

Enrichment Unit 1: Forensic Science

Grade Level: 3

Length of Unit: 12-14 sessions

Unit Rationale:

Third grade students enter the world of forensic science at Bedwell CSI! Using real-world investigation techniques, third grade junior detectives collect evidence, perform scientific tests, and eventually solve crimes based on actual cases. Students also learn that in order to give their opinion on the case they must cite evidence, a writing technique that carries over into their classroom Writing Workshop. Additionally, students learn scientific vocabulary associated with a mystery genre classroom reading workshop unit.

Throughout the unit students will be exposed to various careers in the field of forensic science and investigation. Students use high level analytic and critical thinking skills as they work to decipher a cryptogram, draw conclusions from police statements, analyze finger and shoe prints, and conduct chromatography experiments. Upon completion of organizing and scrutinizing the evidence, students complete an opinion writing piece prior to finding out the conclusion of the crime.

Stage 1 - Desired Results

Understandings:

Students will understand that...

- Forensic science investigators must consider all evidence prior to forming opinions or drawing conclusions.
- There are many pieces of evidence that are critically analyzed in an investigation, and investigators must use reading, writing and science skills in order to appropriately understand that evidence.

Essential Questions:

- Why must investigators have evidence before they form an opinion and solve a crime?
- What types of evidence and techniques are used in forensic science?
- How can we analyze evidence to draw conclusions and form an opinion writing piece without holding bias?

Content:

Students will know...

- Forensic science is the application of science to criminal and civil laws.
- A cryptogram is a text written in code.
- The word decipher means to decode, or figure out, the meaning of something.
- How to use knowledge of letter frequency (certain vowels and consonants used more frequently), repeated letters (bigger, hissing), patterns(ing, ed endings), capitalization and punctuation (start and end of a sentence, the word "I") rules in a cryptogram.
- A suspect is defined as a person who may have committed a crime.
- A motive is defined as the reason why someone may have committed a crime.
- An alibi is defined as the explanation given by a person accused of a crime that he or she was somewhere else

Skills:

Students will be able to...

- Analyze and decipher cryptogram (with guidance from teacher).
- Recognize and identify letter and sound patterns, capitalization and punctuation rules and apply patterns and rules in order to decipher cryptogram.
- Record notes based on suspects' police statements and think critically about each person's motives.
- Identify a loop, whorl and arch fingerprint both in suspect fingerprint photos, and on their own fingerprints.
- Compare and contrast fingerprint patterns.
- Analyze handwriting samples and look for patterns in size, style, and pressure.
- Compare and contrast shoe print patterns.
- Examine sketches and descriptions to make connections from forensic artists' evidence.
- Use the chromatography to separate color pigments in

when the crime was committed.

- Evidence is defined as proof that something exists or is true.
- Suspects often give a police statement when they are questioned regarding a crime.
- Forensic graphology is the study of handwriting especially that found in ransom notes, letters or blackmail demands.
- The root “graph” means “to write”
- There are three main types of fingerprints- loop, whorl and arch. People may have the same type of prints, no two people have the exact same prints.
- In a loop pattern, the ridges will flow in one side, recurve, (loop around) and exit the pattern on the same side as it entered.
- A whorl pattern consists of a series of almost concentric circles.
- In an arch pattern, ridges flow in one side and flow out the opposite side.
- How to recognize patterns in print, shape, and size in order to differentiate and draw conclusions in shoe print comparisons.
- Chromatography is a process of separating out different parts of chemical mixtures onto an absorbent material that can then be individually analyzed because different parts are caught on the material at different rates.
- A forensic artist is defined as an artistic technique used for identification, apprehension or conviction purposes
- A detective is a police officer whose job is to find information about crimes that have occurred and to catch criminals.
- A graphologist and handwriting analyst works to examine handwriting samples and make determinations and comparisons between writing and often personality traits.
- Opinions in an investigation must have support and proof in order to be considered valid.
- Often people’s bias, or favoring for or against someone or something for a certain reason, makes them form opinions. It is important to recognize bias and not stereotype when analyzing suspects in the crime.

different makers.

