GENERAL OBJECTIVE(S):

The purpose of this component is to increase the skills of school based educators in developing specific strategies to teach life science concepts and to lead student investigations in schoolyard, city, and forest, freshwater and/or marine environments.

SPECIFIC OBJECTIVES:

Upon completion of this component, participants will:

1. Define, classify, and give examples and attributes of concepts introduced by the workshop leader.
2. Explain, using a simple diagram, how non-living things are recycled in the water cycle, carbon dioxide/oxygen cycle, and/or nutrient cycle.
3. Develop a lesson plan to teach the selected area, humane education. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.
4. Develop a lesson plan to teach the selected area, recycling. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.
5. Develop a lesson plan to teach the selected area, ecology. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.
6. Develop a lesson plan to teach the selected area, water conservation. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.
7. Develop a lesson plan to teach the selected area, marine ecology. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.
8. Develop a lesson plan to teach the selected area, solar energy. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as
activities and assessment strategies that respond to students’ diverse backgrounds and abilities.

9. Develop a lesson plan to teach selected area, forest ecology. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.

10. Develop a lesson plan to teach the selected area, schoolyard ecology. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.

11. Develop a lesson plan to teach the selected area, solid waste and recycling. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.

12. Develop a lesson plan to teach the selected area, electricity. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.

13. Develop a lesson plan to teach the selected area, wildlife conservation. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.

14. Develop a lesson plan to teach the selected area, animal diversity. The lesson plan will identify specific concepts addressed in the workshop. Student and teacher activities will also be identified as a part of the lesson plan, as well as activities and assessment strategies that respond to students’ diverse backgrounds and abilities.

15. Demonstrate the proper use of scientific equipment used in the humane education studies.

16. Demonstrate the proper use of scientific equipment used in ecological studies, e.g., microscope, magnifying glass, digging trowel, dip net, telescope, etc.

17. Demonstrate the proper use of scientific equipment used in solar energy; e.g., solar powered equipment, windmills etc.

18. Demonstrate the proper use of scientific equipment used in marine science, e.g. microscope, magnifying glass, dip net.

19. Demonstrate the proper use of scientific equipment used in soil and water conservation studies; e.g. microscope, magnifying glass, digging trowel, etc.

20. Demonstrate for students, activities identified as “teacher led activities at Cary Forest”, as previously identified by the workshop leader. These demonstrations will take place at the workshop sites.
21. Demonstrate for students, activities identified as “teacher led activities at St. Johns Water Management”, as previously identify by the workshop leader. These demonstrations will take place at the workshop sites.
22. Demonstrate for students, activities identified as “teacher led activities at the Soil and Water Conservation District”, as previously identified by the workshop leader. These demonstrations will take place at the workshop sites.
23. Demonstrate for students, activities identified as “teacher led activities at the Marine Science Education Center”, as previously identified by the workshop leader. These demonstrations will take place at the workshop sites.
24. Demonstrate for students, activities identified as “teacher led activities at Tree Hill”, as previously identify by the workshop identified by the workshop leader. These demonstrations will take place at the workshop sites.
25. Demonstrate for students, activities identified as “teacher led activities at Timucuan Preserve”, as previously identified by the workshop leader. These demonstrations will take place at the workshop sites.
26. Demonstrate for students, activities identified as “teacher led activities at the Environmental Protection Board”, as previously identified by the workshop leader. These demonstrations will take place at the workshop sites.
27. Demonstrate for students, activities identified as “teacher led activities at the E. Dale Joyner Preserve at Pelote’s Island”, as previously identified by the workshop leader. This demonstration will take place at the workshop sites.
28. Demonstrate for students, activities identified as “teacher led activities at the Jacksonville Zoo”, as previously identified by the workshop leader. These demonstrations will take place at the workshop sites.

**DESCRIPTION OF ACTIVITIES:**

1. A series of sessions will be conducted by science resource centers. During each session, participants will engage in specific learning activities related to teaching science concepts in the Sunshine State Standards and Benchmarks for Science. These activities include lecture, discussion, use of A-V/technology materials, and hands-on laboratory or field experiences.

   The centers are:
   - Animal Control (AC)
   - Cary State Forest (CF)
   - Cooperative Extension Service (CS)
   - Environmental Protection Board (EPB)
   - E. Dale Joyner Preserve at Pelote’s (JP)
   - Jacksonville Zoo (JZ)
   - Marine Science Education Center (MC)
   - Soil and Water Conservation (SW)
   - Tree Hill (TH)
   - Timucuan Preserve (TP)

2. If credit is desired for renewal, participants must select the appropriate number of sessions to equal 10 or more hours from the appropriate grade level activities (see following chart).
<table>
<thead>
<tr>
<th>Component Sessions</th>
<th>Objective Grades</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humane Education (AC)</td>
<td>1,3,15 Grades K-5</td>
<td>Workshop on responsible pet ownership and safety around animals. (2 hrs)</td>
</tr>
<tr>
<td>Environmental Education (CF)</td>
<td>20 Grades 3,4,6</td>
<td>Program is designed to introduce Cary State Forest: the general layout of tour programs and the teacher-led activities portion of the tour. (2 hrs)</td>
</tr>
<tr>
<td>Recycling Adventures (CS)</td>
<td>1,2,4 Grades K-8</td>
<td>Workshop will stress ways to teach recycling (2 hrs)</td>
</tr>
<tr>
<td>Project Learning Tree</td>
<td>1.5.16 Grades K-8</td>
<td>Workshop will stress use and care of trees, and interesting concepts about trees. (2 hrs)</td>
</tr>
<tr>
<td>Introduction to Schoolyard Ecology (CS)</td>
<td>1,5,16 Grades K-12</td>
<td>Teachers will develop landscaping plans for improving the school environment. (2 hrs)</td>
</tr>
<tr>
<td>Water Wise Guys (CS)</td>
<td>1,2,6 Grades K-8</td>
<td>Teachers will be introduced to curriculum for teaching water adventures. (2 hrs.)</td>
</tr>
<tr>
<td>Water Ways (CS)</td>
<td>2,21</td>
<td>St. Johns Water Management curriculum (2 hrs.)</td>
</tr>
<tr>
<td>Nonpoint Source Pollution (EB)</td>
<td>1,2,6 Grades K-8</td>
<td>Workshop on the basic relations between land use and water quality. (4 hrs.)</td>
</tr>
<tr>
<td>Air Quality Curriculum (EB)</td>
<td>1,26 Grades 6-8</td>
<td>Workshop offers instruction on air quality (4 hrs.)</td>
</tr>
<tr>
<td>Schoolyard Ecology (TH)</td>
<td>1,2,10,16,24 Grades K-8</td>
<td>A plan for designing and implementing an environmental education program at their specific school site (6 hrs.)</td>
</tr>
</tbody>
</table>
4R’s Project (TH) 1,2,10,16,24 Grades K-5
A solid waste management curriculum to be used as a supplementary resource to help teachers integrate solid waste and recycling into the existing curriculum. (6 hrs)

What’s Watt (TH) 1,2,12,17,24 Grades 4-8
Energy education focusing on basic concepts in electricity. (6 hrs.)

Project Wild (TH) 1,2,13,16,24
Interdisciplinary, supplemental, Environmental and conservation program emphasizing wildlife (6 hrs.)

Forest Ecology at the Timucuan Preserve (TP) Grades 3,4
Workshop focuses on the learning experiences teachers will have when they bring their classes to the Preserve (3 hrs.)

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Field trips/field studies
7. Production of material resources for classroom use.

