# Charlotte County Curriculum M/J Physical Science
# Course #2003010

## A Different Way of Thinking About Science Instruction
## *Next Generation Sunshine State Standards (NGSSS) for Science*

With the advent of the 2008 *Next Generation* Sunshine State Standards (NGSSS) for Science comes a new way of thinking about science education. There is a shift from "covering" the material to ***mastering*** the concepts. Grade level bands have been replaced with grade-specific benchmarks. Bodies of Knowledge (BOK) have replaced the clusters, and Big Ideas will thread between grade levels, gradually increasing in complexity and depth. ***To ensure the scientific literacy of our students, teachers must teach their grade level benchmarks in depth.***

☺ **Bodies of Knowledge:** Science concepts are divided into four general Bodies of Knowledge. These are Life Science (including Life and Environmental Science concepts), Earth and Space Science, Physical Science (includes Physical and Chemical Science), and Nature of Science (Scientific Thinking).

☺ **Big Ideas:** Eighteen Big Ideas thread throughout all grade levels and the benchmarks under them build in rigor and depth as students advance from K-12. Each grade level includes benchmarks from all four Bodies of Knowledge, but not every grade level will teach concepts from every Big Idea. Not all Big Ideas are taught at every grade level, which will allow teachers to explore specific grade-level concepts more in depth during the school year to ensure student mastery.

☺ **Benchmarks:** Each grade level has their own set of specific benchmarks that students must master. Kindergarten benchmarks are very different from Grade 1 benchmarks. In some Big Ideas, the concept is taught once in a grade level and not taught again for several years. As such, it is critical that students master each and every benchmark for their grade level. We can no longer depend on the next grade level to "catch them up."

☺ **Depth of Knowledge:** Each benchmark has been assigned a "Depth of Knowledge." The verbs used in the benchmark signify the depth to which the student is expected to master the concept. For example, if the verb on a benchmark is "observe," the students are expected to make observations about scientific phenomena. If the verb is "investigate," then students are expected to do an in-depth analysis for mastery of the concept. The important thing to keep in mind is that some benchmarks are intended to be taught more in-depth than others.

☺ **Best Practices:** While *what* is being taught at each grade level has changed, the instructional best practices remain the same. Visit the Department of Education Office of Math and Science website for all science standards and additional resources: http://www.fldoestem.org/center13.aspx .

☺ **Lesson plan links:** FDOE-STEM & CPALMS specific benchmarks for Grade 8: http://www.floridastandards.org/Courses/PublicPreviewCourse114.aspx?ct=1

☺ **Students with Significant Cognitive Disabilities:** Refer to K-12 Science Standards for Access Points to be used with students with ***Significant Cognitive Disabilities***—these Access Points only apply to students who take the FCAT Alternate Assessment (less than 1% of CCPS population).

*(Adapted with permission from Brevard Public Schools*


Blue = Annually Assessed on Science FCAT 2.0; Red = Not assessed on Science FCAT 2.0

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## Next Generation Sunshine State Standards: SCIENCE

***Nature of Science is embedded throughout the entire school year at every grade level for every Body of Knowledge (BOK): Life, Earth, and Physical Sciences.***

**Nature of Science** is introduced at the beginning of the year and is to be taught throughout the year as it blends easily with teaching inquiry and is the basis of an activity/lab-based science classroom.
**Lab safety and the use of scientific tools** should be introduced at the beginning of the year and re-addressed continuously throughout the year. Each primary grade level should be teaching the science process skills and whole class science projects are an appropriate way to teach these skills.

***Integrate Nature of Science Benchmarks into all Units and Activities***

| | |
|---|---|
| **Big Idea #1: The Practice of Science** | |
| ***SC.8.N.1.1 AA*** | Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.<br>***Annually Assessed (AA).*** *Also assesses SC.6.N.1.1, SC.6.N.1.3, SC.7.N.1.1, SC.7.N.1.3, SC.7.N.1.4,* ***SC.8.N.1.3, and SC.8.N.1.4.*** |
| SC.8.N.1.2 | Design and conduct a study using repeated trials and replication. |
| **SC.8.N.1.3** | Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim. |
| **SC.8.N.1.4** | Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data. |
| SC.8.N.1.5 | Analyze the methods used to develop a scientific explanation as seen in different fields of science. |
| SC.8.N.1.6 | Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence. |
| **Big Idea #2: The Characteristics of Scientific Knowledge** | |
| *SC.8.N.2.1* | *Distinguish between scientific and pseudoscientific ideas.*<br>***Not Assessed (integrate into TAG & Advanced)*** |
| *SC.8.N.2.2* | *Discuss what characterizes science and its methods.*<br>***Not Assessed (integrate into TAG & Advanced)*** |
| **Big Idea #3: The Role of Theories Laws, and Models** | |
| *SC.8.N.3.1* | *Select models useful in relating the results of their own investigations.*<br>***Not Assessed (integrate into TAG & Advanced)*** |
| SC.8.N.3.2 | Explain why theories may be modified but are rarely discarded.<br>*Assessed as SC.7.N.3.1* |