- Analyze chromatography results and draw conclusions on which marker was used in the crime.
- Understand the jobs of a fingerprint analyst, crime scene investigator, forensic scientist, and forensic artist.
- Draw final conclusions from *all* evidence and discuss in groups.
- Debate ideas and opinions surrounding opinions on suspects and evidence.
- Identify possible bias for or against a suspect based on stereotypes.
- Write opinion pieces by supporting a point of view with reasons.

NJ Student Learning Standards

RI.3.4: Determine the meaning of general academic and domain-specific words and phrases in a text

relevant to a grade 3 topic or subject area.

RI.3.5:Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.

RI.3.10 :By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2-3 text complexity band independently and proficiently.

RI.3.1 :Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

W.3.4 :With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

W.3.7 :Conduct short research projects that build knowledge about a topic.

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.

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

9.2.5.CAP.3:

Identify qualifications needed to pursue traditional and non-traditional careers and occupations.

CLKS Practices:

- 4.Demonstrate creativity and innovation
- 5.Utilize critical thinking to make sense of problems and persevere in solving them
- 8.Use technology to enhance productivity increase collaboration and communicate effectively

Explanation of how CLKs connect to the unit: Students work in groups to complete forensic science activities using clues from evidence and problem solving. During fingerprinting, students will discuss how technology has changed the way the fingerprinting process is completed.

Explanation of how 9.2 standards connect to the unit: Throughout lessons students will explore different careers, qualifications and skills associated with forensic science (detective, forensic scientist, lab technician, etc).

Interdisciplinary Standards

- **6.1.2.CivicsPD.1:** Engage in discussions effectively by asking questions, considering facts, listening to the ideas of others, and sharing opinions.
- **6.1.2.CivicsPD.2:** Establish a process for how individuals can effectively work together to make decisions.

Explanation of how interdisciplinary standards connect to the unit: Students will engage in group discussions about their forensic science case in which they must consider facts, listen to each other's ideas, share opinions and collaborate to make a decision on evidence.

Technology Integration (9.4 Standards) -

- **9.4.2.CI.1:** Demonstrate openness to new ideas and perspectives
- **9.4.2.CI.2:** Demonstrate originality and inventiveness in work

Explanation of how 9.4 standards connect to the unit:
Students look at forensic science evidence from multiple perspectives and must demonstrate originality in their ideas as detectives.

Stage 2- Assessment Evidence:

Assessment:

| | |
|--------------------|--|
| Formative | Exit tickets, written/pictorial responses to evidence |
| Summative | End of unit written response based on entire unit evidence |
| Alternative | Oral response, poster presentation, slideshow |
| Benchmark | Google form, jamboard |

Stage 3 - Learning Plan

Learning Activities:

Students will engage in a variety of learning activities designed to expose students to the world of forensic science and allowing them to use high level critical thinking skills. Students will work individually and in groups on the following activities throughout the unit:

- Cryptogram
- Police statement discussion and debates
- Fingerprinting analysis
- Handwriting analysis
- Shoeprint analysis
- Forensic art

Differentiation:

ELL:

- Extend time requirements
- Preferential seating
- Check often for understanding
- Oral/visual directions/prompts when needed
- Provide hands-on materials and/ manipulatives for students to practice using new content knowledge

G&T:

- Allow students to take an active role in

- Chromatography experiment
- Opinion writing piece

exploring additional information on simple machines (history, application in real world, etc)

- Propose simple machines extension activities (ex: create a machine from two simple machines)

Special Ed:

- Utilize a multi-sensory approach during instruction
- Reinforce visual directions with verbal cues
- Extend time requirements
- Allow verbal rather than written responses
- Preferential seating as needed

504:

- Review, restate and repeat
- Frequently ask questions to engage student
- Provide graphic organizers as needed

Students at Risk:

- Deliver instruction utilizing varied learning styles including audio, visual and tactile/kinesthetic
- Provide individual instruction as needed
- Meet with students frequently to ensure understanding
- Allow verbal rather than written responses

Core Instructional Resources

Teacher Pedagogical Resources:

Crime Scene Investigations: Real-Life Science Activities for the Elementary Grades by Pam Walker and Elaine Wood, Discovery Education United Streaming, Color Writing Educational Video (National Department of Defense website)

Student Materials:

Fingerprint analysis paper, cryptogram, forensic science student response sheets

DOE Mandates: A statement of how this is shown within the unit. Each component may not be in every unit, as long as it is hit upon at some point within the course.

