GIRLS PURSUING SCIENCE

Grades 3-8

The B.O.S.
Beauty of STEAM

INSTRUCTOR'S GUIDE

www.beautyofsteam.com

GIRLS PURSUING SCIENCE

A GIRL'S GUIDE TO SCIENCE, TECHNOLOGY, ENGINEERING, ART & MATH

Discovering STEAM & Loving it!

Jacquelyn Thomas
Girls Pursuing Science, LLC

Girls Pursuing Science (GPS) introduce girls to science and mathematics through cosmetic chemistry and entrepreneurship. GPS engage girls in STEAM (Science Technology Engineering Art Math) and business development skills during their early elementary and middle-school years. Our goal is to channel a girl's intuitiveness, compassion and love for humanity into innovations that can change the world. GPS use project-based learning to build upon a girl's natural ability to think, create, discover, and lead!

GIRLS PURSUING SCIENCE

Dedications & Credits

It is only fitting, that I dedicate the start of a new chapter of GPS to the people who laid its foundation.

A special thanks to the sold out inaugural GPS Charlotte Summer Academy and staff. Ms. Shannon Woodson and Chinyere Williams, you rock!

To my friend and colleague, Dr. Rutha Carr and the Education Support Systems staff (Leland High School), words are not adequate for the trust and loyalty you showed when GPS was just a figment of my imagination. Dr. Carr, you are the best!

Jacquelyn Thomas
GPS Founder

GIRLS PURSUING SCIENCE

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TABLE OF CONTENTS

Meet The B.O.S.!

Hello, Educators! Welcome to My Lab!

I am Jacquelyn Thomas, founder of Girls Pursuing Science, affectionately known as GPS. I am also a scientist! An old school scientist!

I say “old school” because I didn't realize science was so cool until much later in life, coupled with my having grown up in a small southern town where women were expected to stay home to take care of their children and perform household chores, while men worked to take care of the family.

Unfortunately, during this era in American history, the labor force pertaining to women mirrored the racial issues going on in society and, consequently, minority females faced greater challenges.

Today, women have made substantial progress over the past few decades, from helping to put a man on the moon to running our own empires. Nonetheless, we still face significant challenges.

Therefore, we felt compelled to develop a real-world, STEAM-Business Development curriculum for all girls: “B.O.S.,” which is the acronym for the Beauty of STEAM.

The B.O.S., created for educators by educators, puts girls in charge. Our goal is to educate, inspire, and ignite the next generation of women to play an active part in innovation and repeat the process for women who will follow them.

Thank you for being a part of the phenomenon:

- Fueling creativity
- Forcing divergent thinking, and
- Implementing innovation in your classroom!

Jacquelyn Thomas, Scientist

Get To Know The Curriculum

The B.O.S. is your one-stop shop to bringing STEM and STEAM innovation to your classroom. Girls build chemistry and math concepts by making their own cosmetic products!

The B.O.S. is a digital, instructor-led curriculum with over 75 project-based learning activities. Cool STEM and STEAM skill building animated videos that recap science and mathematical concepts.

The B.O.S. engages, excites, and ignites creativity and critical thinking. Girls get excited about science and math, use technology to do research, create digital art, and CODE! B.O.S. builds creativity skills using real-world applications.

Finally, the Beauty of Business! Girls learn how to start a successful business by creating a budget, marketing campaign, and developing a business plan.

The B.O.S. consists of three modules: STEM, STEAM, and Business Development. It includes over 75 hands-on projects, as well as a downloadable Student Workbook and Instructor's Manual.

After-school! Summer Camp! In-School Enrichment! You choose—B.O.S. delivers!

Professional Development

A Quick Start to the B.O.S.

Now that your equipment has arrived, we want to make sure it does not sit in a closet, waiting for professional development!

1. Inventory your supplies upon delivery. If you are short items or have damaged products, please contact us immediately at 704-469-3535. We ship replacements the next day!
2. Review the digital curriculum, starting with the "Curriculum Overview" tab in the top menu and work your way through the website. Review each page to get familiar with the layout. Watch the first five videos. The videos provide a high-level overview of STEM and STEAM concepts.
3. Review the Resource Section. This includes your downloadable resources, i.e., ***Material Safety Data Sheets*** (MSDS). MSDS documents list the ingredients, test, and emergency medical information on all the chemicals enclosed in your kit. ***READ THEM CAREFULLY***.
4. ***READ FIRST*** documents are also included in the ***Resource Section***. Adhere to all WARNING NOTES about the danger of mixing the B.O.S. chemicals and supplies with other products. ***NEVER MIX OTHER CHEMICALS WITH B.O.S. CHEMICALS***.
5. Need a more "hands-on" approach? Order on-site Professional Development. Contact us. girlspurusingsicence@gmail.com.
6. ***PROJECT IMPLEMENTATION***
   - Choose your project.
   - Give students an overview of the section.
   - If you do not have the physical manuals, provide students with copies of the worksheets.
   - Show the video of each activity.
   - *Students use the worksheets to complete the activity.*
   - *Refer to the Instructor's Manual for additional information.*

STEM Experiment #1

The Beauty of Bubble Bath

STEM Experiment Overview

The Beauty of Bubble Bath experiment is the unique formulation of ingredients to create bubbles. Adding preservatives will provide longevity of the bubbles before adding the color. The Beauty of Bubble Bath will attract attention. The bubbles created are pretty, fun, and fascinating.

Background Information

Two, thin layers make up bubbles: one of soap molecules and one of water. In most cases, the bubbles are filled with air. However, some bubbles contain gases like carbon dioxide or hydrogen. Soap molecules are elongated with a head and tail. The "head" is hydrophilic (water loving) and faces the water, and the "tail" is a hydrophobic (water fearing) hydrocarbon tail that extends away from the water layer. Bubbles have a reaction that reflects what we see. The characteristics of a bubble are color, size, and the longevity of the bubble.