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form
1. Participants will demonstrate increased knowledge and skill mastery on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Participants will demonstrate the ability to select program activities appropriate to grade level and course standards and benchmarks in environmental education.
3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT(S): Supervisor, Science; Contacts named for each program
GENERAL OBJECTIVE(S):

The purpose of this component is to improve teachers’ understanding of the principles and concepts in physics.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Demonstrate the ability to measure length and mass in SI units.
2. Identify SI units commonly used in physics.
3. Solve problems involving scientific notation and significant figures.
4. Solve first and second degree algebraic equations.
5. Identify or calculate the slope of a linear equation.
6. Describe the variables in time-velocity graphs.
7. Demonstrate and explain examples of Newton’s three laws of motion.
8. Provide examples of the factors affecting gravity and calculate acceleration resulting from gravity.
9. Demonstrate and solve problems involving impulse, conservation of momentum, and vector addition.
10. Demonstrate and explain situations involving work, energy, and power.
11. Distinguish between kinetic and potential energy and describe how one form can change to the other.
12. List and describe the basic forces in nature.
13. Describe the relationship between magnetism and electricity.
14. Distinguish between static and current electricity.
15. Distinguish between direct and alternating current.
17. Describe and demonstrate resistance, voltage, and current.
18. Distinguish between reflection and refraction and the various laws governing the behavior of light.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Production of materials for classroom use.
LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate increased knowledge and skill mastery on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.

2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT(S): Supervisor, Science
TITLE: Molecular and Cellular Biology

NUMBER: 1-015-03-00 POINTS TO BE EARNED: 60

GENERAL OBJECTIVE (S):

The purpose of this component is to improve teachers’ understanding of molecular and cellular biology, the vast diversity of living things, and their evolutionary relationships.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. List the characteristics of living things.
2. Describe current knowledge about kingdoms of living organisms and their evolutionary relationships based on genetic makeup and other factors.
3. Name and characterize the main types of organic molecules found in living things.
4. Distinguish between prokaryotic and eukaryotic cells.
5. Name the structures of eukaryotic cells and state the function of each.
6. Describe the cell cycle, including interphase, mitosis, and cytokinesis, and the processes occurring in each.
7. Describe the structure of the cell membrane.
8. Describe the ways in which materials cross the cell membrane.
9. Describe the characteristics of enzymes, and explain the role of enzymes in cellular metabolism.
10. Explain how enzymatic activity is affected by such factors as the amount of enzyme and substrate present, change in temperature, change in pH, and the presence of inhibitors.
11. Explain the relationship between energy and metabolism, and the role of ATP in cellular metabolism.
12. Describe the importance of homeostasis in cells and organisms.
13. Describe the process of respiration; by which cells obtain energy from food.
14. Describe the process of photosynthesis, by which plants use light energy to make food.
15. Solve problems in genetics involving monohybrid and dihybrid crosses by applying Mendel’s laws.
16. Solve problems in genetics involving incomplete dominance, polygenes, multiple alleles, and sex linkage.
17. Describe the process of meiosis and its importance in the life of an organism.
18. Describe the structure and replication of DNA.
19. Explain the mechanism by which DNA controls the processes of the cell.
20. Describe the process of protein synthesis.
21. Describe the current status of genome mapping for various organisms, including humans.
22. Explain the meaning and process of genetic engineering.
23. Explain what biologists mean by evolution, and describe the importance of the theory of evolution to the study of biology.
24. Describe the evolutionary relationships among various groups of living things.
25. Identify contributions of people of diverse backgrounds to molecular, cellular, and evolutionary biology.
26. Develop teaching and assessment strategies and inquiry activities that respond to the needs of student’s diverse abilities and background.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate increased knowledge on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Development of several inquiry activities to teach various biological science concepts.
3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT (S): Supervisor, Science
TITLE: Nature of Matter and Energy

NUMBER: 1-015-04-00 POINTS TO BE EARNED: 60

GENERAL OBJECTIVE(S):

The purpose of this component is to improve teachers’ understanding of the concepts and content involved in chemistry, including energy, and Strands A and B of the Sunshine State Standards for Science.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Demonstrate the ability to correctly measure length, mass, volume, and temperature in SI units.
2. Differentiate between statements that describe units and quantities.
3. Demonstrate the ability to calculate the density of liquids, gases, and regular and irregular solid objects.
4. Solve problems involving scientific notation and significant figures.
5. Distinguish between precision and accuracy.
6. Locate on a periodic table the positions of metals, non-metals, and transition elements.
7. Describe the significance of groups and periods in the periodic table of the elements.
9. Trace the history of the concept of the atom.
10. Demonstrate knowledge of simple atomic and nuclear structure and properties, including protons, neutrons, and electrons, and of experiments that led to this knowledge.
11. Describe the current atomic theory, including the dual nature of matter.
12. Given atomic mass numbers and percentages of isotopes that make up a sample of an element, determine the average atomic mass of the element.
13. Determine from an excerpt of the periodic table, the number of electrons in the atom of an element and the number of neutrons in the nucleus of the element.
14. Recognize the properties of atoms, molecules and valence and relate these properties to the writing of chemical formulas.
15. Given reactants and products, balance chemical equations.
16. Describes the concepts of entropy and equilibrium.
17. Describe the factors that affect reaction rates.
18. Demonstrate the various gas laws and solve gas law problems.
19. Describe the mole concept and solve stoichiometric problems.
20. Describe the various definitions of acids and bases, identify various acids and bases, and demonstrate the neutralization of an acid or base.
21. Demonstrate the use of buffers in acid-base equilibria.
22. Describe the laws of conservation of matter and energy.
23. Describe the first and second laws of thermodynamics.
24. Describe the difference between heat and temperature.
25. Develop teaching and assessment strategies and inquiry activities that respond to the needs of student’s diverse abilities and backgrounds.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

2. Hands-on activities
3. Demonstration lessons
4. Lecture
5. Discussion
6. Small/large group work
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use.

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work
EVALUATION (STAFF): A Changes in Classroom Practices
IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public School’s Evaluation of In-service Form

1. Participants will demonstrate increased knowledge on eight percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Development of several inquiry activities to teach various chemistry concepts.
3. The Professional Development Evaluation Form will be used to evaluate delivery of the component.

COMPONENT CONTACT (S): Supervisor, Science
TITLE: Science, Technology, and Society (STS)

NUMBER: 1-015-05-00 POINTS TO BE EARNED: 60

GENERAL OBJECTIVE(S):

The purpose of this component is to improve the knowledge of elementary and secondary science and social studies teachers about the interrelationships among science, technology, and society.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Define the three concepts: science, technology, and society.
2. Research and discuss various past changes in technology and how they affected society.
3. Research and describe changes in society resulting from changes in information and/or communication technology.
4. Research and describe changes in society resulting from changes in medical technology.
5. Research and describe changes in society resulting from changes in transportation technology.
6. Identify at least two major advances in science and/or technology and discuss their effect on the environment, the economy, communication, transportation, medicine, and/or the quality of human life.
7. Identify and analyze information about STS that appear in the news media.
8. List and discuss at least five STS issues facing the global population.
9. Project the effect of a new technology by evaluating its possible positive and negative consequences.
10. Discuss the implications of growth and development on the environment and citizens of Northeast Florida.
11. Compare and contrast the terms values and attitudes.
12. Describe how an awareness of STS issues may affect people’s values and attitudes.
13. Demonstrate how to integrate science and social studies through the development of an STS lesson or unit.
14. Develop teaching and assessment strategies in STS that respond to the needs of students with diverse backgrounds and abilities.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture  
4. Discussion  
5. Small/large group work  
6. Field trips  
7. Use of audio-visual materials and the Internet  
8. Production of material resources for classroom use.

