

Chemistry Overview 2022 - 2023

This document is designed to provide parents/guardians/community an overview of the curriculum taught in the FBISD classroom. This document supports families in understanding the learning goals for the course, and how students will demonstrate what they know and are able to do. The overview offers suggestions or possibilities to reinforce learning at home.

Included at the end of this document, you will find:

- A [glossary](#) of curriculum components
- The content area [instructional model](#)
- [Parent resources](#) for this content area

To advance to a particular grading period, click on a link below.

- [Grading Period 1](#)
- [Grading Period 2](#)
- [Grading Period 3](#)
- [Grading Period 4](#)

Process Standards

The process standards describe ways in which students are expected to engage in the content. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use knowledge learned efficiently and effectively in daily life.

C.1(A)

demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles or chemical splash goggles, as appropriate, and fire extinguishers

C.1(B)

know specific hazards of chemical substances such as flammability, corrosiveness, and radioactivity as summarized on the Safety Data Sheets (SDS)

C.1(C) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials

C.2(A)

know the definition of science and understand that it has limitations, as specified in chapter 112.35, subsection (b)(2) of 19 TAC

C.2(B) know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories

C.2(C) know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but may be subject to change as new areas of science and new technologies are developed;

C.2(D) distinguish between scientific hypotheses and scientific theories

C.2(E) plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting equipment and technology, including graphing calculators, computers and probes, electronic balances, an adequate supply of consumable chemicals, and sufficient scientific glassware such as beakers, Erlenmeyer flasks, pipettes, graduated cylinders, volumetric flasks, and burettes

C.2(F) collect data and make measurements with accuracy and precision
 C.2(G) express and manipulate chemical quantities using scientific conventions and mathematical procedures, including dimensional analysis, scientific notation, and significant figures
 C.2(H) organize, analyze, evaluate, make inferences, and predict trends from data
 C.2(I) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports, and technology-based reports
 C.3(A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing
 C.3(B) communicate and apply scientific information extracted from various sources such as current events, published journal articles, and marketing materials
 C.3(C) draw inferences based on data related to promotional materials for products and services
 C.3(D) evaluate the impact of research on scientific thought, society, and the environment
 C.3(E) describe the connection between chemistry and future careers
 C.3(F) describe the history of chemistry and contributions of scientists

Grading Period 1

Unit 1: Introduction to Chemistry

Estimated Date Range: Aug. 10 - Aug. 24

Estimated Time Frame: 11 days

Unit Overview:

In this unit, students will be introduced to chemistry and careers associated with it. Students will review lab safety rules and procedures and compare the safety involved in a science classroom to the rules, guidelines, and proper use of safety equipment classroom. Students will evaluate why safety is important in a science classroom and how it is used in everyday life. Next students will review previously learned information on how scientists identify and solve problems. To do this they will plan and carry out scientific investigations in which hypotheses are formulated and tested, collect, analyze, and draw conclusions from data, and express and manipulate chemical quantities using scientific conventions including dimensional analysis, scientific notation, and significant figures.

At home connections:

- Discuss careers in chemistry with your student such as those found [here](#) from the American Chemical Society.
- Have your student measure objects around the home using a measuring tool such as a ruler, measuring cups, scales, etc.
- Practice converting from one unit such as pounds to another unit like grams or kilograms. Convert between ounces and milliliters using bottled drinks or food packages that are marked with their weight or volume.

| Concepts within Unit #1 Link to TEA High School Science TEKS | Success Criteria for this concept |
|--|---|
| Concept #1: Safety C.1A, C.1B, C.1C | <ul style="list-style-type: none"> • I can use all lab equipment properly and safely throughout the course. • I can locate and describe the use of safety equipment. • I can demonstrate safe practices during all lab and field investigations throughout the course. • I can follow all the safety rules of the time during laboratory/field investigations. • I can identify and describe the safety precautions and hazards of various chemicals using the Safety Data Sheet (SDS) |