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**The concepts listed in this section should be incorporated into ALL science lab activities in ALL science classrooms.**
**Participation in Science Fair is required for all Honors/Advanced courses; all students are encouraged to participate in Science Fair.**

*School-based fairs should be completed by mid-November;*
*Regional paperwork turned in to District Office by* ***November 30th***

## Holt *Science Fusion* - Unit 1: Nature of Science

**Essential Questions for Science Process Skills (Nature of Science)**

1. How has technology changed scientific research?
2. Why is replication (*repeating*) important to a scientist's credibility? Why is it important for scientists to be able to repeat the same experiment?
3. How does the process of scientific method lead to the discovery of new knowledge and change?
4. What are the consequences of not identifying and controlling variables? .
5. Why do scientists throughout the world use the metric system?
6. How are physical and chemical properties and changes differentiated?

**How can students use inquiry?**

- Formulate their own questions.
- Plan and conduct their own investigations.
- Employ simple equipment and tools to gather data and extend to the senses.
- Use data to construct a reasonable explanation.
- Communicate investigations and explanations.

**Teaching and Assessment Ideas**

- What are examples of things that would be measured with SI units?
- Construct a timeline of major historical, technical, and scientific advancement.
- Use the scientific method to solve simple problems: Students ***design*** experiments.
- Compare group/individual results to emphasize the need for multiple trials and/or large sample size.
- Conduct measurement labs from *AIMS Metric Olympics*.
- United Streaming clips:*Bill Nye* and *Mythbusters* –students identify control, variables, procedure, etc.
- Venn diagram for mass versus weight, physical versus chemical properties/changes, etc.
- Enter the science fair or create a classroom science fair.
- Research a scientist and create a "wanted" poster describing his/her contribution to modern science.
- Create/defend an experiment demonstrating the steps of the scientific method.
- Design an experiment that demonstrates controlled set-up (Science Fair).
- Design a movie special effect, and describe the science behind the effect.

**Questioning Ideas during Lab Investigations**

- What are you trying to find out? (What were the scientists trying to find out?)
- What do you already know or think you know?
- What's the best way to answer question?
- What kind of data (e.g., observations or measurements) will you collect?
- What variables/factors need to be considered? (If appropriate, how can you make it a fair test?)
- What would you look for? What evidence would support your hypothesis/explanation?
- How might you organize and communicate your data and results?

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| Unit 1: *Chemistry*<br>**Integrate Big Idea18 Matter & Energy Transformations (Biochemistry)** | |
|---|---|
| **Big Idea #8: Properties of Matter** | |
| SC.8.P.8.1 | Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases. *(i.e. History of the model of the atom; Parts of an atom, atomic structure; Properties of electric charges; like/unlike charges)* *Assessed as SC.8.P.8.5* |
| SC.8.P.8.2 | Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass. |
| SC.8.P.8.3 | Explore and describe the densities of various materials through measurement of their masses and volumes. *Assessed as SC.8.P.8.4* |
| **SC.8.P.8.4 AA** | Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample. ***Annually Assessed (AA).*** *Also assesses* ***SC.8.P.8.3*** |
| **SC.8.P.8.5 AA** | Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter. (*i.e. What is an element? Where do elements come from?*) ***Annually Assessed (AA).*** *Also assesses SC.8.P.8.1, SC.8.P.8.6, SC.8.P.8.7, SC.8.P.8.8, and SC.8.P.8.9.* |
| SC.8.P.8.6 | Recognize that elements are grouped in the periodic table according to similarities of their properties. (*i.e. Classify elements based on their characteristics; Properties of families; How has the periodic table changed over time?*) *Assessed as SC.8.P.8.5* |
| SC.8.P.8.7 | Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons). *Assessed as SC.8.P.8.5* |
| SC.8.P.8.8 | Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts. *Assessed SC.8.P.8.5* |
| SC.8.P.8.9 | Distinguish among mixtures (including solutions) and pure substances. *Assessed as SC.8.P.8.5* |
| **Big Idea #9: Changes in Matter** | |
| SC.8.P.9.1 | Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes. |
| **SC.8.P.9.2** | Differentiate between physical changes and chemical changes. (i.e. Behavior of solids, liquids and gases) ***Annually Assessed (AA).*** *Also assesses 8.P.91 and 8.P.9.3* |
| SC.8.P.9.3 | Investigate and describe how temperature influences chemical changes. |
| **Big Idea #10: Forms of Energy** | |
| SC.7.P.10.1 | Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors. |
| SC.7.P.10.2 | Observe and explain that light can be reflected, refracted, and/or absorbed. |
| SC.7.P.10.3 | Recognize that light waves, sound waves, and other waves move at different speeds in different materials. |