Essential Questions

1. How and why are bubbles formed?
2. What are the key characteristics of a bubble?
3. What makes bubbles so exciting?

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***MS-ETS1-1.*** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles.
- ***5-PS1-4***. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solution.	***Chemical Reactions*** When two or more different substances are mixed, a new substance with different properties may form. (5-PS1-4)	***Cause and Effect*** Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4)
Asking Questions and Defining Problems Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. Define a design problem to solve through the development of an object, tool, process, or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)	***Defining and Delimiting Engineering Problems*** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)	***Influence of Science, Engineering, and Technology on Society and the Natural World*** All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165

Common Core State Standards Connections

! *ELA/Literacy*

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3)

! *Mathematics*

MP.4 Model with mathematics. (5-PS1-1)

M.2 Reason abstractly and quantitatively. (MS-ETS1-1), (MS-ETS1-2), (MS-ETS1-3), (MS-ETS1-4)

Performance Objectives

1. Students will recognize the steps of the scientific method.
2. Students will describe how the bubbles are formed.
3. Students will design an experiment with various techniques.
4. Students will analyze and document their results of the experiment.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes the scientific method, describes and documents how the bubbles are formed. In an experiment, students analyzed the results of the experiment, and provided evidence of the completed bubble bath solution.	The student utilizes the steps of the scientific method, describes how the bubbles are formed, provides some analysis of the results of the experiment, and has evidence of the completed bubble bath solution.	The student describes how the bubbles are formed, provides some analysis and documentation of the results of the experiment. Final product meets some expectations.	The student describes how the bubbles are formed, and provides limited analysis and documentation of results. Final project does not meet expectations.

Time Requirement

- Reading and Research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes

Times vary based on program implementation, the number of students, skill levels, etc.

STEM Experiment #2

The Beauty of Bath Fizzies

STEM Experiment Overview

The Beauty of Bath Fizzies introduces chemical reaction of acids and bases. In this experiment, physical and chemical changes occur because of the chemical reactions of acids and bases. Active ingredients, such as baking soda and citric acid create the fizz. The experiment creates products that relax the muscles, moisturize, and have pleasant scents that are beneficial for post-experiment use.

Background Information

Bath Fizzies can be made using a wide range of ingredients and still be classified as a Bath Fizzy. Many ingredients are functional ingredients or the ingredients that make the product work. Add other ingredients to provide benefits to the users. When combining sodium bicarbonate and citric acid, and releasing into water. The citric acid releases carbon dioxide gas from the sodium bicarbonate. The combination of ingredients turns bath water into a fizzing blend of colors and bubbles. The bubbles that make the water fizz are made of carbon dioxide gas. The fizz from the carbon dioxide and color presents an excitement and reaction among students as they identify with science as it happens.

Essential Questions

1. What was the focus to determine your prediction?
2. How can you interpret your body senses within your reflection of the experiment?
3. How does an acid and a base contribute to a chemical reaction?

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***5-PS1-2.*** Measure and graph quantities to provide evidence that, regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- ***MS-PS1-2.*** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Developing and Using Models Use models to describe phenomena. (5-PS1-1)	***Chemical Reactions*** When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)	***Cause and Effect*** Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4)
Developing and Using Models Develop a model to predict and/or describe phenomena. (MS-PS1-1), (MS-PS1-4)	***Chemical Reactions*** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3),(MS-PS1-5)	***Energy and Matter*** Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165

Common Core State Standards Connections

! *ELA/Literacy*

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2), (5-PS1-3), (5-PS1-4)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

! *Mathematics*

MP.5 Use appropriate tools strategically. (PS1-2), (PS1-3)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1)

Performance Objectives

1. Students will define and describe a chemical reaction.
2. Students will predict the reaction based on the pH of ingredients.
3. Students will sort chemicals into groups of acids and bases.
4. Students will make a hypothesis about the water temperature on a second bath fizzy.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes the pH scale, shows how the pH scale identifies acids and bases, describes and documents how the ingredients reflect a chemical reaction in an experiment, analyzes the results of the experiment, and provides evidence of the completed bath fizz.	The student utilizes the pH scale to identify acids and bases, describes how the ingredients reflect a chemical reaction, and provides some analysis of the results of the experiment and evidence of the completed bath fizzy.	The student describes how chemical reactions are formed, and provides some analysis and documentation of the results. Final product meets some expectations.	The student describes how chemical reactions are formed, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Time Requirement

- Reading and Research: 30 - 55 minutes
- Experiment: 60 - 90 minutes

Times vary based on program implementation, the number of students, skill levels, etc.

STEM Experiment #3

The Beauty of Perfume

STEM Experiment Overview

The Beauty of Perfume provides a platform for mixtures. In this experiment, the mixture of the fragrance, oils, and scents will evaporate and release the perfumes. The release of the perfumes is based on the head, heart, and base evaporation.

Background Information

Since early times, the use of perfumes has been different depending on the group that was using them. The perfumes were used for religious purposes, to reflect beauty, to show status, and to cover the smell of illness. So much has changed since the early times. As a result, research has been conducted to change the myth. The change of the myth through perfume research has shown that perfumes can be used for so much more. Perfumes are made from natural or synthetic ingredients. Natural ingredients are extracted from botanical sources, such as roses, lavender, and sandalwood. These ingredients are referred to as notes. Perfume notes are classified as 'head', 'heart,' and 'base,' which describe the scents upon the application of the perfume.

Essential Questions

1. What is the makeup of a fragrance mixture? How does the formulation affect this makeup?
2. Can the fragrance mixture separate? If so, by which method?
3. Does the fragrance mixture differ from the original substances?

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***5-PS1-2.*** Measure and graph quantities to provide evidence that, regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- ***MS-PS1-4.*** Develop a model that predicts and describes changes in particle motion, temperature, and the state of a pure substance when thermal energy is added or removed.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Developing and Using Models Use models to describe phenomena. (5-PS1-1)	***Chemical Reactions*** When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)	***Cause and Effect*** Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4)
Developing and Using Models Develop a model to predict and/or describe phenomena. (MS-PS1-1), (MS-PS1-4)	***Structure and Properties of Matter*** Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)	***Scale, Proportion, and Quantity*** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

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Common Core State Standards Connections

ELA/Literacy

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2), (5-PS1-3), (5-PS1-4)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

Mathematics

MP.5 Use appropriate tools strategically. (PS1-2), (PS1 WHST.6-8.8) Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)

Performance Objectives

1. Students will identify the steps of the scientific method for the fragrance mixture.
2. Students will research the natural and synthetic ingredients present in the perfume.
3. Students will calculate a formula formulation to determine the presence of the perfume.
4. Students will develop a hypothesis about what will happen if more fragrance is added to the perfume.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes ingredients in the perfume, describes and documents how the ingredients reflect a mixture formed in an experiment, analyzes the results of the experiment, and provides evidence of the mixture.	The student utilizes ingredients in the perfume, describes how the ingredients reflect a mixture, provides some analysis of the results of the experiment, and evidence of the mixture.	The student describes how the perfume is formed, conducts an experiment with the ingredients, and provides some analysis and documentation about the results of the experiment. Final product meets some expectations.	The student describes how the mixtures are formed, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Time Requirement

- Reading and Research: 30 - 55 minutes
- Experiment: 45 - 60 minutes

Times vary based on program implementation, the number of students, skill levels, etc.