Diversity, Equity, and Inclusion Mandate:

Gender -

Sexual Orientation -

Race -

Ethnicity -

Religious Tolerance -

Unconscious Bias Impact on Individuals - Discussion of unconscious bias as we examine suspects and motives

Unconscious Bias Impact on Society -

Economic Disparity Impact on Individuals -

Economic Disparity Impact on Society -

Notes:

Career Explorations: Throughout lessons students will explore different careers, qualifications and skills associated with forensic science (detective, forensic scientist, lab technician, etc).

Enrichment Unit 2: Research Investigation

Grade Level: 3

Length of Unit: 10-12 sessions

Unit Rationale:

In this unit students learn to conduct a research investigation and project using a modified version of the Independent Investigation Method (Virginia Morse and Cindy Nottage). Students learn how to take notefacts, cite resources, organize their information according to categories and turn their research into knowledge as they team up to create a project which displays what they have learned. Students are given an overarching general category from which they choose their topic (ex: endangered species), and then they review non-fiction text features while learning the process of conducting research using a choice of differentiated graphic organizers, including both digital and paper choices. Students choose individual topics of high interest and work independently so that they develop self-directed learning skills in planning and time management. This research unit correlates to third grade Reading and Writing Workshop curriculum, and allows students the chance to create a product that is reflective of their individual learning style and displays their topic expertise.

Stage 1 - Desired Results

Understandings:

Students will understand that...

- Learning to research is a skill that is necessary in order to become lifelong learners.
- Researchers take short, factual notes on their topic in order to best understand and present their findings.
- A culminating research product should be informative and created in a way that best meets students' individual strengths and learning style of expression.

Essential Questions:

- What is a research investigation?
- How and why must research be organized?
- How do we write notefacts that are short and true, but contain enough information?
- How can I create a product that displays my knowledge in a way that expresses my learning strengths?

Content:

Students will know...

- Research is the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions.
- A resource is a tool, data set, learning opportunity or source of information and can be human or nonhuman.
- Examples of print resources include non-fiction books, web, charts, etc.
- Examples of non-print resources include artifacts, models, observations, photographs, videos, etc.
- Examples of human resources include content area experts, teachers, etc.
- Research must be based on facts.
- A notefact is a fact that is "short and true" and is put

Skills:

Students will be able to...

- Learn to choose a meaningful topic of interest.
- Identify new vocabulary that is integral to understanding the topic.
- Use a variety of resources and determine which resources will best further their research.
- Evaluate and categorize information according to categories and relevance to topic.
- Write "short and true" notefacts to summarize information.
- Discern conflicting information from various sources.
- Organize notes into categories by recognizing relationships amongst notes and categories.
- Produce a product that reflects understanding and demonstrates knowledge of research topic.
- Evaluate work and draw conclusions on research.

| | |
|--|--|
| <p>into a student's own words.</p> <ul style="list-style-type: none"> -Plagiarism is the practice of taking someone else's work or ideas and passing them off as one's own. -To categorize facts is to place them in particular groups according to their similar attributes. - A product should demonstrate understanding and knowledge about student's topic in a way that is expressive of their learning style. | <p>-Develop self-directed learning skills in planning and time management.</p> |
|--|--|

NJ Student Learning Standards

RI.3.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.

RI.3.5:Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.

RI.3.10 :By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2-3 text complexity band independently and proficiently.

RI.3.1 :Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

W.3.4 :With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

W.3.7 :Conduct short research projects that build knowledge about a topic.

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.

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

CLKS Practices:

4. Demonstrate creativity and innovation
8. Use technology to enhance productivity increase collaboration and communicate effectively

Explanation of how CLKs connect to the unit: Students learn how to use technology resources in their research and their creative products. Students use creativity and innovation as they create products in their expressive learning style.