| | |
|--|---|
| | <ul style="list-style-type: none"> I can dispose of materials from lab investigations appropriately throughout the course. I can differentiate between recyclable and disposable materials and resources. |
| <p>Concept #2: Scientific Processes, Measurement, and Calculations C.2G, C.2H, C.2I</p> | <ul style="list-style-type: none"> I can collect data and make measurements with accuracy and precision. I can convert numbers from one unit to another using dimensional analysis. I can perform calculations and represent answers in the correct scientific notation and significant figures using the rules. I can analyze, evaluate, make inferences, and draw conclusions from data. I can create and interpret graphs and data tables from a lab or field investigation. I can identify and use appropriate technology to create reports and communicate valid conclusions. I can communicate valid conclusions from data through lab reports, journals, and summaries. |
| <p>Unit 2: Matter, Change and States Estimated Date Range: Aug. 25 - Sept. 9 Estimated Time Frame: 11 days</p> | |
| <p>Unit Overview: Matter is everything around us and information from this unit is carried on all through the course. This unit is on changes and properties of matter, classification of matter as either pure substances or mixtures and states of matter. Students will be able to differentiate between physical and chemical changes and properties of matter. Students will be able to classify matter as substances or mixtures based on their composition. Also, students will compare the different states of matter in terms of compressibility, structure, shape, and volume and describe the role of thermal energy in phase changes.</p> <p>At home connections:</p> <ul style="list-style-type: none"> Have students recognize physical and chemical changes that happen around your home such as water freezing, ice melting, water evaporation when boiling, ice cream melting, etc. Identify items around the home that sink or float. Make connections between the densities of the items that sink compared to the density of the items that float. Compare sinking and floating in water versus sinking and floating in a thicker substance such as honey or corn syrup. | |
| <p>Concepts within Unit # 2 Link to TEA High School Science TEKS</p> | <p>Success Criteria for this concept</p> |
| <p>Concept #1: Matter, Change and States C.4A, C.4B, C.4C, C.4D</p> | <ul style="list-style-type: none"> I can identify, describe, and differentiate between physical and chemical changes. Identify when a physical change has occurred and explain how I know it has occurred. |

- Identify when a chemical change has occurred and explain how I know it has occurred.
- I can determine and calculate the densities of given substances.
- I can differentiate between intensive and extensive properties and give examples.
- I can describe and compare solids, liquids and gases using their characteristics.
- I can describe and explain phase changes that occur in matter.
- interpret a phase diagram
- I can define and differentiate between pure substances and mixtures and give examples.

Unit 3: Atomic Structure and Electron Arrangement

Estimated Date Range: Sept. 12 - Oct. 7

Estimated Time Frame: 19 days

Unit Overview:

This unit is on the different atomic theories and experiments that led to the understanding of the atomic structure and components. Students will learn about isotopes, the subatomic particles, and the electromagnetic spectrum. Students will also describe the mathematical relationships between energy, frequency and wavelength of light using the electromagnetic spectrum. Students learn about the arrangement of electrons through drawing Lewis dot structures and writing electron configurations.

At home connections:

- Have students find objects around the home at different levels of the electromagnetic spectrum, such as items that use radio waves or microwaves.
- Encourage students to draw or make models to better understand how atoms are structured and how electrons are arranged for different elements.

Concepts within Unit # 3

[Link to TEA High School Science TEKS](#)

Success Criteria for this concept

Concept #1: Atomic Structure
C.6D, C.6A, C.6B, C.6C

- I can draw Bohr's models for given elements.
- I can critique and differentiate between the different atomic models.
- calculate average atomic mass using the relative frequencies of naturally occurring isotopes
- describe the mathematical relationships between energy, frequency and wavelength of light using the electromagnetic spectrum

Concept #2: Electron Arrangement
C.6D

- I can draw Lewis dot structures of given elements.
- Explain the steps in creating a Lewis dot structure.
- Write the electron configuration for any given atom or ion using the rules for electron configurations.

Grading Period 2

Unit 4: The Periodic Table and Periodic Trends

Estimated Date Range: Oct. 11 – Oct. 26

Estimated Time Frame: 12 days

Unit Overview:

In this unit, the students will learn about the historical development of the Periodic Table. Students will learn how the Periodic Table is arranged using physical and chemical properties and about the different groups (families) on the Periodic Table. Also, students will identify and interpret periodic trends. Students learned about the periodic table in some capacity in 6th and 8th grades.