| Big Idea #18: Matter and Energy Transformations<br>**Integrate Big Idea18 Matter & Energy Transformations (Biochemistry)** | |
|---|---|
| **SC.8.L.18.4 AA** | Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.<br>***Annually Assessed.*** Also assesses SC.8.L.18.1, SC.8.L.18.2, and SC.8.L.18.3 |
| SC.8.L.18.1 | Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen. *Assessed as SC.8.L.18.4* |
| SC.8.L.18.2 | Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide. *Assessed as SC.8.L.18.4* |
| SC.8.L.18.3 | Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment. *Assessed as SC.8.L.18.4* |

## Holt *Science Fusion*: Unit 1 and Unit 2

### Essential Questions

1. What are the fundamental properties of matter? SC.8.P.8.2; SC.8.9.8.3; SC.8.P.8.4; SC.7.P.11.4
2. How does matter undergo change? SC.8.P.9.1; SC.8.P.9.2; SC.8.P.9.3 SC.7.P.11.3
3. How does temperature measure the average kinetic energy of motion of the particles that make up matter? SC.8.P.9.3; SC.7.P.11.1; SC.7.P.11.4;
4. How did the atomic theory develop into the present model of an atom (a massive nucleus of neutral neurons and positive protons surrounded by a cloud of negative electrons)? SC.8.P.8.1; SC.8.N.3.2
5. How did the organization of the present Periodic Table help scientists classify and predict the elements? SC.8.P.8.5; SC.8.P.8.6; SC.8.P.8.7
6. How has technology changed scientific research? SC.8.P.8.8; S.8.N.4.1; SC.8.N.4.2
7. How does the process of scientific method lead to the discovery of new knowledge and change? SC.8.P.8.9; SC.8.P.9.3;

### Teaching and Assessment Ideas

- Element personification: adopt and research an element. Create a family album.
- Maintain a lab notebook for laboratory investigations.
- Build and use a simple calorimeter.
- Design a power point presentation on the evolution of the atom (research, models).
- Graphic organizer for phases of matter, AIMS *I Scream* activity on temperature effects on solids
- Conduction, convection, radiation simulation / students as participants; use foldables as graphic organizers
- Temperature: Blank thermometer activity – give students a blank thermometer and ask them to make it work; build a simple calorimeter
- History of Atom: Accordion foldable (Dinah Zykes) to create a timeline of the evolution of the atomic model– include Greek model to modern model
- Atomic Structure: Atoms Family worksheet www.sciencespot.net ; Models using spice drops or marshmallows; AIMS activities; energy levels – M&M activity; atomic math
- Periodic Table: Student projects and presentations on Adopt-an-Element; Element web quest; Alien PT
- Comparison of Mendelev and current Periodic Tables (change over time as new evidence is discovered)
- Cooperative learning/presentations using white boards/active learning techniques
- Reference Discovery Links Trade Books:
- Videos from SPC: Discovery Channel Elements, Bill Nye, Teacher Video series on the Periodic Table, other video titles – use a graphic organizer during the video to define purpose and focus students on what is important in the video.
- TOPS Module #10: Analysis; #11 – Oxidation; #12 – Solutions; #13 - Cohesion/Adhesion
- Mystery object in a box (nuts, and bolts in film canisters, car parts, school supplies, etc.): have the students draw what they think is in the box based on sounds. Alternative: have one student look at a unique object (car part) and describe it to the class. Students must draw the object based on the one student's description.
- Introduction to the model of an atom: how has it changed over time? What is a model (abstract thinking)? Trace the history of the design of an airplane over time. How has it changed?
- Use vocabulary maps and webbing for important terms.