STEM Experiment #4

The Beauty of Lip Balm

STEM Experiment Overview

The Beauty of Lip Balm correlates chemical change based on gas, liquid, and temperature. In this experiment, a chemical change will occur to reflect how the ingredients control the form and solidity of the lip balm. Fragrance and flavor are components within the experiment, but are additives compared to the natural oils and waxes in the experiment.

Background Information

Lip balm is very popular, and particularly popular among adolescents. The fragrance and flavor are important when determining if the student desires a liquid or solid type lip balm. A liquid form of lip balm is produced by using oils, and the solid form of lip balm is made by using wax. Emollients contribute to the product's unique feel, delivery of characteristics, and affect the physical and photochemical stability of the product. Commonly used emollients are oils or butters (i.e. castor, seed, jojoba oils, or shea butters). Waxes are used to provide structure. To achieve the right look, feel, and consistency, chemists may mix several waxes. The use and mixture of waxes determine the texture, smoothness, and softness or hardness. The lip balm cannot be too soft, runny, or too hard. Either extreme may create a product that is difficult to use.

There is nothing like getting ready to go somewhere and your outfit is complete when you apply lip balm. Lip balm is produced based on the supply and demand of the consumer. Wax and oil lip balms are the favorites; both undergo different chemical changes.

Essential Questions

1. What is the indicator for the lip balm chemical reaction?
2. What properties in the lip balm are determined to be chemically changed?
3. How do you explain the chemical change among the components of the lip balm?

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***5-PS1-2.*** Measure and graph quantities to provide evidence that, regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- ***MS-PS1-4.*** Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Developing and Using Models Use models to describe phenomena. (5-PS1-1)	***Structure and Properties of Matter*** Measurements of a variety of properties can be used to identify materials. (5-PS1-3)	***Scale, Proportion, and Quantity*** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2)
Developing and Using Models Develop a model to predict and/or describe phenomena. (MS-PS-1-4)	***Structure and Properties of Matter*** Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)	***Cause and Effect*** Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165

Common Core State Standards Connections

ELA/Literacy

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

Mathematics

MP.4 Model with mathematics. (5-PS1-1), (5-PS1-2), (5-PS1-3)

MI.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)

Performance Objectives

1. Students will identify the steps of the scientific method for the lip balm chemical change.
2. Students will produce a lip balm substance using correct measurements of materials.
3. Students will compare oil and wax lip balms.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the chemical change of the ingredients for lip balm, describes and documents how the ingredients reflect a chemical change in an experiment, and compares and contrasts the wax and oil lip balms, and analyzes the results of the experiment and provides evidence of the chemical change of lip balm.	The student describes how the ingredients reflect a chemical change, and provides some analysis of the results of the experiment and evidence of the completed chemical change of lip balm.	The student describes how chemical changes are formed, and provides some analysis and documentation of the results of the experiment. Final product meets some expectations.	The student describes how chemical change is formed, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Time Requirement

- Reading and Research: 30 - 55 minutes
- Experiment: 60 - 90 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #1

The Beauty of Soap Jellies

STEM Experiment Overview

The Beauty of Soap Jellies presents the states of matter that can be reflected through STEAM. Matter changes into three different forms: liquids, solids, and gases. These three states of matter determine the effects of a substance such as soap jellies. Soap jellies come in many different shapes and sizes. The prediction of the size and shape can be constructed using Word Art - design graphics. Soap jellies can be measured by their weight and volume. The animated and digital components of soap jellies can be produced with an animation presentation of the jellies, and physical component can be designed using the engineering design process.

Background Information

Using soap is a part of our daily regimen. We use soaps for washing, cleaning, and relaxing. As with the products we create as scientists and everything around us, soap jellies are considered matter. When the soap jelly is set, it is hard (this is the solid state). As a liquid, soap jellies can bring more detail to the soap, when pouring the liquid soap into different molds. Soap jellies may also be different shapes. The fun part is soap jelly as a gas. Yes, a gas! The foam from the soap jelly is also matter, bound for relaxation and fun!

Essential Questions

1. What are the three states of matter?
2. How are the states of matter changed?

Performance Objectives

1. Student will identify the states of matter.
2. Students will observe how states of matter change.
3. Students will calculate volume.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the three states of matter, describes and documents how the states of matter change, and calculates and explains the concept of volume in an experiment, and analyzes the results of the experiment and provides evidence of soap jellies.	The student utilizes ingredients in the soap jellies, describes how the ingredients reflect one or all states of matter, and provides some analysis of the results of the experiment and evidence of matter change.	The student describes how soap jellies are formed, and provides some analysis and documentation about the results of the experiment. Final product meets some expectations.	The student describes how states of matter change, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***5-PS1-2.*** Measure and graph quantities to provide evidence that, regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- ***MS-PS1-4.*** Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Developing and Using Models Use models to describe phenomena. (5-PS1-1)	***Structure and Properties of Matter*** Measurements of a variety of properties can be used to identify materials. (5-PS1-3)	***Cause and Effect*** Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4)
Constructing Explanations and Designing Solutions Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)	***Structure and Properties of Matter*** The changes of state that occur with variations in temperature or pressure can be described and is predicted using these models of matter. (MS-PS1-4)	***Structure and Function*** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

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Common Core State Standards Connections

ELA/Literacy

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-PS1-2), (MS-PS1-3)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

Mathematics

5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)

MI.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #2

The Beauty of Color Science

STEM Experiment Overview

The Beauty of Color Science scientifically shows how we see the reflection of light. The visual light spectrum shows how the energy of an object is not absorbed but reflected for us to see. A color spectrum model will demonstrate how the colors are absorbed or not absorbed. Through experiment, soap colors can be created using a clear soap base and a colorant. Spectroscopes can help with understanding the light sources at home, school and around the city. When colors are created, boxes can be used to transport the colors display. The ability to determine the dimensions (length, width, and height) of the crayons and box are important.