At home connections:

- Have students identify patterns or trends that occur in everyday life such as traffic patterns, patterns in weather, and schedules and routines.
- Look at food items, hygiene products, and cleaning supply ingredient lists and identify the elements used in them. Find the elements on the periodic table.

Concepts within Unit # 4

[Link to TEA High School Science TEKS](#)

Concept #1: The Periodic Table and Periodic Trends
C.5C, C.5A, C.5B

Success Criteria for this concept

- I can explain the contributions of Mendeleev and Mosley.
- I can explain how chemical and physical properties were used to develop the periodic table.
- I can describe the physical and chemical properties of all the groups/families on the periodic table.
- I can determine the properties, including the reactivity, of an element based on its position on the periodic table.
- recognize the importance/value of knowing periodic trends
- I can identify and explain the trend for atomic radii.
- Identify and explain the trend for ionization energy.
- I can identify and explain the trend for electronegativity.
- I can identify and explain the trend for atomic radii.
- I can identify and explain the trend for ionization energy.

Unit 5: Chemical Bonding

Estimated Date Range: Oct 27 - Nov. 11

Estimated Time Frame: 11 days

Unit Overview:

Students will construct electron dot formulas to represent ionic and covalent bonds and apply the Octet rule to chemical bonding. Students will describe and differentiate between the different types of chemical bonds and the properties of compounds formed through each type of chemical bond. Students will construct and predict the shape of individual molecules based upon the extent of electron-pair electrostatic repulsion using the valence shell electron pair repulsion (VSEPR) theory.

At home connections:

- Identify metals and non-metals around the home. Watch videos together about chemical bonding, specifically discuss what elements participate in ionic, covalent, and metallic bonds.

Concepts within Unit # 5

[Link to TEA High School Science TEKS](#)

Concept #1: Chemical Bonding
C.6D, C.7A, C.7B, C.7C

Success Criteria for this concept

- I can identify and describe the properties of ionic, covalent, and metallic compounds.
- I can identify and differentiate among metallic, ionic, and covalent bonds.
- I can construct electron dot formulas that represent ionic and covalent bonds.

| | |
|--|--|
| | <ul style="list-style-type: none"> • I can identify each electron shell using the periodic table. • I can know the capacity of each electron shell. • I can build the full and abbreviated electron configuration for each element. • I can predict the shape of individual molecules based upon the extent of electron-pair electrostatic repulsion using the valence shell electron pair repulsion (VSEPR) theory. • I can explain why polar bonding occurs using examples. |
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Unit 6: Chemical Formulas and Compounds

Estimated Date Range: Nov. 14 - Dec. 16

Estimated Time Frame: 20 days

Unit Overview:

In this unit, the students will write chemical formulas for and name compounds. Students will use electron dot diagrams to write the chemical formula of ionic and covalent compounds. Students will also learn to use charges of ions to write the formulas of and name compounds. The students will be able to use the appropriate naming convention and rules to name acids, ionic and covalent compounds.

At home connections:

- Have your student view the ingredients list on food items, hygiene products like shampoo and deodorant, and cleaning products and attempt to write out the chemical formulas that match the names of some of the ingredients. Check accuracy by looking up that ingredient's name.

| Concepts within Unit # 6 Link to TEA High School Science TEKS | Success Criteria for this concept |
|--|---|
| Concept #1: Chemical Formulas and Compounds C.7A, C.6D, C.7B | <ul style="list-style-type: none"> • I can describe the purpose of having universal naming rules (IUPAC) • I can write formulas and name Ionic compounds. • I can write formulas and name covalent compounds using appropriate prefixes. • I can name compounds that contain transition metal using Roman numerals • I can name acids using the appropriate rule. • I can identify the most commonly used polyatomic ions • I can locate the charge associated with common polyatomic ions on formula charts |

Grading Period 3

Unit 7: Chemical Reactions

Estimated Date Range: Jan. 5 - Jan. 25

Estimated Time Frame: 14 days

Unit Overview:

In this unit students will use knowledge from naming chemical compounds to write equations. Students will learn to properly balance equations. Students will also differentiate between the types of reactions and use solubility rules to predict solubility in reactions.