**LEARNING METHOD:** A Workshop  

**EVALUATION (STUDENT):** C Portfolios of Student Work  

**EVALUATION (STAFF):** A Changes in Classroom Practices  

**IMPLEMENTATION:** P Participant Product related to training  

**EVALUATION CRITERIA:**

Duval County Public School’s Evaluation of In-service Form  

1. Participants will demonstrate increased knowledge and skill mastery on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest or  

2. Presentation of a project about one facet of the interrelationship of science, technology, and society.  

3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT(S):** Supervisor, Science
TITLE: Inquiry and Problem Solving

NUMBER: 1-015-06-00    POINTS TO BE EARNED: 15

GENERAL OBJECTIVE(S):

The purpose of this component is to provide teachers with knowledge and skills to provide inquiry and problem solving experiences in science for their students.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify and explain the continuum of inquiry, from more teacher-centered to more student-centered.
2. Identify process skills that could be used to solve problems in scientific investigations.
3. Describe how scientific methods are used to solve scientific problems.
4. Identify strategies and appropriate activities for inquiry experience.
5. Identify sources of information for development of inquiry and problem solving skills.
6. Describe the use of problem solving strategies and scientific methods in science projects.
7. Describe the use of problem solving strategies in creating an invention.
8. Develop inquiry activities that are appropriate for students with diverse abilities and backgrounds.
9. Develop activities to solve problems that are appropriate for students with diverse abilities and backgrounds.
10. Develop science project activities that are appropriate for students with diverse abilities and backgrounds.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of the Internet
7. Production of materials for classroom use.

LEARNING METHOD:  A  Workshop

EVALUATION (STUDENT):  C  Portfolios of Student Work
EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public School’s Evaluation of In-service Form

1. Participants will demonstrate increased knowledge and skill mastery on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Preparation of an inquiry or problem solving activity for students or a lesson or unit plan for helping students create an invention or science project.
3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT(S): Supervisor, Science
TITLE: Project Learning Tree (PLT)

NUMBER: 1-015-07-00 POINTS TO BE EARNED: 40

GENERAL OBJECTIVE(S):

The purpose of this component is to provide participants with content knowledge, materials, and strategies for teaching about forests, land use, and resource allocation and for integrating these concepts into the science, social studies, math, language arts, and other curricula.

SPECIFIC OBJECTIVIES:

Upon completion of the component, participants will:

1. Demonstrate knowledge of forest concepts and related theories, facts, and assumptions.
2. Apply forest concepts and related theories, facts, and assumptions to ecological systems in Florida’s forest.
3. Use science methods to investigate environmental situations.
4. Describe important issues about Florida’s forests.
5. Discuss past and current trends and consequences of forest practices.
6. Describe the implications of interactions between science, technology, and society and the environment.
7. Identify methods that enhance critical thinking skills and move participants from awareness to changes in life style relating to forest resources.
8. Correlate PLT concepts with the Florida Sunshine State Standards and benchmarks for Science.
9. Develop teaching and assessment strategies that respond to the needs of students with diverse abilities and backgrounds.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Field trips/field studies
7. Production of material resources for classroom use.

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work
EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public School’s Evaluation of In-service Form

1. Participants will demonstrate increased knowledge and skill mastery on eighty percent (80%) of the specific objectives through an objective-based pretest and posttest.
2. Participants will demonstrate the ability to select Project Learning Tree activities appropriate to grade level and course standards and benchmarks in environmental education.
3. Participants will select PLT activities that would be appropriate for interdisciplinary units.
4. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT(S) Supervisor, Science
TITLE: Environmental Education

NUMBER: 1-015-08-00 POINTS TO BE EARNED: 40

GENERAL OBJECTIVE(S):

The purpose of this component is to enhance teachers’ understanding of a wide variety of topics related to environmental education, with an emphasis on the Florida environment.

SPECIFIC OBJECTIVES:

Upon completion of this component, participants will:

1. Outline environmental topics to encourage a sound conservation philosophy.
2. Identify strategies for observing nature.
3. Demonstrate knowledge of outdoor survival skills.
4. Describe the relationships between ecosystems and climate.
5. Distinguish among populations, habitats, niches, communities, and ecosystems.
6. Discuss examples of predator-prey relationships.
7. Describe the effects of changes in one part of a food web on other parts of the web.
8. Describe the characteristics and locations of various global biomes.
9. Describe the interrelationships between forests, wildlife, and water quality.
11. Describe important issues about Florida’s forests, including timber management practices, wildfires, and prescribed burning.
12. Identify major concerns of Florida’s water system, including the Floridan aquifer.
13. Identify selected examples of Florida’s flora and fauna.
14. Identify ways that people can implement personal commitments to preserve and enhance the environment.
15. Develop teaching and assessment strategies that respond to the needs of students with diverse abilities and backgrounds.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Field trips/field studies
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use.
LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public School’s Evaluation of In-service Form

1. Participants will demonstrate increased knowledge and skill mastery on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Preparation of a lesson and materials appropriate to grade level and course standards and benchmarks in environmental education.
3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT(S): Supervisor, Science
TITLE: Alternative Assessment

NUMBER: 1-015-09-00        POINTS TO BE EARNED: 30

GENERAL OBJECTIVE(S):

The purpose of this component is to provide elementary and secondary teachers with knowledge about alternative assessment and with skills to begin implementation of one or more of its forms.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Describe the meanings of the term’s alternative assessment, performance assessment and authentic assessment.
2. List several advantages of alternative assessment over standardized testing in evaluating student learning.
3. Have reviewed at least five recent journal articles dealing with alternative assessment.
4. Describe at least five different methods of alternative assessment.
5. Give an example of an actual assessment for each of these methods, as described in #4.
6. Define the term rubrics and describe how rubrics are used for evaluation in alternative assessment.
7. Have developed a portfolio assessment suitable for the diverse abilities and backgrounds of their students, including rubrics for evaluating it.
8. Have developed one or more types of performance assessment suitable for diverse abilities and backgrounds of their students, including rubrics for evaluating the performance.
9. Have used at least one form of alternative assessment to evaluate student learning in their classroom.
10. Have a portfolio in progress of their individual thinking and work on an alternative assessment, including assessment examples and rubrics.

DESCRIPTION OF ACTIVITIES:

Activities will include: lecture/discussion, cooperative groups, modeling of assessment alternatives, reading of current research, and hands-on development of alternative assessment items.

LEARNING METHOD:          A  Workshop

EVALUATION (STUDENT):     C  Portfolios of Student Work

EVALUATION (STAFF):       A  Changes in Classroom Practices
IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate knowledge of alternative assessment practices and ability in developing alternative assessments for the classroom. They will be evaluated in two ways: a pretest/posttest and an educational product.
2. The pretest/posttest will cover specific objective #1-6; participants must master at least 80% of these objectives. The educational product will be one or more of the assessments described in specific objectives #7-10, as follows:
   i. 4 point component one of the four objectives
   ii. 10 point component two of the four objectives
   iii. 20 point component three of the four objectives
   iv. 30 point component all four objectives
3. Participants and consultants will evaluate the component by completing the Professional Development Evaluation Form.

COMPONENT CONTACT(S) Supervisor, Science/Environmental Studies
TITLE: Science Teacher Leaders

NUMBER: 1-015-10-00 POINTS TO BE EARNED: 30

GENERAL OBJECTIVE(S):

To develop mentoring skills and materials that experienced secondary science teachers may use to assist beginning or more inexperienced teachers in teaching science.

SPECIFIC OBJECTIVES:

Upon completion of this component, participants will have:

1. Identified and individual area of strength in science content/concepts.
2. Demonstrate Knowledge of the science content/concepts in this area of strength.
3. Developed a model lesson incorporating hands-on strategies, which can be used to teach that concept.
4. Developed a video presentation based on the lesson.
5. Acquired skills necessary for presenting an on-camera demonstration that could translate into student video productions.
6. Made a videotape of the teacher training presentation.
7. Developed instructional materials to assist the beginning teacher in presenting the lesson to students.
8. Developed student materials supporting the video presentation that are responsive to students’ diverse backgrounds and abilities.
9. Developed assessment strategies that will respond to students’ diverse backgrounds and abilities.
10. Formed a mentor ship with at least one beginning or less experienced teacher for a specified time, using the videotapes as one means of support.