Background Information

Colors play an important role in our everyday lives. Colors are used to create an emotion or trigger a response. Emergency vehicles and images of them are typically red. The color red creates a sense of urgency. Yellow creates a sense of caution. Color is also a creative marketing tool, a colorful advertisement can "control" a consumer's buying habits. Color is quite scientific. Light is a form of energy. When we see color, we are actually seeing light that has been reflected off of an object. Light moves from its source in waves of different lengths. When we see light we are seeing energy from certain wavelengths. This is called the visible light spectrum; all the colors that can be seen with the human eye. The spectrum presents the colors in a particular order, ranging in wavelength from 700-400 nm (nanometers).

Essential Questions

1. How is color created?
2. What causes light to reflect color?

Performance Objectives

1. Students will observe how color is created.
2. Students will design a spectrum to display color.
3. Students will calculate dimensions of a box for the colors.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The Students successfully utilizes and describes the how color is created, students describes and documents what causes light to reflect color, calculate and explain dimensions in an experiment, students analyzed the results of the experiment and provides evidence of color.	The Students utilizes crayon soap base, fragrance ingredients, and colorants, describes how the ingredients reflect color, the students provides some analysis of their results of the experiment and evidence light reflection in color.	Students describes how color is create, student provides some analysis and documentation about the results of the experiment, final product meets some expectations.	Students describe how color is created, yet provides limited analysis and documentation of results, final project does not meet expections.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***4-PS4-2.*** Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- ***MS-PS4-2.*** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Developing and Using Models Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1)	***Electromagnetic Radiation*** An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)	***Patterns*** Similarities and differences in patterns can be used to sort and classify designed products. (4-PS4-3)
Using Mathematics and Computational Thinking Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1)	***Electromagnetic Radiation*** When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2)	***Structure and Function*** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS4-2)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165

Common Core State Standards Connections

ELA/Literacy

RI.4.9	Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)

Mathematics

MP.4	Model with mathematics. (4-PS4-1), (4-PS4-2)
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #3

The Beauty of Lotion

STEM Experiment Overview

Your skin is made up of three layers: epidermis, dermis, and hypodermis. These layers are made of thousands of cells that need water in order to maintain elasticity. Lotion gives the skin the next best thing to their natural oils when their natural oils are taken away. Research about lotions and the combination of lotions are needed for understanding how lotion protects your skin. With background information, we can design and create a bottle of lotion. There are so many different types of lotions available for consumers. The right product packaging that is appealing to consumers would also contribute to selling large volumes of the lotion. The formulation of the lotion is what should be constantly considered to better the product over time.

Background Information

Have you ever wondered why people put lotion on their skin as part of their daily beauty ritual, or how lotion works to keep your skin hydrated and moisturized? The answer can be understood by finding out about the layers of skin and why they need protecting. Your skin is made up of three layers: epidermis (top), dermis (middle), and hypodermis (bottom). These layers are made of thousands of cells that need water in order to maintain elasticity. Using harsh soaps when you shower strips the natural oils of your skin. Natural oils protect your skin by keeping the water in your skin cells. When the oil is stripped, the water can escape more easily, leaving your skin very dry and flaky.

Essential Questions

1. What are the three layers of skin?
2. How does lotion provide protection and moisture?

Performance Objectives

1. Students will summarize the three layers of the skin.
2. Students will explain the protection and moisture needed for the skin.
3. Students will develop their own lotion.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the three layers of skin, describes and documents lotion provides protection and moisture, calculates and explains the conversion of metric units. In an experiment, student analyzed the results of the experiment and provided evidence of protection and moisture from his/her lotion.	The student utilizes ingredients in the lotion, describes how the ingredients reflect protection and moisture, and provides some analysis of the results of the experiment and evidence of protection and moisture.	The student describes how lotion is formed, and provides some analysis and documentation about the results of the experiment. Final product meets some expectations.	The student describes the layers of skin, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***3-5-ETS1-1.*** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- ***MS-ETS1-1.*** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Asking Questions and Defining Problems Define a simple design problem to solve through the development of an object, tool, process, or system and include several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)	***Developing Possible Solutions*** At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)	***Influence of Science, Engineering, and Technology on Society and the Natural World*** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)
Developing and Using Models Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)	***Developing Possible Solutions*** A solution needs to be tested, and then modified based on the test results, in order to improve it.	***Influence of Science, Engineering, and Technology on Society and the Natural World*** The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

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Common Core State Standards Connections

ELA/Literacy

W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1), (3-5-ETS1-3)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2)

Mathematics

3-5. OA	Operations and Algebraic Thinking (3-ETS1-1), (3-ETS1-2)
7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1), (MS-ETS1-2), (MS-ETS1-3)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #4

The Beauty of Eyeshadow

STEM Experiment Overview

The ingredients of the minerals used for eyeshadow is the reason why it produces a color shimmer on our face and stays on all day. The minerals in eyeshadow have many different properties, such as streak, hardness, luster, fracture, and cleavage. Research can be conducted to determine the mineral by looking for the different properties. When making your own eyeshadow, you must imagine, plan, create, and evaluate your product. The right product packaging that is appealing to consumers will help sell large volumes of the eyeshadow. Using the metric system can help with determining how many units of eyeshadow can be shipped in one box, and even to determine the most cost effective way to hold the eyeshadow in its case while protecting the product from damage.

Background Information

Have you ever wondered how eyeshadow stays on your eyes all day? What is the main ingredient and where does it come from? The physical nature of the main ingredient is mica. The word “mica” means “crumb” in Latin. This describes the consistency of mica itself. A naturally occurring mineral forms in thin sheets that can be crumbled into a fine powder.