At home connections:

- Consider all the balanced reactions that happen in the kitchen. Three eggs in a cake mix recipe, means that there must be three eggs in the finished cake. The idea behind balanced reactions is that what goes in must come out. It may look different or be bonded with another “ingredient” but that it is still there in the overall reaction taking place.

| Concepts within Unit # 7 Link to TEA High School Science TEKS | Success Criteria for this concept |
|---|--|
| Concept #1: Chemical Reactions C.8E, C.8F, C.7A, C.7B, C.10B | <ul style="list-style-type: none"> • I can assign oxidation numbers to elements following the rules. • I can define acid base reactions, precipitation reactions and each redox reaction • I can identify the type of reaction that reactants undergo. • I can predict the products for any given set of reactants. • I can Identify which type of reaction has taken place and explain how I know. • I can take the written words for an equation and turn it into a skeleton equation • I can count the number of atoms on each side of a reaction. • I can balance equations with accuracy. • I can know the names of the compounds used in reactions. |

Unit 8: Solutions and Acids and Bases

Estimated Date Range: Jan. 26 - Feb. 15

Estimated Time Frame: 15 days

Unit Overview:

In this unit, students will explore the two common definitions for acids and bases, comparing each. Students will learn the mechanism (ionizations) by which acids and bases exist and identify acids and bases as strong or weak in nature. Students will experience laboratory exercises to collect data about the acidity or basicity of common household items using pH paper, litmus paper, chemical indicators and possibly titrations. Students will be able to calculate the pH, pOH, H⁺ concentration and OH⁻ concentration from given information using pH formulas and calculators.

At home connections:

- Sugar and salt dissolve best in hot water compared to cold water, experiment with how much sugar can be dissolved at different temperatures and with and without stirring.
- Identify items around the house that are either acids or bases using images from websites such as [this one](#).

| Concepts within Unit # 8 Link to TEA High School Science TEKS | Success Criteria for this concept |
|---|--|
| Concept #1: Solutions C.10E, C.10A, C.10B, C.10C, C.10D, C.10F | <ul style="list-style-type: none"> • I can differentiate among unsaturated, saturated, and supersaturated solutions. • I can differentiate among electrolytes and non-electrolytes. • I can describe and draw the structure of water molecules. • I can list the physical and chemical properties of water. • I can make predictions about solubility based on solubility rules. • I can use molarity to make solutions of a particular concentration. • I can change a solution from its current concentration to one of a lesser concentration • I can explain the impact of temperature, agitation, and surface area • I can define solubility, read, and interpret solubility graphs. |
| Concept #2: Acids and Bases C.10E, C.10G, C.10H | <ul style="list-style-type: none"> • I can use a pH scale to identify where strong acid, weak acid, neutral, weak base, and strong base would fall on the scale. • Identify strong and weak acids and bases and give examples. • I can describe acids and bases based on their different definitions. • I can define the pH scale and use it to determine if a substance is acidic or basic. • I can calculate the pH of a substance using the formula for hydrogen ion concentrations. |

Unit 9: Chemical Quantities in Reactions (Stoichiometry)

Estimated Date Range: Feb. 16 - Mar. 10

Estimated Time Frame: 15 days

Unit Overview:

In this unit, students will define the mole and use the concept to calculate the number of particles, grams, or liters of any given substance. Students will also calculate molar mass and number of moles of any given substance and determine limiting and excess reagent. Students will learn to calculate percent yield and percent composition.

At home connections:

- Convert units of mass, volume, and length of items around the home. Consider creating two step conversions such as changing from ounces to liters to milliliters of a bottle of water or soda.
- This unit requires strong math skills and the ability to apply those skills to science concepts. Use online tutorials in stoichiometry that walk students through the process step by step.
- Consider the limiting reactant when cooking. If I would like to make blueberry pancakes, I can only make as many ingredients as I have the least of will allow. I may have plenty of pancake mix and water, but only a small container of blueberries. Therefore, the blueberries will run out first and so they are my limiting reactant. Have your student develop additional examples of this concept in the kitchen.