**See *Best Practices in Secondary Science* on the Essential Learnings:**
**http://www.yourcharlotteschools.net/curriculum/**

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| Unit 2: *Force & Motion*<br>**Integrate Big Idea 5 (Earth in Space and Time)** | |
|---|---|
| **Big Idea #8: Properties of Matter** | |
| SC.8.P.8.2 | Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass. |
| **Big Idea #10: Forms of Energy** | |
| **SC.7.P.10.1 AA** | Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors. ***Annually Assessed.*** *Also assesses SC.8.E.5.11* |
| SC.7.P.10.2 | Observe and explain that light can be reflected, refracted, and/or absorbed. |
| **SC.7.P.10.1 AA** | Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors. ***Annually Assessed.*** *Also assesses SC.8.E.5.11* |
| **Big Idea #11: Energy Transfer and Transformations** | |
| SC.6.P.11.1 | Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa. |
| SC.7.P.11.1 | Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state. |
| **SC.7.P.11.2 AA** | Investigate and describe the transformation of energy from one form to another. ***Annually Assessed.*** *Also assesses SC.6.P.11.1 and SC.7.P.11.3.* |
| SC.7.P.11.3 | Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another. |
| **SC.7.P.11.4 AA** | Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature. ***Annually Assessed.*** *Also assesses SC.7.P.11.1* |
| **Big Idea #12: Motion of Objects** | |
| SC.6.P.12.1 | Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship. |
| **Big Idea #13: Forces and Changes in Motion** | |
| **SC.6.P.13.1 AA** | Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational. ***Annually Assessed.*** *Also assesses SC.6.P.13.2 and SC.8.P.8.2.* |
| SC.6.P.13.2 | Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are. *(i.e. Balanced and unbalanced forces)* |
| **SC.6.P.13.3 AA** | Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both. ***Annually Assessed.*** Also assesses SC.6.P.12.1. |

## Holt *Science Fusion*: Unit 3; Unit 4; Unit 5

### Essential Questions

1. How does a force affect an object (position, direction of motion, speed, and use of simple machines? SC.6.P.11.1; SC.6.P.12.1; SC.6.P.13.3
2. How do objects interacting with each other conform to Newton's Laws of Motion, Universal Law of Gravity, and the laws of conservation of momentum and energy? SC.8.P.8.2; SC.6.P.11.1; SC.7.P.11.2; SC.6.P.12.1; SC.6.P.13.1; SC.6.P.13.2
3. How have the properties of waves been utilized to benefit today's society? SC.7.P.10.1; SC.7.P.10.2; SC.7.P.10.3
4. What is the relationship between electricity and magnetism? SC.6.P.13.1; SC.7.P.11.2; SC.7.P.11.1; SC.7.P.11.3

### Teaching and Assessment Ideas:

- Balanced and unbalanced forces: arm wrestling activity
- Friction: graphic organizer or foldable on the types of friction; friction kits
- Motion (speed, velocity, acceleration): TOPS Heel-Toe Walk and Heel-Toe Shuffle activities; create a Heel-Toe graph as a culminating activity; Bubble Gum physics; Speed Challenge; Tortoise and the Hare activity; combining velocities (adding and subtracting)
- Keep a lab notebook.; Cooperative learning groups using white boards/active learning
- Newton's Laws: Use foldable or graphic organizer for three laws; demos – pushing off wall with a chair, toys
- Discovery Links Trade Books: *Amusement Park Science, The Body in Motion*
- Reference Sciencesaurus and Daybooks form Great Source; www.sciencespot.net
- What would happen if xx part of the electromagnetic spectrum disappeared?
- Create an alien life form able to "see" a portion of the electromagnetic spectrum other than visible light. Describe/draw what the alien would see.
- Foldable on parts of a simple machine.
- Design and build a simple machine using magnets, wires, current, etc.
- Simple Machines: Aims Simple Machines activity; work versus mechanical advantage
- Describe Newton's three laws as they apply to your favorite activity (i.e. sports, dance, etc)
- You are an Amusement Park engineer- how would you describe the various types of motion associated with a specific ride?

**See *Best Practices in Secondary Science* on the Essential Learnings: http://www.yourcharlotteschools.net/curriculum/**

### Integrate Big Idea 5 – Earth in Space and Time

**ANNUALLY ASSESSED: SC.8.E.5.7** Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions. Also assesses SC.8.E.5.4 and SC.8.E.5.8.

- **SC.8.E.5.4** Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.
- **SC.8.E.5.8** Compare various historical models of the Solar System, including geocentric and heliocentric.

**ANNUALLY ASSESSED: SC.8.E.5.5** Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness). Also assesses SC.8.E.5.6.

- **SC.8.E.5.6** Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.