Essential Questions

1. What is the most important ingredient in eyeshadow?
2. What are the different properties to identify a mineral?

Performance Objectives

1. Students will gain knowledge about the different ingredients in eyeshadow.
2. Students will develop a hypothesis about the different properties in minerals.
3. Students will compare the units of the metric system.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the important ingredients in minerals, describes and documents the different properties that identify minerals in an experiment, compares and converts the units of the metric system, analyzes the results of the experiment, and provides evidence of properties and ingredients of minerals.	The student utilizes ingredients in the minerals, describes how the properties of the minerals can be identified, and provides some analysis of the results of the experiment and evidence of properties and ingredients of minerals.	The student describes how minerals are formed, and provides some analysis and documentation about the results of the experiment. Final product meets some expectations.	The student describes minerals, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***5-PS1-3.*** Make observations and measurements to identify materials based on their properties.
- ***MS-PS1-3.*** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Planning and Carrying Out Investigations Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)	***Structure and Properties of Matter*** Measurements of a variety of properties can be used to identify materials. (5-PS1-3)	***Scale, Proportion, and Quantity*** Standard units are used to measure and describe physical quantities, such as weight, time, temperature, and volume. (5-PS1-2), (5-PS1-3)
Constructing Explanations and Designing Solutions Undertake a design project, engaging in the design cycle to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)	***Chemical Reactions*** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5)	***Structure and Function*** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

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Common Core State Standards Connections

ELA/Literacy

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2), (5-PS1-3), (5-PS1-4) support analysis, reflection, and research. (MS-PS4-3)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

Mathematics

5.MD.A. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2)

MP.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #5

The Beauty of Shampoo

STEM Experiment Overview

Shampoo is used to clean and refresh your hair. Students will research their favorite shampoo to find the active ingredients and learn about the function of surfactants. Using the Engineering Design Process, students will imagine, plan, create and ultimately evaluate the steps they took to create a new product. The art section will reinforce the use of recyclable materials to make a useful holder for their bottles. Finally, students will make discoveries to learn about how much their product would cost to make, and what would be a fair price for their customers and make a profit.

Background Information

Have you ever wondered how shampoo works to make your hair silky and clean? The answer is surfactants. Surfactant is short for "surface-acting agents" and is one of many different compounds that are in personal care products. The surfactant in shampoo reduces the surface tension of water to help it spread and move around our hair to remove the oil and dirt. Surfactant molecules have two different ends. One end of the molecule attracts water (hydrophilic). The other end of the molecule repels water (hydrophobic). Therefore, the hydrophilic end of the molecule cleans and rinses away oil and dirt attached to the hydrophobic end.

Essential Questions

1. What is the difference between the surfactant and its ingredients?
2. How are the oils and water washed away?

Performance Objectives

1. Students will compare and contrast surfactants and the ingredients.
2. Students will demonstrate how oils and water are washed away.
3. Students will develop and evaluate shampoo products.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the difference between the surfactant and its ingredients, describes and documents how oils and water are washed away, constructs and evaluates shampoo products in an experiment, analyzes results of the experiment, and provides evidence of the oils and water washed away.	The student utilizes the ingredients in the shampoo, describes how oils and water are washed away, provides some analysis of the results of the evaluation of shampoo products, and provides some analysis of experiment and evidence of surfactant and the ingredients.	The student describes how shampoo is formed, and provides some analysis and documentation about their results of the experiment. Final product meets some expectations.	The student describes the surfactant, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***3-5-ETS1-1.*** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- ***MS-PS1-3.*** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Asking Questions and Defining Problems Define a simple design problem to solve through the development of an object, tool, process, or system and include several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)	***Developing Possible Solutions*** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)	***Influence of Science, Engineering, and Technology on Society and the Natural World*** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)
Constructing Explanations and Designing Solutions Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)	***Chemical Reactions*** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5)	***Structure and Function*** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

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Common Core State Standards Connections

ELA/Literacy

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1), (3-5-ETS1-3)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

Mathematics

MP.5 Use appropriate tools strategically. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)

MP.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #6

The Beauty of Conditioner

STEM Experiment Overview

In this activity, students will learn the science behind conditioner. Students will conduct research on the ingredients of conditioner, as well the properties of the ingredients. During the experiment, it is important that students do not add too much of the essential oil. Essential oils are pure distillations of natural sources, (i.e. flowers, herbs) and are prized for their potent fragrances. Therefore, essential oils are strong and expensive. The art section will reinforce the use of recyclable materials to make a useful holder for their bottles. Finally, students will identify the best way to create different sized products (travel vs. economy size) and still be cost-effective.

Background Information

After washing your hair with shampoo, the next step is to use conditioner. After shampooing, your hair is left feeling clean and smooth. But, how does it do this? Is there something magic in conditioner that leaves it untangled and shiny? The answer is the science! Your hair, at the microscopic level, looks like frayed rope. As days go by, your hair becomes more and more frayed. Conditioner works to bind frayed strands together to make one solid strand of hair, which leaves your hair feeling silky and smooth!

Essential Questions

1. Why is conditioner important after shampooing the hair?
2. What is the difference between ounces and grams?

Performance Objectives

1. Students will recognize the importance of conditioner.
2. Students will compare the difference between ounces and grams.
3. Students will implement new product sizes using the metric system.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the importance of conditioner, describes and documents the importance of conditioning after shampooing in an experiment, calculates and explains the conversion of metric units, and analyzes results of the experiment and provides evidence of the importance of conditioners.	The student utilizes ingredients in the conditioner, describes how the ingredients of conditioners are important after shampooing, and provides some analysis of the results of the experiment and evidence importance of conditioners.	The student describes how conditioners are formed, provides some analysis and documentation about the results of the experiment. Final product meets some expectations.	The student describes conditioner, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***3-5-ETS1-1.*** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- ***MS-PS1-3.*** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Asking Questions and Defining Problems Define a simple design problem to solve through the development of an object, tool, process, or system and include several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)	***Developing Possible Solutions*** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)	***Influence of Science, Engineering, and Technology on Society and the Natural World*** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)
Constructing Explanations and Designing Solutions Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)	***Chemical Reactions*** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5)	***Structure and Function*** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

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Common Core State Standards Connections

ELA/Literacy

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1), (3-5-ETS1-3)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

Mathematics

MP.5 Use appropriate tools strategically. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)

MP.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #7

The Beauty of Spritzer

STEM Experiment Overview

Spritzers are special sprays that are used to remove unwanted smells from clothes and living spaces. But are they environmentally safe? Think about when we sniff their aromas? Students will learn about aroma-compounds and how they work. Students will research different chemicals and identify which ones are harmful to the ozone layer. In the technology connection in this activity, students will design a box using Pixlr, a free digital drawing tool (http://pixlr.com/editor), and then create a "free-hand" designed warning label. Students will also test the strength of their finished box to ensure their product stays safe inside. In the math section, students learn about ratios and how it affects the formulation of their spritzer.