| Concepts within Unit # 9 Link to TEA High School Science TEKS | Success Criteria for this concept |
|---|--|
| Concept #1: Stoichiometry C.8B, C.7A, C.7B, C.8A, C.8C, C.8G, C.8H | <ul style="list-style-type: none"> • I can convert from moles to grams, particles, or liters. • I can convert from grams, particles, or liters to moles. • I can write molecular formulas. • I can calculate and state the empirical formula. • I can write out and solve stoichiometric calculations. • I can explain the concept of a mole in terms of number of particles. • I can calculate percent composition of each element in any substance. |

Grading Period 4

Unit 9 (continued): Chemical Quantities in Reactions (Stoichiometry)

Estimated Date Range: Mar. 20 - Mar. 24

Estimated Time Frame: 5 days

Unit Overview:

In this unit, students will define the mole and use the concept to calculate the number of particles, grams, or liters of any given substance. Students will also calculate molar mass and number of moles of any given substance and determine limiting and excess reagent. Students will learn to calculate percent yield and percent composition.

At home connections:

- Convert units of mass, volume, and length of items around the home. Consider creating two step conversions such as changing from ounces to liters to milliliters of a bottle of water or soda.
- This unit requires strong math skills and the ability to apply those skills to science concepts. Use online tutorials in stoichiometry that walk students through the process step by step.
- Consider the limiting reactant when cooking. If I would like to make blueberry pancakes, I can only make as many ingredients as I have the least of will allow. I may have plenty of pancake mix and water, but only a small container of blueberries. Therefore, the blueberries will run out first and so they are my limiting reactant. Have your student develop additional examples of this concept in the kitchen.

Concepts within Unit # 9

[Link to TEA High School Science TEKS](#)

Concept #1: Stoichiometry
C.8B, C.7A, C.7B, C.8A, C.8C, C.8G, C.8H

Success Criteria for this concept

- I can convert from moles to grams, particles, or liters.
- I can convert from grams, particles, or liters to moles.
- I can write molecular formulas.
- I can calculate and state the empirical formula.
- I can write out and solve stoichiometric calculations.
- I can explain the concept of a mole in terms of number of particles.
- I can calculate percent composition of each element in any substance.

Unit 10: Nuclear Chemistry

Estimated Date Range: Mar. 27 - Apr. 5

Estimated Time Frame: 8 days

Unit Overview:

In this unit, students will differentiate between the three types of radioactive decay and write balanced nuclear equations for each type of decay process. Students will learn to predict the product of a decay process

At home connections:

- Visit museums or virtual museums and consider how present-day scientists can determine the age of artifacts.
- Watch videos about the science behind the development of the atomic bomb and how radiation from atomic bomb components affect humans over time.

Concepts within Unit # 10

[Link to TEA High School Science TEKS](#)

Concept #1: Nuclear Chemistry
C.12A, C.12B, C.8E

Success Criteria for this concept

- I can name the radioactive decay processes and describe their characteristics.
- I can write balanced nuclear equations for each different decay processes.
- I can explain the concept of half-life and how half-life is used in dating.

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|--|--|
| | <ul style="list-style-type: none">• I can describe and compare fission and fusion nuclear reactions. |
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Unit 11: Gas Laws

Estimated Date Range: Apr. 6 – Apr. 27
Estimated Time Frame: 14 days

Unit Overview:

In this unit, students will calculate the relationships between volume, pressure and temperature using gas laws. Students will identify and use Boyle's Law, Charles' Law, Avogadro's Law, Dalton's Law and The Ideal Gas Law. Students will recognize that ideal gases have predictable behaviors that can be studied, observed and measured.

At home connections:

- Identify objects in the home that depend on changes in the temperature, pressure, and/or volume to function. These can include thermometers, water pressure in the pipes, the air conditioner and heater, or a pressure cooker.

| Concepts within Unit # 11 Link to TEA High School Science TEKS | Success Criteria for this concept |
|--|--|
| Concept #1: Gas Laws C.9A, C.9B, C.8A, C.8B, C.8E, C.8G | <ul style="list-style-type: none"> I can describe and perform calculations using the gas laws. I can describe the relationships between pressure, temperature, and volume of an ideal gas in a closed system. I can use Avogadro's principle to relate the number of particles and the volume of an ideal gas. I can perform stoichiometric calculations on reactions involving gases. I can determine mass and volume relationships between reactants and products in reactions involving gases. |

Unit 12: Reaction Energy (Thermodynamics)

Estimated Date Range: Apr. 28 - May 25
Estimated Time Frame: 20 days

Unit Overview:

In this unit, students will learn to identify a reaction as endothermic or exothermic. Students will learn to use thermochemical equations to calculate the amount of energy absorbed or released during a reaction. Students will describe energy and its forms such as kinetic, potential, chemical and thermal. Students will understand the law of conservation of energy and heat transfer using calorimetry and perform specific heat calculations.