| Human Health Unit (after FCAT - about 3-4 weeks) | |
|---|---|
| **Health Literacy: Responsible Behavior - Standard 2**<br>Demonstrate the ability to access valid health information, products, and services to enhance health. | |
| HE.8.B.1.1 | Evaluate the validity of health information, products, and services. (Some examples may include advertisements, articles, infomercials, Web-based products.) |
| HE.8.B.1.2 | Analyze valid health information from home, school, and community. (Some examples may include reliability of current events, community events, media, local organizations, school news.) |
| HE.8.B.1.3 | Analyze the accessibility of products and services that enhance health. (Some examples may include health department, community agencies, prescribed medications vs. over-the-counter.) |
| HE.8.B.1.5 | Compare valid and reliable health products and services. (Some examples may include current research and news/standard practice; generic/brand name; over-the-counter medicines and energy, vitamin and nutritional supplements/foods.) |
| **Health Literacy: Responsible Behavior - Standard 2**<br>Demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks. | |
| HE.8.B.2.1 | Illustrate skills necessary for effective communication with family, peers, and others to enhance health. (Some examples may include refusal skills, nonverbal communication, asking questions.) |
| HE.8.B.2.2 | Illustrate refusal, negotiation, and collaboration skills to enhance health and avoid or reduce health risks. (Some examples may include team work, compromise, assertive communication.) |
| HE.8.B.2.3 | Examine the possible causes of conflict among youth in schools and communities.( Some examples may include relationships, territory, jealousy.) |
| **Health Literacy: Responsible Behavior - Standard 3**<br>Demonstrate the ability to use decision-making skills to enhance health. | |
| HE.8.B.3.2 | Explain circumstances that can help or hinder healthy decision-making. (Some examples may include alcohol consumption; influences of media, peers, family/community; access to health care; mental health condition.) |
| HE.8.B.3.3 | Distinguish when individual or collaborative decision-making is appropriate. (Some examples may include pressure to consume alcohol, self-injury, weight management, sexual activity, mental health issues.) |
| HE.8.B.3.6 | Adopt healthy alternatives over unhealthy alternatives when making a decision. (Some examples may include alcohol abstinence, sexual abstinence, healthy nutrition.) |
| **Health Literacy: Responsible Behavior - Standard 4**<br>Demonstrate the ability to use goal-setting skills to enhance health. | |
| HE.8.B.4.1 | Assess personal health practices. (Some examples may include physical activity, sleep habits, interpersonal skills, risky behaviors, injury prevention.) |
| HE.8.B.4.2 | Design an individual goal to adopt, maintain, or improve a personal health practice. (Some examples may include physical activity, eating habits, cyberbullying, social relationships, sleep habits.) |

## Health Unit: Resource - *Carolina Biological* Supplement: Human Body; or

**Essential Questions**

1. How can a malfunction in one component of a system (human body) affect the overall functioning of the system (human body)?
2. How does an unhealthy lifestyle impact an individual's health and well-being?
3. What is healthful living? What is wellness?
4. How has technology changed scientific research?
5. How does the process of scientific method lead to the discovery of new knowledge and change?
6. How does the body fight diseases?
7. What are STDs and HIV and how can they spread?
8. What are healthy foods (portions)? What is healthful eating? Could a diet for one individual be unhealthy for another? What is meant by a balanced diet?

**Teaching and Assessment Ideas**

- Carolina Biological Supplement: Human Body
- Charlotte County Health Department Guest Speaker on HIV/STDs
- Review body systems through health topic discussions.
- What are the structures and functions of the major body systems as they relate to health issues (tobacco, drugs, alcohol)?
- How do the different body systems communicate with one another?
- Technology provides a way for a better understanding of the human body systems processes.
- Effects of nutrition, exercise, aging, behavior and substance abuse on the body systems.
- Create/design a commercial/poster to improve/sell the nutritional value of an existing food product.
- Design a questionnaire about coffee or tea that you can ask of ten people for a report to give to your advertiser so that they can then decide how to sell their product.
- Write a biography about an important person in the food industry.
- Design a questionnaire to determine which healthy foods are popular. Graph results.
- Write a letter to a fast food restaurant explaining why you think their advertising is false and misleading
- RAFT: Role – person with a dietary restriction caused by a medical condition, Audience – group of middle school students, Format – speech about the importance of eating healthy, Task – to convince students to eat healthy and avoid fast foods.
- Prepare a webpage, power point presentation, or report on a human body system using technology. Present to the class. Discuss how your body system communicates with the other body systems.
- Point of view: Debate an issue between nutritionists and fast food CEO's.
- Create "Teen Magazine" discussing issues related to STDs and drugs.
- During group presentations, students will analyze and summarize the functions and components of the body systems in an organized data table.
- Scenario: Your grandfather has been diagnosed with emphysema/high blood pressure and wants you to explain to him what he can expect to happen to his body as a result of the emphysema/high blood pressure.
- Student research projects based on substance abuse, nutrition, STDs, and the effects on the body systems.