Background Information

Spritzers and room fresheners contain aroma-compounds (chemical compounds consisting of two or more atoms). Unfortunately, most aerosol air fresheners contain harmful chemicals and impact the earth's ozone layer. Air fresheners are designed to mask unwanted odor, but does not eliminate it. Therefore, air fresheners are sprayed continuously to cover odors. Think about how spritzers and room fresheners can be created without the use of harmful chemicals.

Essential Questions

1. What is an aroma-compound?
2. What is an example of a chemical formula?

Performance Objectives

1. Students will understand the purpose of aroma-compound.
2. Students will research ingredients that make up more earth and health-friendly spritzers.
3. Students will use ratios to determine the best formulation for their spritzer.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes an aroma-compound, describes and documents chemical formulas in an experiment, calculates and explains the chemical formula, and analyzes the results of the experiment and provides evidence of healthy spritzers.	The student utilizes ingredients of healthy spritzers, and describes the purpose of an aroma-compound, and provides some analysis of the results of the experiment and evidence of a healthy spritzer.	The student describes how spritzers are formed, and provides some analysis and documentation about the results of the experiment. Final product meets some expectations.	The student describes spritzers, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***5-PS1-2.*** Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- ***MS-PS1-5.*** Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and, thus, mass is conserved.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Planning and Carrying Out Investigations Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)	***Chemical Reactions*** When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)	***Cause and Effect*** Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4)
Constructing Explanations and Designing Solutions Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)	***Chemical Reactions*** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5)	***Structure and Function*** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

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Common Core State Standards Connections

ELA/Literacy

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2), (5-PS1-3), (5-PS1-4)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)

Mathematics

5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1), (MS-PS1-2), (MS-PS1-5)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #8

The Beauty of Product Labeling

STEM Experiment Overview

The purpose of product labels is to list information about a product. I.e. ingredients. Students will research different types of labels (consumer, product, etc.) and their functions, to help identify which product label is most applicable.

Students will revisit the Engineering Design Process to create an eye-catching product label, with a customized logo. They will also learn about the importance of consumer protection labels and design their own. In this activity, students will be gathering data using a spreadsheet program, and learn the basics of the distributive property along with basics of supply and demand.

Background Information

Do you read the label on the back of your favorite snack before eating it? Have you ever wondered why our snacks have labels? These labels list the ingredients and nutritional information of the food that we are eating. It is important to know what ingredients are in our foods in case of allergies, a special diet, etc. Product labels provide information about the manufacturer, ingredients, quantity, price, usage, warnings, date of expiration, and how to handle the item. Products that we buy to put in (food) or on (cosmetics) our bodies are required by law to have labels. There are many types of labels, such as branding, grade, descriptive, and informative labels.

Essential Questions

1. How can product labeling promote a product?
2. What can enhance the product label to increase the sales of products?

Performance Objectives

1. Students will gain an understanding of the different types of consumer product labels.
2. Students will use the Engineering Design Process to create a label with three important components, (Logo, product information and ingredients).
3. Students will design a product label.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes product labeling as a promotion for the product, describes and documents the product label design in an experiment, analyzes the results of the experiment, and provides evidence of promotion and sales using product label.	The student utilizes product labeling as a promotion for the product, describes the product label design, provides some analysis of the results of the experiment and evidence of promotion and sales using product label.	The student describes product labeling, and provides some analysis and documentation about the results of the experiment. Final product meets some expectations.	The student describes product labeling, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***3-5-ETS1-1.*** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- ***MS-PS1-3.*** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Asking Questions and Defining Problems Define a simple design problem to solve through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)	***Developing Possible Solutions*** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)	***Influence of Science, Engineering, and Technology on Society and the Natural World*** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)
Constructing Explanations and Designing Solutions Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)	***Chemical Reactions*** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5)	***Structure and Function*** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165

Common Core State Standards Connections

ELA/Literacy

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1), (3-5-ETS1-3)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

Mathematics

MP.5 Use appropriate tools strategically. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)

MP.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

STEAM Experiment #9

The Beauty of Reverse Engineering

STEM Experiment Overview

Reverse engineering is an easy, cheaper, and faster way to duplicate an original product. In the fashion industry, purses, shoes, and clothes are "engineered" to look and feel the same as their luxurious counterparts, however, less expensive. As a scientist or engineer, it is important that students learn practical skills to find different ways to create products that are very similar to others, are of good quality, but cost less to make. Students will conduct research on replicating or creating a "knock-off" product and design their own. They will also discuss variables in equations to explain variations in ingredients in their "reverse engineered" product.

Background Information

When you hear the term "reverse engineering," it is typically referring to reversing code. The dictionary's definition of reverse engineering is "to disassemble and examine or analyze in detail (a product or device) to discover the concepts involved in manufacturing usually in order to produce something similar." Chemists analyze ingredients in a product, copy the formulation, and "knock it off." Lotions, eyeshadow, and perfumes are popular "knock off" items that chemists reversed engineered the formulations.

Essential Questions

1. How is reverse engineering similar to reverse formulation?
2. What components are needed to create a formula?

Performance Objectives

1. Students will research ingredients and compare the formula of a popular product with their version.
2. Students will create a presentation for their new product line.
3. Students will understand variables and the power of devising product formulations using basic math concepts.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the comparison of reverse engineering and reverse formulation, describes and documents the different label products, designs a safety label for product, and analyzes results of the experiment and provides evidence of different types of label products.	The student utilizes reverse formulation, describes the product safety label, and provides some analysis of the results of the experiment and evidence of different types of product label products.	The student describes reverse formulation, and provides some analysis and documentation about the results of the experiment. Final product meets some expectations.	The student describes reverse formulation, yet provides limited analysis and documentation of results. Final project does not meet expectations.