Explanation of how 9.2 standards connect to the unit: Students learn about a variety of research based careers and careers specific to their research topic. Specific skills and requirements for careers will be discussed.(Ex: a student studying manatees may explore marine biologist career in their research).

Interdisciplinary Standards

- **6.1.2.CivicsPD.1:** Engage in discussions effectively by asking questions, considering facts, listening to the ideas of others, and sharing opinions.
- **6.1.2.CivicsPD.2:** Establish a process for how individuals can effectively work together to make decisions.

Explanation of how interdisciplinary standards connect to the unit:

In creating research products students work in groups and collaborate while considering and discussing each other's factual information.

Technology Integration (9.4 Standards) -

- **9.4.2.DC.3:** Explain how to be safe online and follow safe practices when using the internet
- **9.4.2.IML.1:** Identify a simple search term to find information in a search engine or digital resource.

Explanation of how 9.4 standards connect to the unit: Students will use a variety of digital tools in order to complete their research.

Stage 2- Assessment Evidence:

Assessment:

| | |
|--------------------|---|
| Formative | Exit tickets, research self-reflections, students' research notes |
| Summative | Research notes; student products |
| Alternative | Digital research notes, video or audio recording; research product choice board |
| Benchmark | End of unit research presentation |

Stage 3 - Learning Plan

Learning Activities:

During the research portion of this unit students are taught through a mini-lesson and then given time for independent research or product development. Students will be guided through the following mini-lessons and learning activities:

- Introduction into overarching topic through books, videos, hands-on activity to get students excited about research
- Define research, review of elements of nonfiction and using research links online, computer safety, using Google Classroom
- Topic selection and reasons why students wants to research topic
- Organizing research into categories and subcategories that are meaningful; why we have to organize research
- Using resources appropriately and effectively
- Learning to take "short and true" notefacts about a topic
- Extending research, checking conflicting information
- Choosing a product that is expressive of our strengths and learning styles, and that displays knowledge and topic expertise (play, board game, report, video, model, poster, diagram, etc.)
- Presentations/sharing

Differentiation:

Content and instruction will be differentiated through questioning, clarifying, repeating, and rewording. Content will be further differentiated through the use of graphic organizers for research notes (different for below, on and above grade level, digital versus print, developing additional categories for high level, teacher developed categories for those needing support, etc). Lastly, final products are differentiated according to student learning style (digital, artistic, performance, written products for students to choose from), and students may work individually or in groups to complete product.

ELL:

- Extend time requirements
- Preferential seating
- Check often for understanding
- Oral/visual directions/prompts when needed
- Provide hands-on materials and/ manipulatives for students to practice using new content knowledge

G&T:

- Allow students to take an active role in exploring additional information on simple machines (history, application in real world, etc)
- Propose simple machines extension activities (ex: create a machine from two simple machines)

Special Ed:

- Utilize a multi-sensory approach during instruction
- Reinforce visual directions with verbal cues
- Extend time requirements
- Allow verbal rather than written responses
- Preferential seating as needed

504:

- Review, restate and repeat
- Frequently ask questions to engage student
- Provide graphic organizers as needed

Students at Risk:

- Deliver instruction utilizing varied learning styles including audio, visual and tactile/kinesthetic
- Provide individual instruction as needed
- Meet with students frequently to ensure understanding
- Allow verbal rather than written responses

Core Instructional Resources**Teacher Pedagogical Resources:**

Independent Investigation Method by Virginia Morse and Cindy Nottage, www.worldbookkids.com

Student Materials:

www.worldbookkids.com ; BES library books for research; student research packets; product materials (varies by student choice)

Notes:

Career Explorations: Students learn about a variety of research based careers and careers specific to their research topic. Specific skills and requirements for careers will be discussed.(Ex: a student studying manatees may explore marine biologist career in their research).