- *What's Up* Magazines from Channing Bete on various substance abuse prevention topics: HIV/AIDS, Peer Pressure, Growing up Girls/Boys, Drugs, Smoking, Abstinence, Staying Healthy, etc.
- Reference *STC Human Body Systems* (see Program Planner) from Carolina Biological, *Everybody: Preventing HIV, Weekly Reader* Instructional Materials (Drug Awareness and prevention Guide, Getting the Facts About AIDS, etc.)
- Reference *Sciencesaurus* from Great Source
- Integrate Discovery Links Trade Books: *Food For Life, The Body in Motion, Blood*
- Curriculum Confidential in a Box (Substance Abuse Prevention topics)
- Science World Magazine and Current Health Magazine
- Contact the school's Safe and Drug-Free Coordinator to arrange to invite a guest speaker to your class to discuss drugs, tobacco, alcohol prevention and HIV, teen pregnancy, and STDs (call Charlotte County Health Department to arrange for a guest speaker for each: HIV, teen pregnancy, and STDs – use middle school health letters as notification to parents regarding this program (contact Curriculum Specialist for Health)
- Keep a journal of the foods you eat during the week. Prepare a healthy menu for one day.
- Discuss caloric intake versus output, portion size
- Emphysema scenario: Discuss which organs are involved and how the organs interact. Make a drawing to show the interconnectedness of the various systems. Use a vocabulary map to discuss the definition of emphysema. Keep a journal on emphysema research (start with prior knowledge and have students determine if they are correct). Foldable accordion for a timeline on the stages of emphysema (development of the disease). Compare lung capacity of a lung with emphysema (use small straw) and without emphysema. In groups, research the effects of emphysema on the various human systems.
- Videos from SPC: *Super Size Me* (Nutrition and Lifestyle Choices), *Miss Ever's Boys* (STD Syphilis), *She's Too Young* STD's and Lifestuyle Choices), *Travis* (HIV), other substance prevention resources: Discovery School, Bill Nye, etc.
- Integrate novels for reading: *Annie's Baby, It Happened to Nancy*
- Integrate technology: Adam-Inside Story, Operation Frog, BrainPop Subscription)

# BEST PRACTICES IN SCIENCE – AN OVERVIEW

As Science teachers, we understand that learning is an ongoing process. Brain research tells us that the process works best when new knowledge is connected to prior knowledge by the teaching of meaningful lessons. Lessons related to personal experiences and taught in an emotionally safe environment allow for greater retention.

**Strategies to Incorporate into Science Lessons:**

- Relate what students already know to the new concepts.
- Encourage student curiosity by making time for their observations and questions. Relate them to what is being learned and use them to initiate investigation when possible.
- Guide learning. Ask probing questions to encourage student discussion and develop understanding. Gives students the chance to explain and defend their thoughts and conclusions.
- Build on prior understanding, identify and resolve existing misconceptions.
- Actively engage students in scientific processes and Inquiry.
- Provide opportunities for hands-on activities, and investigations that involve collecting and analyzing data.
- Use a variety of Science resources.
- Use books, periodicals, multimedia technology and up-to-date information.
- Emphasize the real-life relevance of Science.
- Relate Science to daily life and encourage students to bring their own experiences to Science.
- Involve students in sustained, in-depth projects rather than just "covering the textbook."
- Engage students in the "Big Ideas" of Science, which can be fully explored through integration of the Science strands in other content areas. Teach and revisit the benchmarks whenever it is a teachable moment throughout the year.
- Integrate subject matter to exemplify how the disciplines co-exist in actual practice.
- Science and other subject areas should be integrated to unify concepts and disciplines.
- Promote collaboration among students. Engage students in cooperative learning and small group projects to build understanding and retention.
- Engage students in measuring, collecting, manipulating, and using data. There are many opportunities to integrate math.
- Encourage students to communicate. Orally explaining what was learned makes it easier to write about it.
- Allow students to make oral presentations, have class discussions, and complete journals and data logs. "Teaching" others solidifies understanding and retention of content.
- Use meaningful assessments (performance tasks requiring short and extended responses).
- Focus on student understanding rather than on memorized definitions. Can they apply what they learned to another situation?

***According to the NSTA, 60% of science instructional time should be devoted to these activities. By using these strategies, our students will have positive experiences and become actively engaged in Inquiry, scientific processes, and problem solving.***