At home connections:

- Explore how different materials hold and release heat (how quickly their contents cool down) like a Styrofoam cup compared to a paper cup or a plastic cup.
- Research how instant hand warming packs and instant cold packs work.

| Concepts within Unit # 12 Link to TEA High School Science TEKS | Success Criteria for this concept |
|--|--|
| Concept #1: Thermodynamics C.11C, C.11A, C.11B, C.11D | <ul style="list-style-type: none"> I can identify characteristics of endothermic and exothermic reactions. I can determine the heat of formation of a compound. I can use Hess's law to find the enthalpy change of a reaction. I can use thermochemical equations to represent the energy changes that occur in exothermic and endothermic reactions. I can use graphs to represent the energy changes that occur in exothermic and endothermic reactions. |

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|--|---|
| | <ul style="list-style-type: none">• I can perform calculations involving heat, mass, temperature change and specific heat.• I can recognize heat as a form of energy |
|--|---|

Glossary of Curriculum Components

Overview– The content in this document provides an overview of the pacing and concepts covered in a subject for the year.

TEKS – Texas Essential Knowledge and Skills (TEKS) are the state standards for what students should know and be able to do.

Unit Overview – The unit overview provides a brief description of the concepts covered in each unit.

Concept – A subtopic of the main topic of the unit.

Success Criteria—A description of what it looks like to be successful in this concept.

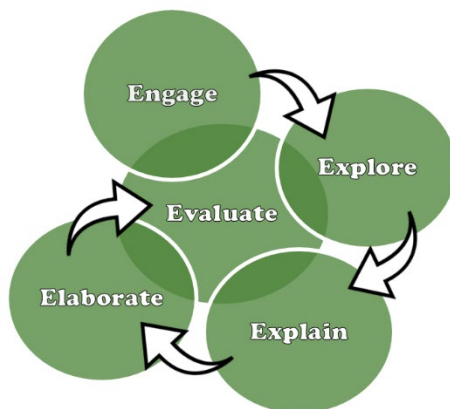
Parent Resources

The following resources provide parents with ideas to support students’ understanding. For sites that are password protected, your child will receive login information through their campus.

| Resource | How it supports parents and students |
|--|--|
| Pearson Chemistry https://www.fortbendisd.com/Page/92908 | This is the state adopted textbook for Chemistry. Click on the link for directions on accessing the textbook. |
| Khan Academy | This resource contains practice exercises, instructional videos, and a personalized learning dashboard where students can learn and study at their own pace. |
| Texas Gateways | This online resource contains lessons, videos, and interactive activities for various science concepts. |
| NSTA – Science Resources for Parents | This online resource has science activities for high school students and their families to help support learning at home. |
| NOAA – National Oceanic and Atmospheric Administration | This resource contains videos, images, interactive media, graphics, and data related to the ocean and atmosphere. |

Instructional Model

The structures, guidelines or model in which students engage in a particular content ensures understanding of that content.



- It is based on the constructivist learning theory, which states that learners build or construct new ideas based on their experiences.
- It represents a recursive cycle of cognitive stages in inquiry-based learning.

- Stages are intended to be completed sequentially; however, you may revisit a stage more than once during the 5E process.
- It capitalizes on hands-on activities, students' curiosity, and academic discussion among students.
- Typically, **NOT** all five stages would be experienced in a single classroom period, but all five would certainly be embedded in a series of lessons that would develop a particular concept, lasting days, or weeks.
- It should be used to develop conceptual understanding over time with each stage building on the previous stage, rather than serve as a series of activities.
- It should be used in conjunction with other instructional strategies such as writing in science, graphing, graphic organizers, collaboration, etc.