DESCRIPTION OF ACTIVITIES:

In a series of workshop sessions, participants will demonstrate knowledge of specific science content/concepts, effective teaching strategies, and video presentation skills by making a videotape to be used for teacher training. Teacher and student resource materials supporting the videotapes will be developed for inclusion into a notebook. Participants will also form mentor ships with beginning or less experienced teachers, which make sure of their teaching experience and content knowledge.

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training
EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Each participant will demonstrate knowledge on (80%) of the objectives developed by workshop leaders for individual content knowledge, teaching strategies, and video presentation.
2. Each participant will produce at least one video on a specific science topic for teacher training.
3. Each participant will form a mentorship with at least one beginning or less experience teacher for a length of time agreeable to both.
4. Participants and consultants will evaluate the component by completing the Professional Development Evaluation Form.

COMPONENT CONTACT(S): Supervisor, Science
TITLE: Science Information Update

NUMBER: 1-015-11-00  POINTS TO BE EARNED: 10

GENERAL OBJECTIVE(S):

The purpose of this component is to provide elementary or secondary teachers with current knowledge and recent developments in various areas of science.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Describe in writing current knowledge and recent developments in the science area selected as the focus of the workshop.
2. State in writing the impact of these developments on selected individuals and/or society.
3. Identify at least four sources of science information that can be consulted for periodic updating of these recent developments.
4. Develop teaching strategies for the updated content that are appropriate for the diverse abilities and backgrounds of students.

DESCRIPTION OF ACTIVITIES:

1. Lecture
2. Discussion
3. Small/large group work
4. Internet searches
5. Field trips/field studies

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate increased knowledge and skill mastery on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Preparation of a brief paper describing recent developments in the content area selected
3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT(S): Supervisor, Science
TITLE: STARBASE: Integrating Aviation/Aerospace Technology into the Science and Mathematics Curricula

NUMBER: 1-015-12-00 POINTS TO BE EARNED: 30

GENERAL OBJECTIVES(S):

The purpose of this component is to help elementary and middle school teachers develop knowledge of specific techniques to integrate aviation/aerospace and advanced technology into the science and mathematics curricula. They will also develop techniques to teach personal growth, including goal setting and building self-esteem.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify aviation/aerospace resources for integration into science and mathematics curricula.
2. Identify techniques for appropriate questioning to solicit critical thinking.
3. Develop aviation/aerospace experiences that are appropriate for students with diverse abilities and backgrounds.
4. Develop and demonstrate appropriate grade level activities for problem solving related to aviation/aerospace.
5. Develop activities that promote personal growth, including goal setting and building self-esteem.
6. Describe methods by which aviation/aerospace and advanced technology can enhance cross-curricular activities and enrich students’ academic experiences.
7. Develop cross-curricular activities in aviation/aerospace that promote the “whole child” concept.
8. Describe the use of critical thinking and quality management skills in classroom activities.
9. Develop crisis intervention and classroom management strategies appropriate for students with diverse abilities and backgrounds.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Tour of the STARBASE facility

LEARNING METHOD: A Workshop
EVALUATION (STUDENT):  C  Portfolios of Student Work
EVALUATION (STAFF):  A  Changes in Classroom Practices
IMPLEMENTATION:  P  Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate increased knowledge on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Participants will demonstrate an understanding of material presented through participating in experiments and through critical thinking.
3. Participants will demonstrate knowledge in promoting student self-esteem and race and gender equity in the classroom through group activities.
4. Participants will demonstrate increased knowledge in developing cross-curricular experiments in aviation/aerospace through their participation in-group activities, which build upon this concept.
5. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT(S):  Supervisor, Science
TITLE: Project Wild/Aquatic Wild/Schoolyard Wildlife

NUMBER: 1-015-13-00 POINTS TO BE EARNED: 60

GENERAL OBJECTIVE(S):

The purpose of this component is to introduce participants to the:

1. availability and use of various components of Project WILD, an activity-centered, supplementary conservation and environmental education program that emphasizes wildlife and its habitats (specific objectives 1-7, 20).
2. aquatic habitats that various bodies of water support (specific objectives 8-14, 20)
3. potential of their school site for teaching wildlife education on school property (specific objectives 15-20).

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Describe the basic philosophy and goals of Project WILD.
2. Identify the seven basic principles of Project WILD in an environmental education unit.
3. Articulate the conceptual framework around which Project WILD activities are designed.
4. Demonstrate content knowledge of Florida’s terrestrial and aquatic wildlife resources.
5. Identify and describe methods of integrating basis principles of wildlife management and environmental education.
6. Develop appropriate activities to increase student knowledge and awareness of current and projected problems in the conservation of Florida’s natural resources.
7. Demonstrate specific teaching techniques in implementing Project WILD activities for environmental education.
8. Describe the characteristics of aquatic environments.
9. Demonstrate an awareness of the interconnectedness of all waters on the planet.
10. Describe the contributions of aquatic species and aquatic ecosystems to people and the environment.
11. Demonstrate content knowledge of aquatic species, aquatic habitats, and aquatic ecosystems in both fresh water and marine environments.
12. Describe the impact of human cultural traditions on aquatic environments.
13. Demonstrate knowledge of aquatic environmental issues and consequences: i.e. acid rain, land use questions, pollution, and nutrient loading in lakes.
14. Demonstrate specific teaching techniques in implementing Aquatic WILD activities for environmental education.
15. Demonstrate content knowledge of the plants and animals indigenous to north central Florida.
16. Select from workshop materials plant and animal activities that are suitable to the age, needs, and abilities of students.
17. Articulate the benefits of establishing a wildlife habitat study area on school property.
18. Describe different types of wildlife habitat study areas that are suitable for different school sites, based on previously existing site ecosystems.
19. Describe how to develop a wildlife habitat study area on school property.
20. Develop teaching and assessment strategies in environmental education that respond to the needs of students with diverse backgrounds and abilities.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Field trips/field studies
7. Production of material resources for classroom use.

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate increased knowledge and skill mastery on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Participants will demonstrate the ability to select Project WILD, Aquatic WILD, and/or Schoolyard Wildlife classroom activities appropriate to grade level and course standards and benchmarks in environmental education.
3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT(S): Supervisor, Science
TITLE: Understanding by Design in Science

NUMBER: 1-015-14-00  POINTS TO BE EARNED: 90

GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of the Understanding by Design (UbD) curriculum framework. Participants will be introduced to all three stages in the context of a specific science content area. They will use this training to create and teach an expanded unit based on the district curriculum that incorporates the principles of UbD. Participants will provide feedback to the district on the implementation of the unit.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify what is worthy for students to understand including the Sunshine State Standards for science (Stage 1).
2. Write a set of enduring understandings for a unit within a science content area.
3. Write a set of essential questions for a unit within a science content area.
4. Identify the knowledge and skills that students are expected to master in this unit.
5. Identify the essential components of assessment (Stage 2).
6. Create a performance task that will assess Stage 1.
7. Identify the components of good items to use for visualizations.
8. Evaluate web sites for use as visualizations.
9. Identify commonly held misconceptions in science.
10. Identify the essential components of a WHERE (Stage 3).
11. Select a unit in an appropriate curriculum and construct a Stage 1.
12. Learn appropriate methods for providing peer review.
13. Provide peer review for your colleagues’ Stage 1’s.
14. Develop an appropriate performance task that will assess your students’ knowledge of your enduring understandings and essential questions.
15. Provide peer review for your colleagues’ Stage 2’s.
16. Identify other forms of alternative assessments to use in your unit including a pre and post test.
17. Develop appropriate WHERE’s for your unit that provide opportunities for your students to experience and apply information that is necessary for them to demonstrate that they have comprehended the enduring understandings (Stage 3).
18. Incorporate visualizations that are appropriate whenever possible in the WHERE.
19. Create opportunities that address commonly held student misconceptions concerning the topic you are teaching.
20. Provide peer review for your colleagues’ Stage 3’s.
21. Complete a multi-week science unit using the Understanding by Design format, the district curriculum, and the Sunshine State Standards.
22. Reflect on implications of research on learning as applied to your unit.
23. Collaborate with peers to identify connecting links for students by utilizing the six facets of understanding whenever appropriate within the unit.
24. Observe a colleague in the classroom implementing a lesson from their unit and provide peer review.
25. Reflect in writing on the general process used to create and implement the unit.
26. Present your findings concerning the construction process of this unit and its implementation in the classroom to your peers.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Lecture
3. Discussion
4. Individual and group reflection (verbal and in writing)
5. Small/large group work
6. Reading strategies for science text comprehension
7. Search for and evaluation of appropriate web sites