*(Adapted with permission from Brevard County Schools)*

| **RELATED READING & MATHEMATICS BENCHMARKS:** | |
|---|---|
| Nonfiction – Standard: The student identifies, analyzes, and applies knowledge of the elements of a variety of nonfiction, informational, and expository texts to demonstrate an understanding of the information presented. | |
| LA.6.2.2.3 | The student will organize information to show understanding (e.g., representing main ideas within text through charting, mapping, paraphrasing, summarizing, or comparing/contrasting); |
| Informative – Standard: The student develops and demonstrates technical writing that provides information related to real-world tasks. | |
| LA.6.4.2.2 | The student will record information (e.g., observations, notes, lists, charts, legends) related to a topic, including visual aids to organize and record information and include a list of sources used; |
| Algebra: BIG IDEA 3 - Write, interpret, and use mathematical expressions and equations. | |
| MA.6.A.3.6 | Construct and analyze tables, graphs, and equations to describe linear function s and other simple relations using both common language and algebraic notation. |
| Mathematics: Statistics - Data Analysis | |
| MA.6.S.6.2 | Select and analyze the measures of central tendency or variability to represent, describe, analyze, and/or summarize a data set for the purposes of answering questions appropriately. (A teacher can give students data sets that contain test/quiz grades for hypothetical classes. Students are asked to calculate and compare the class mean, median, mode, and range and discuss the effects of any outliers on the measures of central tendency. ) |

## 2012 FCAT-2 Annually Assessed *Physical* Science Benchmarks (including "also assessed" benchmarks

### Big Idea 8 Properties of Matter

**ANNUALLY ASSESSED: SC.8.P.8.4**
Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

Also assesses SC.8.P.8.3.

- **SC.8.P.8.3** Explore and describe the densities of various materials through measurement of their masses and volumes.

**ANNUALLY ASSESSED: SC.8.P.8.5**
Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

Also assesses SC.8.P.8.1, SC.8.P.8.6, SC.8.P.8.7, SC.8.P.8.8, and SC.8.P.8.9.

- **SC.8.P.8.1** Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.
- **SC.8.P.8.6** Recognize that elements are grouped in the periodic table according to similarities of their properties.
- **SC.8.P.8.7** Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).
- **SC.8.P.8.8** Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.
- **SC.8.P.8.9** Distinguish among mixtures (including solutions) and pure substances.

### Big Idea 9 Changes in Matter

**ANNUALLY ASSESSED: SC.8.P.9.2**
Differentiate between physical changes and chemical changes.

Also assesses SC.8.P.9.1 and SC.8.P.9.3.

- **SC.8.P.9.1** Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.
- **SC.8.P.9.3** Investigate and describe how temperature influences chemical changes.

### Big Idea 10 Forms of Energy

**ANNUALLY ASSESSED: SC.7.P.10.1**
Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.

Also assesses SC.8.E.5.11.

- **SC.8.E.5.11** Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.

**ANNUALLY ASSESSED: SC.7.P.10.3**
Recognize that light waves, sound waves, and other waves move at different speeds in different materials.

Also assesses SC.7.P.10.2.

- **SC.7.P.10.2** Observe and explain that light can be reflected, refracted, and/or absorbed.

## Big Idea 11 Energy Transfer and Transformations

**ANNUALLY ASSESSED: SC.7.P.11.2**
Investigate and describe the transformation of energy from one form to another.

Also assesses SC.6.P.11.1 and SC.7.P.11.3.

- **SC.6.P.11.1** Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.
- **SC.7.P.11.3** Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.

**ANNUALLY ASSESSED: SC.7.P.11.4**
Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.

Also assesses SC.7.P.11.1.

- **SC.7.P.11.1** Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.

## Big Idea 13 Forces and Changes in Motion

**ANNUALLY ASSESSED: SC.6.P.13.1**
Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.

Also assesses SC.6.P.13.2 and SC.8.P.8.2.

- **SC.6.P.13.2** Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.
- **SC.8.P.8.2** Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

**ANNUALLY ASSESSED: SC.6.P.13.3**
Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.

Also assesses SC.6.P.12.1.

- **SC.6.P.12.1** Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.

## Indicators for Quality Science Instruction

Middle and High School Science

- The classroom is organized into groups, areas, or centers, and science materials are evident and accessible.
- The teacher integrates science curriculum, presenting concepts rather than isolated facts and disciplines.
- The teacher fosters a safe learning environment.
- The teacher provides up-to-date information and a variety of perspectives through the use of current and varied resources, including books, periodicals, telecommunications, and multimedia technology.
- Instruction builds on students' prior understandings. The teacher works to identify and resolve existing science misconceptions.
- The teacher promotes collaboration among students. Students are engaged in cooperative learning to accomplish small group projects and investigations.
- The teacher actively engages students in scientific processes and inquiry.
- Students explore cause-effect relationships, use manipulatives, and participate in hands-on activities (at least 50% of science instruction).
- The teacher engages students in collecting, manipulating and using data. Students analyze data collected through their own laboratory investigations and use it to support oral or written claims.
- The instructional focus is on exploring science concepts rather than covering textbook chapters. Curriculum decisions are based on science standards.
- The teacher involves students in sustained in-depth projects rather than a series of isolated topics. Major ideas are fully explored.
- Applications of science are emphasized. The teacher encourages students to relate classroom studies to their own lives and experiences, as well as to the work of practicing scientists.
- The teacher asks probing questions that encourage student discussion, prediction, or explanation. Students observe and experience science rather than recite memorized information.
- The teacher displays respect for the diverse ideas, skills, and experiences of all students.
- The teacher encourages students to communicate about science, including laboratory reports, class discussions, oral presentations, reflection journals, and data logs.
- The teacher uses meaningful assessments, which focus on understanding concepts, problem-solving abilities, and inquiry skills rather than on memorized definitions.