Correlation to Next Generation Science Standards

Students who demonstrate understanding can:

- ***3-5-ETS1-1.*** Define a simple design problem, reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- ***MS-PS1-3.*** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Next Generation Science Standards

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSSCUTTING CONCEPTS
Asking Questions and Defining Problems Define a simple design problem to solve through the development of an object, tool, process, or system and include several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)	***Developing Possible Solutions*** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)	***Influence of Science, Engineering, and Technology on Society and the Natural World*** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)
Constructing Explanations and Designing Solutions Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)	***Chemical Reactions*** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5)	***Structure and Function*** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165

Common Core State Standards Connections

ELA/Literacy

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1), (3-5-ETS1-3)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

Mathematics

MP.5 Use appropriate tools strategically. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)

MP.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

GPS Business Activity #1

The Beauty of Entrepreneurship

Background Information

Successful business owners gather as much information as they can about their products and their competitors' products. They compare information and determine what will make their product more appealing to their competitors. In this activity, students will explore their entrepreneurial spirit and learn what it takes to build a brand. They will explore color, font types, and digital logo design, and ask thought provoking questions to guide their creativity.

Essential Questions

1. What questions should be asked for product research?
2. What will make your product stand out from the rest?

Performance Objectives

1. Students will construct questions about their products and compare it to their competitors.
2. Students will do a competitive analysis to determine the strengths and weaknesses of the competitors product.
3. Students will identify steps to building a brand.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes product, describes and documents competitor's product information, analyze the features of competitor's product, and demonstrate and provide evidence about the importance of the feature of a brand.	The student describes product and competitor's product information, describes the features of competitor's product, and provides some analysis about the importance of the feature of a brand.	The student describes how the product is used, and provides some analysis and documentation about the competitor's product, and demonstrates the importance of the feature of a brand. Final product meets some expectations.	The student describes product, describes competitor's product, and provides limited analysis and documentation about the importance of the feature of a brand.

Common Core State Standards Connections

! *ELA/Literacy*

CCSS.ELA-LITERACY.W.3.2.A Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1), (3-5-ETS1-3)

CCSS.ELA-LITERACY.RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

! *Mathematics*

CCSS.MATH.CONTENT.3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

CCSS.MATH.CONTENT.7.SP.C.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

GPS Business Activity #2

The Beauty of Planning & Budgeting

Background Information

Before you start selling your products, it's important that you develop a plan and budget. A business plan describes the business, lists the goals and details, and how they will be attained.

Students will discuss the importance of a business plan, and use the business plan template to document how they plan to design, launch, and maintain their business.

Essential Questions

1. Why is a business plan important?
2. What is needed to start and grow a business?

Performance Objectives

1. Students will identify key components of a business plan.
2. Students will develop and manage a product budget.
3. Students will compare and contrast the growth of their company to their competitors.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes business plan, describes and documents product budget, compares and contrasts the features of their competitor's product, and demonstrates and provides evidence about the business plan.	The student describes their business plan and product budget, describes the features of the competitor's product, and provides some analysis about the business plan.	The student describes their business plan, provides some analysis, and documents product budget. The business plan meets some expectations.	The student describes business plan and the competitor's product, yet provides limited analysis and documentation about the product plan.

Common Core State Standards Connections

- ***ELA/Literacy***

CCSS.ELA-LITERACY.W.3.7 Conduct short research projects that build knowledge about a topic.

CCSS.ELA-LITERACY.W.6.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

- ***Mathematics***

CCSS.MATH.CONTENT.3.MD.A.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

CCSS.MATH.CONTENT.6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

GPS Business Activity #3

The Beauty of The Budget

Background Information

In order to make important decisions and become a successful business owner, you will need to plan for profitability.

Budgets help entrepreneurs estimate the amount of money they have for business-related spending. The budget should reflect the business goals and determine how much money is available for supplies, marketing, and business profits. Students will evaluate a sample budget to create bubble bath. They will use questioning skills and collaboration to project short and long-term goals for their business.

Essential Questions

1. What is the purpose of creating a budget?
2. How do businesses predict growth and the decline of sales?

Performance Objectives

1. Students will calculate a sample budget.
2. Students will analyze the cost of various budgets that are presented in the student's manual.
3. Students will predict the profit of sales based on their budgets.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the business budget, describes and documents cost of various budgets, predicts the profit of sales in a timely manner, and demonstrates and provides evidence about the business budget.	The student describes the business budget, describes the cost of various budgets, and provides some analysis about the prediction of the profit of sales in a timely manner.	The student describes the business budget, provides some analysis and documentation of the cost of various budgets and prediction of profit sales. Business budget meets some expectations.	The student describes the business budget and the cost of various budgets of their competitor's product, yet provides limited analysis and documentation about the product budget.

Common Core State Standards Connections

ELA/Literacy

CCSS.ELA-LITERACY.W.3.1.A Introduce the topic or text they are writing about, state an opinion, and create an organizational structure that lists reasons.

CCSS.ELA-LITERACY.W.6.2.A Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

Mathematics

CCSS.MATH.CONTENT.3.OA.D.9 Identify arithmetic patterns.

CCSS.MATH.CONTENT.6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

Time Requirement

- Reading and research: 30 - 55 minutes
- Experiment: 45 - 60 minutes
- Analysis: 30 minutes
- Art: 30 - 40 minutes
- Technology: 30 minutes
- Mathematics: 20 - 40 minutes

Times vary based on program implementation, the number of students, skill level, etc.

GPS Business Activity #4

The Beauty of Marketing & Advertising

Background Information

Business owners like to know as much information as they can about marketing and advertising before they begin to sell their product. Before advertisements are published, a creative team works together to create the right words and pictures to communicate the best features of their product or service. Students will research existing advertisements and identify characteristics of the ads that will promote their product. They will form a "creative team" or group to brainstorm and develop a storyboard for their advertisements. Use the appendix, referencing the storyboard, to guide this lesson.

Essential Questions

1. What are effective advertisements?
2. Why is it important to have a creative team?

Performance Objectives

1. Students will research advertisements and marketing strategies.
2. Students will identify and use the key features of the advertisements.
3. Students will organize and collaborate with a creative team.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully utilizes and describes the research of advertisement, describes and documents the features of advertisement, and demonstrates and provides evidence of a creative team.	The student describes the research of advertisement, describes the features of advertisement, and provides some analysis about a creative team.	The student describes the research of advertisement, and provides some analysis and documentation of the features of advertisement. Organization of creative team meets some expectations.	The student describes the research of advertisement and features of advertisement, yet provides limited analysis and documentation about the creative team.