Enrichment Unit 3: Bubble Science

(Adapted from "Pop Science: Investigating Bubbles" written by Emily Pike)

Grade Level: 3

Length of Unit: Approximately 4 sessions

Unit Rationale:

Bubbles can serve as a means for the discovery, investigation and demonstration of many science and math related concepts. Among the properties being explored in the unit are surface tension, structure, stability, aerodynamics, and interference. In addition, bubbles illustrate key concepts that cross content areas, and students will conduct hands-on experiments that relate to physics, biology, chemistry, geometry, and technology. Students will develop an understanding of the chemical and physical properties of bubbles as they learn to develop hypotheses, plan experiments, and interpret data. In line with the NGSS (Next Generation Science Standards), this unit allows students to be actively engaged in constructing their own understandings of the behavior of soap film and bubbles, and it allows learners to develop a variety of competencies for continued exploration of scientific principles.

Stage 1 - Desired Results

Understandings:

Students will understand that...

- In order for an experiment to be considered a fair test, you must change only one factor at a time while keeping all other conditions the same.
- A bubble's size, longevity and ability to stay aloft is affected by numerous scientific variables.
- Surface tension is the effect caused by the attraction a substance has to itself, and this force is affected when molecules in a substance are changed.

Essential Questions:

- How can we use the steps of the scientific method to conduct experiments and draw conclusions?
- How can we carry out a fair test in an experiment?
- What is surface tension and how does it relate to bubbles?
- What causes a bubble's spherical shape?
- How can bubbles stay aloft (Bernoulli principle)?
- What causes the diameter and longevity of a bubble to be affected?

Content:

Students will know...

- A hypothesis is an educated guess based on prior knowledge and observation.
- Eiffel Plasterer was a self-taught expert on soap films and bubbles, and used bubbles to demonstrate scientific principles.
- Surface tension is the effect caused by the attraction a substance has to itself.
- A molecule is a group of atoms bonded together.
- There is an inward pull on the surface of water molecules that holds them together, causing water to act as if it has a skin.
- Water has high surface tension (resistance to being pulled apart).
- When soap is introduced to water, the soap molecules get between water molecules, reducing the attractive force that water molecules have for one another (making it water less "sticky").
- Glycerin is a colorless, viscous liquid formed as a byproduct in the soap making process.

Skills:

Students will be able to...

- Make predictions based on prior knowledge and observations.
- Analyze, interpret and communicate their data and results.
- Conduct various experiments to test ideas and further their understanding of bubble science.
- Explain understandings of concepts through discussion and written journal entries.
- Measure and record data.
- Develop strategies for keeping bubbles aloft.
- Apply learned knowledge and strategies to future experiments.
- Cooperate in groups to conduct a variety of scientific experiments.
- Discuss and debate scientific ideas related to experiments using scientific evidence and support.
- Summarize findings from experiments and draw

- Soap molecules do not create the same level of surface tension that water molecules do, causing enough strength to form a stretchable film (bubbles).
- Bubbles become spherical no matter what shape bubble was used to blow them.
- A sphere has the smallest surface area of all the shapes that can enclose a given volume of space.
- Bubbles have a preference for stability; they want to assume the shape that requires the least amount of energy (least surface area).
- The factor that selects the spherical form for bubbles and other liquids is surface tension.
- Diameter is a straight line passing from side to side through the center of a body or figure, especially a circle or sphere.
- In order for an experiment to be considered a fair test, you must change only one factor at a time while keeping all other conditions the same.
- Scientists call the changing factors in an experiment variables.
- A hemisphere is a half sphere (used for measuring half bubbles)
- The stability and lifespan of soap films and bubbles are affected by a number of factors including evaporation, humidity, carbon dioxide in the atmosphere, air currents or vibrations.
- The amount of glycerin in a soap solution affects the longevity of the bubble.
- The gas in a bubble will effuse through the wall of the bubble over time, causing the diameter of the bubble to decrease.
- The relationship between velocity and pressure exerted by a moving liquid is described by Bernoulli's principle: the faster air flows, the less pressure it exerts.
- Bernoulli's principle can be used to explain how an airplane can stay in the sky and how bubbles are able to remain aloft when you wave over them..

conclusions.
 -Extend ideas from conclusions to make scientific generalizations and further understandings.