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

For 60 points:

2. Participants will design a multi-week science unit using the Understanding by Design format.
3. Participants will provide reflective feedback on this process and how it has impacted their teaching in the classroom.
For additional points beyond 60:

4. Participants will implement their unit in the classroom.
5. Participants will present their findings to their peers.

COMPONENT CONTACT: Supervisor, Science
TITLE: Science Contact and Science Chairpersons Update

NUMBER: 1-015-15-00 POINTS TO BE EARNED: 60

GENERAL OBJECTIVE(S):

The purpose of this component is to help elementary science contacts and secondary science department chairpersons to develop a current knowledge of science standards, curricular content, and district policy and practices related to science for enhancing science instruction in the classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Visit exemplary science programs, in schools and in the community.
2. Review the science curriculum appropriate to their grade levels and/or course:
3. Learn about the current assessment programs for district students;
4. Receive information about the science promotional requirements;
5. Discuss the correlation between the curricula, the textbook, Science For All Students, and national standards;
6. Share lessons used in their classrooms successfully that support the curricular guidelines and reforms;
7. Receive safety updates;
8. Learn about co- and extra-curricular opportunities;
9. Review opportunities for technology integration;
10. Share meeting agenda with their peers;
11. Discuss district goals and objectives regarding multicultural education;
12. Explain the different approaches to multicultural education regarding context, content and process of instruction.

DESCRIPTION OF ACTIVITIES:

Contacts and Department Chairpersons will participate in periodic meetings that will include one or more of the following:

1. Discussion
2. Hands-on activities
3. Demonstration
4. Lecture
5. Production of material resources for classroom work
6. Field trips

LEARNING METHOD: A Workshop
EVALUATION (STUDENT):  C  Portfolios of Student Work
EVALUATION (STAFF):  A  Changes in Classroom Practices
IMPLEMENTATION:  P  Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will share meeting agendas with their peers.
2. Participants will evaluate the program for the year in writing
3. Participants will design the agenda for the program for the next school year.
4. Participants will evaluate the component by completing the Professional Development Evaluation form.

COMPONENT CONTACT(S):  Supervisor, Science
GENERAL OBJECTIVES(S):

The purposes of this component are to:

1. Prepare teachers to bring their students to a field experience at the Challenger Learning Center.
2. Provide resource materials and instructional techniques for integrating space science and technology into the science and mathematics curricula.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify at least four activities from the Challenger resource materials that can be used as part of the participant’s current teaching assignment to prepare students to visit the Challenger Center.
2. Participate in a simulation of the roles students will play as they work as a member of a mission control group.
3. Identify the different cultural and ethnic backgrounds of the Challenger astronauts and scientists who serve as role models.
4. Identify space science resources for integration into the science and mathematics curricula.
5. Develop and demonstrate appropriate grade level activities for problem solving as they relate to space science.
6. Describe methods by which space science and technology can enhance interdisciplinary activities and enrich students’ academic experiences.
7. Identify techniques for appropriate questioning to solicit critical thinking.
8. Develop presentation delivery skills that are appropriate to different student learning styles in an active classroom.
9. Develop teaching and assessment materials and strategies that will be responsive to the needs of students of diverse background and abilities.

DESCRIPTION OF ACTIVITIES:

The workshop is designed to prepare the teachers for providing their students with instructional experiences and materials prior to visiting the Challenger Learning Center.

Activities will include several of the following:

1. Hand-on activities
2. Demonstration lessons
3. Lecture/discussions
4. Small/large group activities
5. Production of classroom resource materials
6. Participation in a simulated Challenger “mission”.

**LEARNING METHOD:**    A        Workshop

**EVALUATION (STUDENT):**    C        Portfolios of Student Work

**EVALUATION (STAFF):**    A       Changes in Classroom Practices

**IMPLEMENTATION:**    P        Participant Product related to training

**EVALUATION CRITERIA:**

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate increased knowledge on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. Participants will demonstrate the ability to select and use in the classroom Challenger Learning Center instructional materials appropriate to grade level and course standards and benchmarks in space science.
3. Participants will complete the following out-of-class assignments:
   a. Share the workshop information with other teachers from the participant’s school or responsibility center;
   b. Design, implement, and evaluate a two-week lesson plan or interdisciplinary unit.
   c. Write out a plan for a specific space-related project that will help students learn about space science and their role assignment during the Challenger Learning Center experience.
4. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT(S):**    Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts and content in physical, earth/space, and life sciences.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. Objects can be described, classified, and compared by their composition and physical properties.
2. Many things are made of smaller parts.
3. Sound is caused by vibrations.
4. Sunrise and sunset are due to the rotation of the earth every 24 hours.
5. All living things have basic needs.
6. If living things do not get food, water, shelter, and space to live, they will die.
7. Plants and animals have many different parts.
8. Living things have offspring that resemble their parents.
9. There are many different kinds of living things that live in many different environments.
10. Plants and animals depend on each other to survive.
11. In order to learn about the world, it is important to observe and compare.
12. Tests repeated under the same conditions give similar results.
13. In science, it is helpful to work with a team and to share findings.
14. People use scientific processes to explore the natural world. The senses, tools, and instruments help us obtain information from our surroundings.
15. Most natural events occur in patterns.
16. Science, technology, and society are interwoven and interdependent.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

LEARNING METHOD: A Workshop
EVALUATION (STUDENT): C  Portfolios of Student Work
EVALUATION (STAFF): A  Changes in Classroom Practices
IMPLEMENTATION: P  Participant Product related to training

EVALUATION CRITERIA:

Duval County Public School's Evaluation of In-service Form

1. Participants will demonstrate increased knowledge of specific objectives through learning log entries.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts and content in physical, earth/space, and life sciences.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. Different things move at different speeds.
2. There is a relationship between force and motion.
3. One way to change how something is moving is to give it a push or a pull.
4. The solid materials making up the earth come in all sizes.
5. Life occurs on or near the surface of the earth in land, air and water.
6. People influence the quality of life in the environment.
7. The sun supplies heat and light energy to Earth.
8. Environments have living and non-living parts.
9. Plants and animals depend on each other to survive.
10. If living things do not get food, water, shelter, and space to live, they will die.
11. All living things have basic needs.
12. Every human action requires energy from food.
13. Living things and non-living things are different.
14. Plants and animals have different structural characteristics.
15. Plants and animals change as they grow.
16. Living things have offspring that resemble their parents.
17. The structures of living things are adapted to their function in the environment.
18. Animals and plants can be matched to their environment by looking at their structural characteristics.
19. In order to learn about the world, it is important to observe and compare.
20. Tests repeated under the same conditions have similar results.
21. In science, it is helpful to work with a team and to share findings.
22. People use scientific processes to explore the natural world.
23. The senses, tools, and instruments help us obtain information from our surroundings.
24. Most natural events occur in patterns.
25. Science, technology, and society are interwoven and interdependent.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