Common Core State Standards Connections

! *ELA/Literacy*

CCSS.ELA-LITERACY.W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

CCSS.ELA-LITERACY.W.6.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

! *Mathematics*

CCSS.MATH.CONTENT.3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

CCSS.MATH.CONTENT.6.SP.B.5.A Reporting the number of observations.

Time Requirement

- Reading and research: 55 minutes
- Experiment: 30 minutes
- Analysis: 30 minutes

Times vary based on program implementation, the number of students, skill level, etc.

GPS Business Activity #5

The Beauty of Making a Storyboard

Background Information

The storyboard is a visual map of your advertisement. It is a rough draft and editable plan for your idea. Effective advertising is what business owners do to tell people about their product or service. As a creative team, students will work together to create an ad for Video, Internet, Print, Radio, or formal class presentation. An example of each ad type are included in the student manual. Students will develop a plan via a storyboard, select a medium for their ad, and carry out their plans to promote their beauty products.

Essential Questions

1. What are the components of a storyboard?
2. How are storyboards used to create advertisements?

Performance Objectives

1. Students will complete a storyboard.
2. Students will create an advertisement.
3. Students will present their advertisement to an audience.

Performance Criteria

4 EXCEEDS EXPECTATIONS	3 MEETS EXPECTATIONS	2 MEETS SOME EXPECTATIONS	1 NEEDS ADDITIONAL SUPPORT
The student successfully completes and describes a storyboard, creates an advertisement, and successfully presents advertisement to an audience.	The student completes the storyboard, creates an advertisement, and presents some analysis features of advertisement to an audience.	The student describes the storyboard, and presents some analysis and documentation about the advertisement. The advertisement meets some expectations.	The student describes the storyboard and has limited or inconsistent evidence of the created advertisement. Presentation of the advertisement to an audience did not meet any expectations.

Common Core State Standards Connections

ELA/Literacy

CCSS.ELA-LITERACY.W.3.1.A Introduce the topic or text they are writing about, state an opinion, and create an organizational structure that lists reasons.

CCSS.ELA-LITERACY.W.6.2.A Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

Mathematics

CCSS.MATH.CONTENT.3.OA.D.9 Identify arithmetic patterns.

CCSS.MATH.CONTENT.6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

Time Requirement

- Reading and research: 55 minutes
- Experiment: 30 minutes
- Analysis: 30 minutes

Times vary based on program implementation, the number of students, skill level, etc.

APPENDIX

STORYBOARD EXAMPLE

Your Name Valeri

Advertisement or Product Title Smart Bubbles!

Advertisement Description

We are a team of 3 girls. The name of our product is 'Smart Bubbles."
Smart Bubbles is made with shea moisturizer and lavender so when you take a bath and add Smart Bubbles, it softens your skin and relaxes your body.
Smart Bubbles uses a secret ingredient that works like magic!
When you mix it in water, the bubbles float around the tub! We will use pictures and music to communicate our message to customers.
As the pictures are displayed, we will describe the unique qualities and benefits of Smart Bubbles!

Commercial Idea

Girls use a special bubble bath called "Smart Bubbles" before going to bed at night. The bubble bath has special ingredients that soften the skin and leave you feeling and looking good. Smart Bubbles has magic bubbles that float around the tub. Oh what fun!

Production Notes

THEME Smart Bubbles are fun, and make you feel and look good!

TONE Happy and Fun

CASTING Graphics and voice, no actors.

MUSIC Hip Hop Beat, rhythm enhanced.

Scene 1

Script

We will introduce Smart Bubble as a "Smart" bubble bath that helps relax you before bed, and by morning your brain is energized! You look sharp! Smart! And ready to go!

Scene 2

Script

Show a picture of a girl in the tub who is enjoying her bath. While showing the picture, say "SMART BUBBLES are fun bubbles! And feel terrific!"

Scene 3

Script

Show another picture and say "Smart Bubbles are sparkling bubbles! Catch the bubbles as they float around the tub!"

Scene 4

Script

Show a picture of a girl that is looking good and ready for school!
Say "Get Smart Bubbles... Get Pretty Smart!"

STORYBOARD TEMPLATE

Your Name _____

Advertisement or Product Title _____

Advertisement Description

_____

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Commercial Idea

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Production Notes

THEME _____

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TONE _____

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CASTING _____

_____

MUSIC _____

_____

Scene 1

Script

Scene 2

Script

Scene 3

Script

Scene 4

Script

My Business Plan

Draw or glue your logo here

Name of Your Business

Date

CONTENTS

About Us

- In this section, write a paragraph about why you want to start a business and describe what you are selling.

- Write a paragraph explaining the current position of your idea such as just starting (Startup Phase) or Growth Phase (you are ready to expand your business), etc. Also state the type of business that you are in, e.g., skin care, hair, etc.

- Briefly state what makes your product better than other similar products and why should someone buy it.

Objectives

List at least three objectives for your business. The objectives are the results you hope to achieve and maintain as you run and grow your business. Make sure your objectives are very specific and not too vague. Include a date for achieving your goal. This will keep you focused and keep your objectives short and sweet. This will also prevent you from getting too overwhelmed with all you may have going on in school.

An example of a good business objective:

I will sell at least two products a week for the first six months of my business.

1. _____

2. _____

3. _____

Marketing

Briefly explain how you plan to market your product. Marketing is what you will do to try to convince people to want to buy your product. How do you plan to reach people? By posting your commercial on social media? Passing out flyers? Setting up a table in the front yard?

Owner(s)

Write a paragraph about you such as your name, the school you attend, hobbies and skills, things you do very well, etc. Focus on what you think will make you a good business person as you get older. Do you plan to go to college? Seek additional training? Are you responsible? A hard worker? These are just a few idea questions to get you thinking about what would make you a good business owner.

Summary

End with a brief summary of the main points of your plan: Where you are now and where you want the plan to take your business. At your age, things will always be changing so include a date that you will review your plan and make changes. The more frequently it's reviewed, the better!