*(Adapted with permission from Brevard County Schools)*

# SCIENCE SAFETY FOR THE CLASSROOM AND SCIENCE TEACHERS

In order to ensure quality learning experiences for all students, safety must be a priority when setting up labs, activities and experiences for our students. You can promote safety during Science activities and labs by following these procedures:

- Conduct all Science activities yourself before doing them in the class and identify any steps or materials that might create safety hazards.
- Teach measurement and the tools of Science (BOK Nature of Science) at the beginning of the school year, and throughout the year.
- Find out if any students have allergies that might raise serious health concerns, such as allergies to latex or to plant or animal specimens. Be sure all students wear gloves or otherwise protect themselves when interacting with live specimens and chemicals.
- Do not allow students to perform Science activities without supervision.
- Make sure students are dressed appropriately for Science activities and that long hair, loose clothing, or jewelry do not cause safety concerns.
- If using hot plates or other heating equipment, make sure that they are not near flammable materials.
- Do not use mercury thermometers. Use safe liquid alloy or alcohol thermometers.
- Do not leave electrical devices or other machinery on when unattended.
- Chemicals
    - Explain how to correctly dispose of chemicals and other waste from Science activities (dilute with water before flushing down sink).
    - Maintain only a select group of chemicals and only in small quantities (a one-year supply is recommended).
    - Many simple substances, even cleaning supplies, are toxic. Keep these substances in a locked storage area.
    - Consult your MSDS sheets for proper use of chemicals. A resource for MSDS information is the *Flinn Scientific* website: http://www.flinnsci.com/search_MSDS.asp
    - Label your storage areas, storage containers, bottles, and jars. Chemicals should be identified by scientific name, formula, precautions for use, and antidote.

**Suggested Science Safety Rules for Students**

Have students make a Science safety poster illustrating the safety rules. Scientists know they must work safely when doing experiments. As a Science student, you need to be careful when doing Science activities, too. Follow these safety rules.

- Read the activity carefully before you start. Listen to the teacher's instructions. Ask questions about things you do not understand.
- Wear safety goggles and gloves when needed.
- Keep your work area neat and clean. Clean up spills right away.
- Never taste or smell substances unless directed to do so by your teachers.
- Handle sharp items, chemicals and other equipment carefully.
- Help keep plants and animals that you use safe.
- Tell your teacher if you have an accident or you see something that looks unsafe.
- Put materials away when you finish. Dispose of chemicals properly. Wash your hands well when you are finished.

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# Middle School Science Safety Agreement

Scientists know they must work safely when doing experiments. As a student scientist, your child needs to be careful when doing Science activities, too. Please review the following safety rules with your child and sign the safety agreement. Return the form as soon as possible so that your child can start experiencing the exciting hands-on activities we have planned this year.

- Safety apparel (goggles and aprons) will be worn for as long as you are in the lab when specified by the instructor.
- When heat sources are being used by anyone in the lab, long hair will be tied back. Long hanging necklaces, heavy jewelry, and bulky jackets and sweaters should be removed. Keep heat sources toward the middle of the lab tables. Use tongs and/or protective gloves to handle hot objects. Never reach across an open flame or burner.
- There will be no gum, no eating or drinking of any kind in the lab.
- Never taste chemicals/specimens or smell them directly. Avoid touching chemicals as much as possible.
- Activities will be done only as instructed with the specified amounts of materials.
- Proper procedures for handling all equipment and any additional safety precautions for specific labs, will be followed.
- Never leave an activity unattended unless instructed to do so.
- Horseplay or other inappropriate behavior will not be tolerated.
- Report all accidents to the teacher immediately, no matter how minor.
- Do not remove any materials or equipment from the lab without the teacher's permission.
- After completing an activity, all equipment should be put away and materials should be disposed of as directed. Remember, the sinks are not trashcans. Before leaving the room, each work area will be cleaned.

I agree to follow the Science safety rules.

_____
Student Signature

I have read and discussed this safety agreement with my child. My child has the following needs that should be considered during some Science activities:

| | | |
|---|---|---|
| My child wears glasses: | Yes | No |
| My child is colorblind: | Yes | No |
| My child has allergies: | Yes | No |

My child is allergic to:

_____

My child has (other):

_____

_____
Parent/Guardian Signature Date