**LEARNING METHOD:**
- **A**  Workshop

**EVALUATION (STUDENT):**
- **C**  Portfolios of Student Work

**EVALUATION (STAFF):**
- **A**  Changes in Classroom Practices

**IMPLEMENTATION:**
- **P**  Participant Product related to training

**EVALUATION CRITERIA:***

1. Participants will demonstrate increased knowledge of specific objectives through learning log entries.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT:**  Supervisor, Science
TITLE: Grade 1 Science: STC “Life Cycle of Butterflies”

NUMBER: 1-015-19-00  POINTS TO BE EARNED: 6

GENERAL OBJECTIVE:

The purpose of this component is to provide teachers an understanding of concepts and content required for implementing the Science and Technology for Children (STC) “Life Cycle of Butterflies” kit.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. Environments have living and non-living parts.
2. Plants and animals depend on each other to survive.
3. If living things do not get food, water, shelter, and space to live, they will die.
4. All living things have basic needs.
5. Plants and animals have different structural characteristics.
6. Plants and animals change as they grow.
7. Living things have offspring that resemble their parents.
8. The structures of living things are adapted to their function in the environment.
9. Animals and plants can be matched to their environment by looking at their structural characteristics.
10. In order to learn about the world, it is important to observe and compare.
11. In science, it is helpful to work with a team and to share findings.
12. People use scientific processes to explore the natural world.
13. The senses, tools, and instruments help us obtain information from our surroundings.
14. Most natural events occur in patterns.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

LEARNING METHOD: A Workshop
EVALUATION (STUDENT):  C  Portfolios of Student Work
EVALUATION (STAFF):   A  Changes in Classroom Practices
IMPLEMENTATION:        P  Participant Product related to training

EVALUATION CRITERIA:

1. Participants will demonstrate increased knowledge on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT:  Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts and content in physical, earth/space, and life sciences.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. Objects can be described, classified, and compared by what they are made of and by their physical properties.
2. The same material can exist in different states.
3. The properties of materials can change.
4. Many things are made of smaller parts.
5. Weather occurs in recognizable patterns.
6. Light reflected by the moon looks a little different each night.
7. Day and night (sunrise and sunset) are due to the rotation of the earth every 24 hours.
8. The sun supplies heat and light energy to Earth.
9. There are many objects in the sky that are only visible at night.
10. Light passes through some objects and not others.
11. Model energy systems can be described.
12. Heat can be produced in many ways.
13. All living things have basic needs.
14. People need energy from food.
15. The structures of living things are adapted to their function in the environment.
16. There are many different kinds of living things that live in many different environments.
17. Environments have living and non-living parts.
18. Plants and animals depend on each other to survive.
19. There are many different plants and animals living in many different environments.
20. Animals and plants can be matched to their environment by looking at their structural characteristics.
21. If living things do not get food, water, shelter, and space to live, they will die.
22. Human activities affect plants and animals in many ways.
23. People influence the quality of life in the environment.
24. In order to learn about the world, it is important to observe and compare.
25. Tests repeated under the same conditions give similar results.
26. In science, it is helpful to work with a team and to share findings.
27. People use scientific processes to explore the natural world.
28. The senses, tools, and instruments help us obtain information from our surroundings.
29. Most natural events occur in patterns.
30. Science and technology are connected to people's lives.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work
EVALUATION (STAFF): A Changes in Classroom Practices
IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

1. Participants will demonstrate increased knowledge of specific objectives through learning log entries.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to provide teachers an understanding of concepts and content required for implementing the Science and Technology for Children (STC) “Weather” kit.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. The same material can exist in different states.
2. The properties of materials can change.
3. Weather occurs in recognizable patterns.
4. Clouds are the source of precipitation.
5. The sun supplies heat and light energy to Earth.
6. Heat can be produced in many ways.
7. Environments have living and non-living parts.
8. Weather data can be collected daily and displayed using charts and graphic organizers.
9. Weather data can be collected over time and compared to find seasonal weather patterns.
10. In order to learn about the world, it is important to observe and compare.
11. Tests repeated under the same conditions give similar results.
12. In science, it is helpful to work with a team and to share findings.
13. People use scientific processes to explore the natural world.
14. The senses, tools, and instruments help us obtain information from our surroundings.
15. Most natural events occur in patterns.
16. Science and technology are connected to people's lives.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use
LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

1. Participants will demonstrate increased knowledge on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts and content in physical, earth/space, and life sciences.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. Properties of materials can be compared and measured.
2. The weight of an object equals the sum of its parts.
3. Materials may be made of parts too small to be seen without magnification.
4. There are various forms of energy.
5. Most things that emit light also emit heat.
6. Energy can be transformed from one type to another.
7. The various forms of energy can be measured.
8. Heat moves from one object to another until both are at the same temperature.
9. Large rocks break down to smaller rocks and then to soil.
10. The surface of the Earth is in a continuous state of change.
11. About 75% of the Earth is covered by water.
12. Temperature, air pressure, and land features influence the water cycle.
13. The appearance of sunrise and sunset is due to the rotation of Earth every 24 hours.
14. The combination of the earth's movement and the movement of the moon around the earth causes the phases of the moon.
15. The sun is a star and it provides energy for Earth.
16. There are many other stars besides our sun.
17. Living things are different but share similar structures.
18. Many characteristics of an organism are inherited but other characteristics are learned.
19. Organisms need energy.
20. Animals eat plants or other animals for energy.
21. All animals depend on plants.
22. It is important to keep accurate records scientific experiments.
23. A successful method of exploring the natural world is to observe, record, analyze, and communicate the results.
24. In working collaboratively, all team members should be free to reach, explain, and justify their own conclusions.
25. Comparing and contrasting observations and results are essential skills in science.
26. Models differ from the real thing but help us learn about it.
27. Natural events are often predictable and logical.
28. People invent new tools to solve problems and do work that affects life outside of science.
29. Data are collected and interpreted to explain events or concepts.
30. People should determine the effects of new discoveries.
31. Science processes and knowledge help people solve problems.

**DESCRIPTION OF ACTIVITIES:**

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Reading strategies for science text comprehension
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use

**LEARNING METHOD:** A Workshop

**EVALUATION (STUDENT):** C Portfolios of Student Work

**EVALUATION (STAFF)** A Changes in Classroom Practices

**IMPLEMENTATION:** P Participant Product related to training

**EVALUATION CRITERIA:**

1. Participants will demonstrate increased knowledge of specific objectives through learning log entries.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT:** Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts and content in physical, earth/space, and life sciences.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. Vibrations cause waves, which can produce sound.
2. Waves travel at different speeds through different materials.
3. Pushes or pulls make things move.
4. Force and motion are related.
5. Types of motion may be described, measured, and predicted.
6. The amount of force acting on an object makes it move at constant speed, slow down, speed up, or change direction.
7. The more massive an object is, the less effect a given force has.
8. The motion of an object is determined by the overall effect of all forces acting on it.
9. Simple machines are operated by forces.
10. There are various forms of energy.
11. The flow of energy in a system can be traced.
12. Energy can be transformed from one type to another.
13. The various forms of energy can be measured.
14. The tilt of the earth on its axis as it rotates and revolves around the sun causes changes in season, length of day, and amount of the sun's energy received.
15. The sun is a star and it provides energy for Earth.
16. The planets differ in size, characteristics, and composition and they orbit the sun in our solar system.
17. There are many other stars besides our sun.
18. The human body is made of systems with structures and functions that are related.
19. Similar cells form different kinds of structures.
20. It is important to keep accurate records of scientific experiments.
21. A successful method of exploring the natural world is to observe, record, analyze, and communicate the results.
22. In working collaboratively, all team members should be free to reach, explain, and justify their own conclusions.
23. Comparing and contrasting observations and results are essential skills in science.
24. Models differ from the real thing but help us learn about it.
25. Natural events are often predictable and logical.
26. People invent new tools to solve problems and do work that affects life outside of science.
27. Data are collected and interpreted to explain events or concepts.
28. People should determine the effects of new discoveries.
29. Science processes and knowledge help people solve problems.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Reading strategies for science text comprehension
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

