work for each team member to be engaged in a task, and working on the script or planning the commercial is something they can be doing while working on the package.
* Since the commercial is 30 seconds or less, it should be fairly short.
* Students have seen commercials on television, so they should be familiar with how to create a commercial.
* Some things to consider about the commercial (Project this criteria on a screen so that students can refer to it as they work):
	+ Should be creative
	+ If possible, can include music or any special effects from video editing apps
	+ To the point
	+ Address the proper target audience (this includes any music or special effects)
	+ Include a shot of the product package (since the actual candy has not been prepared yet)
	+ Include the name of the product, show the logo, and a description of the product
* Following the commercial, each team should be prepared to explain how they decided on the product they developed.
* For the rest of the class period, teams should continue to work on the package and/or commercial.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What questions do you have about your commercials?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Twenty**

**Key Question of the Day**: (Continuation of Day Nineteen) What are the elements of a commercial?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “Status update: How much progress have we made?”

**Learning Objective**

As a result of this lesson, students will be able to:

* Develop a script.
* Record a 30-second (maximum) commercial.

**Required Materials for Daily Lesson**

* Video recording tool
	+ Students can use their cell phones, Flip cameras, iPads/iPods, or any other devices that are accessible for video recording

**Estimated Instructional** **Time:** 50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* This is an opportunity to determine how much more time is needed for students to complete their packages and commercials before moving on to preparing the candy.
* If the class is small and everyone is done, you can skip this day. If the class needs more time to work on their packages and commercials, this is the time.
	+ **Teacher TIP!** Continue to allow time for the filming and editing of the commercials. If it seems like it is taking too long, feel free to assign pieces of this for homework, when possible.

**Middle** – 40 minutes

* Students will continue to work in teams to finish their packages and commercials.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“Are you ready to make your new candy?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Twenty-one**

**Key Question of the Day**: How is candy made?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “Today is the day! Are you ready to make your new candy prototype? What questions do you have?”

**Learning Objective**

As a result of this lesson, students will be able to:

* Create a new candy product.
* Follow a recipe to prepare a food item.

**Required Materials for Daily Lesson**

* Candy ingredients (which should have been purchased several days ago)
* Cooking equipment
	+ Stove or hot plates (microwaves work too)
	+ Thermometers (regular or candy thermometers)
	+ Glass bowls
	+ Wooden spoons
	+ Measuring cups
	+ Measuring spoons
	+ Refrigerators
	+ Freezers
	+ Paper towels
	+ Waxed paper
	+ Food storage containers
	+ Baking sheets
	+ Anything else required by specific recipes
	+ Food handling gloves

**Estimated Instructional** **Time:** 50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Answer any questions the students might have about making their recipes.
* Explain that teams will have to be efficient with time due to the fact that we only have a 50-minute class period to work.
* Review food safety and lab safety.

**Middle** – 40 minutes

* Teams will use the class period to make their new candy product prototype.
	+ They should only prepare one serving of the product.
* Offer assistance to any teams who need it.
* If anyone finishes early, they can put any finishing touches on the overall project (package, commercial, etc.).
* Note that it is possible to continue preparation of the candy the next day if it can be stored in a refrigerator overnight.
* There should be enough candy for the teams to sample what they created, as well as for the “candy shop owners” to taste during the judging.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What questions do you have about your commercials?”

* Collect the Exit Ticket for the day as students leave the classroom

**Day Twenty-two**

**Key Question of the Day**: Why is my product the best?

Bell-Work (Each day the Bell-Work question should be prominently displayed and used to open the lesson)

* Provide students with the weekly Bell-Work sheet – Appendix 1
* “Any last minute questions? Today is the day you will pitch your prototype.”

**Learning Objective**

As a result of this lesson, students will be able to:

* Describe the elements of new product development.
* Give an oral presentation.

**Required Materials for Daily Lesson**

* Computer
* Projector
* Cooked candy product
* Packages and commercials
* Candy shop owner
	+ **Teacher TIP!** If there is a local candy store in your community, invite the owner to be a guest judge. If this isn’t possible, you can invite administrators, teachers, or other key community business leaders to serve as the “candy shop owners.”
* Rubric – Appendix 19
* Project Reflection – Appendix 20
* Collaboration Rubric – Appendix 21 – One for the teacher
* Project Presentation Audience Feedback – Appendix 22 – One per student

**Estimated Instructional** **Time:** One50-minute class period

**Opening** – 5 minutes

* Read the Bell-Work question and solicit responses from the students.
* Answer any questions the students might have about their projects.
* Review etiquette for the audience and presenters.

**Middle** – 40 minutes

* After each team shares their commercial, they will also explain why they decided to create the product they chose.
* Students should use Appendix to select one team to evaluate.
* The teacher should use Appendix 21 as a guide for evaluating team collaboration.
* At that time, the “candy shop owners” will conduct a sensory evaluation of the prototype.
* The “candy shop owners” have the option to ask the team any questions about how their prototype was developed.
	+ Sort of like cooking shows like Cupcake Wars, where the judges taste the cupcakes and the chefs describe the cupcake, the ingredients, and why they selected the ingredients.
* If any of the recipes made a large serving size, feel free to take some time for the students to sample each other’s creations.
* For small classes, presentations would likely take one day, but for larger classes, it might carry over to two days.
* When presentations are complete, give each student a copy of the Appendix 20 to complete.
* Have a brief discussion to debrief their experience learning about product development through candy.

**Closing** – 5 minutes

* Students will turn in their Exit Ticket for that day. They will respond to the following prompt:

“What did you learn from the presentations today?”

* Collect the Exit Ticket for the day as students leave the classroom