NJ Student Learning Standards

English Language ARts

W.3.10

Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Science

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

3-PS2-2. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

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.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

9.1.2.CAP.1: Make a list of different types of jobs and describe the skills associated with each job.

CLKS Practices:

4. Demonstrate creativity and innovation
5. Utilize critical thinking to make sense of problems and persevere in solving them

Explanation of how CLKs connect to the unit: Students use creativity, innovation and problem solving in conducting a variety of bubble and molecular experiments throughout the unit.

Explanation of how 9.2 standards connect to the unit: Students will explore jobs related to engineering and chemistry (chemical engineer, water chemist, chemistry teacher, forensic scientist, etc).

Interdisciplinary Standards

Math

3.G.A.1

Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

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.

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. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

Explanation of how interdisciplinary standards connect to the unit: As students learn about the science of bubbles they will discuss geometric shapes, conduct experiments with time, and draw graphs to represent data.

Technology Integration (9.4 Standards) -

9.4.2.CT.2: Identify possible approaches and resources to execute a plan

9.4.2.CT.3: Use a variety of types of thinking to solve problems

Explanation of how 9.4 standards connect to the unit: Students work collaboratively in groups to identify different approaches to solving problems within experiments.

Stage 2- Assessment Evidence:

Assessment:

| | |
|--------------------|---|
| Formative | Student observation journals, exit tickets |
| Summative | Student lab experiment sheets |
| Alternative | Oral or digital response to experiments, poster |
| Benchmark | Student journal response beginning and end of unit. |

Stage 3 - Learning Plan

Learning Activities:

Students will complete a variety of critical thinking learning activities designed to actively engage in the scientific process. Students will make discoveries and gain knowledge through investigation. Students will work individually and in groups on the following activities throughout the unit:

-Introduction to bubbles: bubble blowing demonstration and student experimentation, initial observations.

Eiffel Plasterer's lost journal story and creation of students own bubblogist journals

-Buggy about Science experiments:
floating a paperclip on water to show surface tension, using an eyedropper and water to create surface tension on penny (and using soap to break surface tension), water striders

-Birthday Bubbles experiment:
Using different shape wands, students make predictions on the shape bubbles that will be produced- all will be spherical regardless of the shape wand.

Differentiation:

ELL:

- Extend time requirements
- Preferential seating
- Check often for understanding
- Oral/visual directions/prompts when needed
- Provide hands-on materials and/ manipulatives for students to practice using new content knowledge

G&T:

- Allow students to take an active role in exploring additional information on bubble science/chemistry/physics
- Propose chemistry extension activities (additional experiments, google slides, websites)

Special Ed:

- Utilize a multi-sensory approach during

-Bigger is Better experiment:

Using different bubble solutions students measure and compare the diameter of bubbles. Students must hypothesize and discuss why certain bubbles are larger.

-Bully Proof Bubbles

Students determine the longevity of bubbles blown from different soap solutions. Each solution has different amounts of glycerin. Students will use a timer to test longevity.

-Pop Star

Students learn Bernoulli's principle as they use different materials and techniques to keep their bubble aloft. Students will guide their bubble through an obstacle course using learned techniques illustrating an understanding of bubble properties.

instruction

- Reinforce visual directions with verbal cues
- Extend time requirements
- Allow verbal rather than written responses
- Provide hands-on materials and/ manipulatives for students to practice using new content knowledge
- Preferential seating as needed

504:

- Review, restate and repeat
- Frequently ask questions to engage student
- Provide graphic organizers as needed

Students at Risk:

- Deliver instruction utilizing varied learning styles including audio, visual and tactile/kinesthetic
- Provide individual instruction as needed
- Meet with students frequently to ensure understanding
- Allow verbal rather than written responses

Core Instructional Resources

Teacher Pedagogical Resources:

"Pop Science: Investigating Bubbles" by Emily Pike, www.nationalgeographic.org

Student Materials:

Experiment materials, lab response sheets

Notes:

Career Explorations: Students will explore jobs related to engineering and chemistry (chemical engineer, water chemist, chemistry teacher, forensic scientist, etc).