1. Participants will demonstrate increased knowledge of specific objectives through learning log entries.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts and content in physical, earth/space, and life sciences.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. Properties of materials can be compared and measured.
2. Common materials can be changed from one state to another by heating and cooling.
3. Different objects are made by combining different materials.
4. Materials made by chemically combining substances have properties that differ from the original materials.
5. Materials may be made of parts too small to be seen without magnification.
6. There are various forms of energy.
7. Light passes through some objects but not others.
8. Energy can be transformed from one type to another.
9. Nonrenewable energy causes costs and risks to society and the environment.
10. The limited supply of fossil fuels makes renewable energy sources very important.
11. Reusing, recycling, and reducing the use of natural resources improve the quality of life.
12. The surface of the earth is in a continuous state of change.
13. Some changes in the earth's surface are due to slow processes and others to fast processes.
14. Plants, animals, and protists interact in many ways.
15. Living things compete in a region with other living things; their adaptations make them fit for the environment.
16. Green plants use carbon dioxide, water, and light energy to make food.
17. Some organisms decompose dead plants and animals into simple nutrients, thereby recycling matter.
18. Animals eat plants or other animals for energy.
19. Organisms need energy.
20. Organisms grow, die, and decay; plants use the decayed materials as nutrients.
21. Abiotic factors are largely responsible for the diversity in ecosystems.
22. The flow of energy in a system may be traced.
23. All living things compete for Earth's limited resources.
24. Population size depends on available resources.
25. Changes in the habitat of an organism may be helpful or harmful.
26. It is important to keep accurate records scientific experiments.
A successful method of exploring the natural world is to observe, record, analyze, and communicate the results.

In working collaboratively, all team members should be free to reach, explain, and justify their own conclusions.

Comparing and contrasting observations and results are essential skills in science.

Models differ from the real thing but help us learn about it.

Natural events are often predictable and logical.

People invent new tools to solve problems and do work that affects life outside of science.

Data are collected and interpreted to explain events or concepts.

People should determine the effects of new discoveries.

Science processes and knowledge help people solve problems.

**DESCRIPTION OF ACTIVITIES:**

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Reading strategies for science text comprehension
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use

**LEARNING METHOD:**  A  Workshop

**EVALUATION (STUDENT):**  C  Portfolios of Student Work

**EVALUATION (STAFF):**  A  Changes in Classroom Practices

**IMPLEMENTATION:**  P  Participant Product related to training

**EVALUATION CRITERIA:**

1. Participants will demonstrate increased knowledge of specific objectives through learning log entries.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT:**  Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts and content in physical, biological, and earth/space sciences.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Understand properties and distinguish between examples of mass, weight, volume, and density.
2. Identify characteristics of the states of matter.
3. Explain information on a periodic table of the elements.
4. Identify examples of physical and chemical changes.
5. Describe the structure of the atom.
6. Distinguish among elements, compounds, and mixtures.
7. Identify examples of potential and kinetic energy.
8. Identify examples of force and work.
10. Identify static and current electricity.
11. Describe parallel and series circuits.
12. Understand waves and wave properties.
13. Identify examples and types of simple machines.
14. Describe the cell theory.
15. Identify parts of animal and plant cells; describe functions of these parts.
16. Identify the six kingdoms of living things; describe examples and characteristics of each.
17. Define the terms food chain and food web; give examples of each.
18. Explain the purposes of photosynthesis and respiration.
19. Describe the formation and characteristics of the solar system.
20. Explain the cause of Earth’s seasons.
21. Illustrate and explain the phases of the moon.
22. Explain the theories of continental drift and plate tectonics.
23. Identify types of rocks and minerals and explain the rock cycle.
24. Explain causes of weathering and erosion, giving examples of each.
25. Understand properties of air such as temperature vs. volume, density differences, and high and low pressure.
26. Describe global conditions that affect weather.
27. Explain the water cycle and cloud formation.
DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

1. Participants will demonstrate increased knowledge on eighty percent (80%) of the specific objectives through an objectives-based pretest and posttest.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for M/J Comprehensive Science 1 including the Nature of Science, Physical Science, Life Science, and Earth Space Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Describe and give examples of ways in which Earth’s surface is built up and torn down by physical and chemical weathering, erosion, and deposition.
2. Recognize that there are a variety of different landforms on Earth’s surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.
3. Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth’s system.
4. Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.
5. Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.
6. Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.
7. Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.
8. Differentiate between weather and climate.
9. Investigate how natural disasters have affected human life in Florida.
10. Describe ways human beings protect themselves from hazardous weather and sun exposure.
11. Describe how the composition and structure of the atmosphere protects life and insulates the planet.
12. Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.
13. Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life.
14. Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.
15. Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.

16. Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.

17. Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.

18. Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

19. Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation 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.

20. Explain why scientific investigations should be replicable.

21. Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.

22. Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.

23. Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.

24. Distinguish science from other activities involving thought.

25. Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.

26. Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.

27. Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.

28. Recognize and explain that a scientific law is a description of a specific relationship under given condition in the natural world. Thus, scientific laws are different from societal laws.

29. Give several examples of scientific laws.

30. Identify the role of models in the context of the sixth grade science benchmarks.

31. 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.

32. Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.

33. Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.

34. 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.

35. Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.
DESCRIPTION OF ACTIVITIES:
Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A (Workshop)

EVALUATION METHOD, STUDENT: C (Portfolios of Student Work)

EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)

IMPLEMENTATION METHOD P (Participant Product)

EVALUATION CRITERIA:
1. Development of one or more inquiry investigations to teach selected concepts in selected NGSSS benchmarks.
2. Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks.
3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:
The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for M/J Comprehensive Science 2 including the Nature of Science, Physical Science, Life Science, and Earth and Space Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:
Upon completion of the component, participants will:

1. Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores.
2. Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).
3. Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.
4. Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.
5. Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.
6. Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.
7. Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.
8. Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.
9. Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.
10. Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.
11. Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.
12. Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.
13. Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.
14. Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment.
15. Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.
16. Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.
17. Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.
18. Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation 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.
19. Differentiate replication (by others) from repetition (multiple trials).
20. Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.
21. Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.
22. Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.
23. Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.
24. Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.
25. Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.
26. Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.
27. Identify the benefits and limitations of the use of scientific models.
28. 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.
29. Observe and explain that light can be reflected, refracted, and/or absorbed.
30. Recognize that light waves, sound waves, and other waves move at different speeds in different materials.
31. Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.
32. Investigate and describe the transformation of energy from one form to another.
33. Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.
34. Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.

DESCRIPTION OF ACTIVITIES:
Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A (Workshop)

EVALUATION METHOD, STUDENT: C (Portfolios of Student Work)

EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)

IMPLEMENTATION METHOD P (Participant Product)

EVALUATION CRITERIA:

1. Development of one or more inquiry investigations to teach selected science concepts in selected NGSSS benchmarks
2. Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks
3. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:
The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for M/J Comprehensive Science 3 including the Nature of Science, Physical Science, Life Science, and Earth and Space Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:
Upon completion of the component, participants will:

1) Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.
2) Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.
3) Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.
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.
5) Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).
6) Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.
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.
8) Compare various historical models of the Solar System, including geocentric and heliocentric.
9) Explain the impact of objects in space on each other including:
   a. the Sun on the Earth including seasons and gravitational attraction
   b. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body
10) Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
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.
12) Summarize the effects of space exploration on the economy and culture of Florida.
13) Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.

14) Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.

15) 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.

16) Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

17) 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.

18) Design and conduct a study using repeated trials and replication.

19) Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.

20) Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

21) Analyze the methods used to develop a scientific explanation as seen in different fields of science.

22) 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.

23) Distinguish between scientific and pseudoscientific ideas.

24) Discuss what characterizes science and its methods.

25) Select models useful in relating the results of their own investigations.

26) Explain why theories may be modified but are rarely discarded.

27) Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.

28) Explain how political, social, and economic concerns can affect science, and vice versa.

29) 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.

30) 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.

31) Explore and describe the densities of various materials through measurement of their masses and volumes.

32) 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.

33) 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.

34) Recognize that elements are grouped in the periodic table according to similarities of their properties.
35) 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).

36) Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

37) Distinguish among mixtures (including solutions) and pure substances.

38) Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

39) Differentiate between physical changes and chemical changes.

40) Investigate and describe how temperature influences chemical changes.

**DESCRIPTION OF ACTIVITIES:**

Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

**LEARNING METHOD:** A (Workshop)

**EVALUATION METHOD, STUDENT:** C (Portfolios of Student Work)

**EVALUATION METHOD, STAFF:** A (Changes in Classroom Practice)

**IMPLEMENTATION METHOD:** P (Participant Product)

**EVALUATION CRITERIA:**

1) Development of one or more inquiry investigations to teach selected concepts in selected NGSSS benchmarks

2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks

3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT:** Supervisor, Science
GENERAL OBJECTIVES:

The purpose of this component is to develop understanding of the research-based Chemistry in the Community (ChemCom) approach to teaching the chemistry curriculum in high school, as well as appropriate content knowledge and skills for its implementation. Teachers will be introduced to the inquiry format of teaching along with implementation strategies to use in the classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Understand the rationale for teaching an inquiry science curriculum as it relates to the content and process Sunshine State Standards for science.
2. Explain the philosophy of Chemistry in the Community (ChemCom) that makes it a feasible program for teaching the enduring understandings of chemistry.
3. Explain how the district curriculum for Chemistry I is incorporated within the ChemCom format.
4. Identify the components of each unit in the ChemCom program and how they relate to the performance task for the unit.
5. Perform selected lab investigations in the ChemCom program and determine any modifications necessary for effective use with students.
6. Understand and implement effective strategies for cooperative group work.
7. Identify alternative forms of assessment necessary to evaluate students of diverse abilities and backgrounds as they move through investigations in a unit.
8. Establish a working analytical rubric for each performance task in the ChemCom program.
9. Explain how various investigations led to the discovery of the parts of the atom.
10. Distinguish among the products of radioactive decay.
11. Describe the benefits and risks of nuclear energy.
12. Identify chemical and physical properties of elements, including trends in these properties, and explain how these relate to use of metals in coins.
13. Identify and explain chemical concepts involved in teaching about mineral resources and their conservation, including metallurgy.
14. Explain what petroleum is and how its by-products are used in society today.
15. Investigate the effects of changes in concentration and temperature on selected chemical systems at equilibrium.
16. Demonstrate the relationships among temperature, pressure, volume, and number of particles in gases.
17. Describe the effect of solar radiation on climate.
18. Explain how acids develop in the atmosphere and the effect they have on Earth’s surface.
19. Describe the sources and uses of water on Earth.
20. Demonstrate how water can become contaminated and then cleaned.
21. Investigate the possible sources of water contamination that could cause a fish kill.
22. Identify contributions of people of diverse backgrounds to the development of scientific concepts and theories.
23. Describe the processes of scientific thinking that lead to scientific discoveries.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Reading strategies for science text comprehension
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

1. Participants will implement curriculum as intended by the district.
2. Participants will provide a written evaluation of the implementation of one of the ChemCom performance tasks.
3. Participants will administer a common district exam to all their students and analyze data from the exam.
4. Participants will provide feedback at the district level on implementation and possible ways for improvement.
5. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
TITLE: Earth System Science in the Community (EarthComm)

NUMBER: 1-015-30-00 POINTS TO BE EarnED: 60

GENERAL OBJECTIVE (S):

The purpose of this component is to introduce the research based EarthComm approach to teaching the Earth/Space Science curriculum in high school. Teachers will be introduced to the inquiry format of teaching along with implementation strategies to use in the classroom. All the investigations from the curriculum will be conducted in the workshop to provide content background and alternative implementation strategies. Teachers will explore how each component of the program provides opportunities for the students to acquire information necessary for the performance task at the end of each unit.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify the properties of EarthComm that allow it to use a systems approach to teaching the enduring understandings of earth science.
2. Explain the rationale for teaching an inquiry science curriculum as it relates to the Sunshine State Standards of content and process.
3. Identify all the essential structural components of EarthComm and how they relate to teacher activity both in the classroom and planning for instruction.
4. Explain how the district curriculum for Earth/Space Science is incorporated within the EarthComm format.
5. Identify effective strategies for cooperative group work.
6. Identify alternative forms of student assessment necessary to evaluate students of diverse abilities and backgrounds as they move through their investigations and pre-performance activities.
7. Establish a working analytical rubric for each performance task.
8. Describe how Earth’s geosphere, hydrosphere, atmosphere, and biosphere interact with each other throughout the content of the material covered.
9. Identify characteristics of severe weather patterns including thunderstorms, tornadoes, and flash floods.
10. Describe technologies used today to identify, track, and disseminate information to the public concerning severe weather patterns.
11. Identify local climate patterns that contribute to the development of severe weather patterns.
12. Identify the energy links that exist between the hydrosphere and the atmosphere.
13. Identify the movement of weather patterns as they relate to the hydrosphere.
14. Diagram the conditions that exist in the Pacific during an El Nino event.
15. Identify and describe features that are related to each type of plate tectonic movement.
16. Describe technological advances that allow humans to track plate movement and tentatively predict geological events.
17. Investigate their community for evidence of plate activity and climate change.
18. Describe current theories for the creation of the universe, solar system, and planets.
19. Identify the relationships that exist between satellites and planets, planets and stars, stars and galaxies, and galaxies and the universe.
20. Describe the properties of the Sun and compare the life cycle of the Sun with stars of smaller and larger masses.
21. Identify how orbital variations, atmospheric concentrations of gases, and plate movement can affect climate patterns on Earth.
22. Describe current technology used today to examine prior climatic conditions on Earth.
23. Develop a possible scenario of how the climate in their local community may be altered based on conditions known to science today.
24. Identify contributions of people of diverse backgrounds to the development of scientific concepts and theories.
25. Describe the processes of scientific thinking that lead to scientific discoveries.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Reading strategies for science text comprehension
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

1. Participants will implement curriculum as intended by the district.
2. Participants will provide a written evaluation of the implementation of one of the EarthComm performance tasks.
3. Participants will administer a common district exam to all their students.
4. Participants will provide feedback at the district level on implementation and possible ways for improvement.
5. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVES:

The purpose of this component is to introduce the research based Active Physics approach to teaching the Physics I curriculum in high school. Teachers will be introduced to the inquiry format of teaching along with implementation strategies to use in the classroom. All the investigations from the curriculum will be conducted in the workshop to provide content background and alternative implementation strategies. Teachers will explore how each component of the program provides opportunities for the students to acquire information necessary for the performance task at the end of each unit.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify the properties of the Active Physics approach that allow it to utilize a systems approach to teaching the enduring understandings of Physics I.
2. Explain the rationale for teaching an inquiry science curriculum as it relates to the Sunshine State Standards of content and process.
3. Identify all the essential structural components of Active Physics and how they relate to teacher activity both in the classroom and planning for instruction.
4. Explain how the district curriculum for Physics I is incorporated within the Active Physics format.
5. Identify effective strategies for cooperative group work.
6. Describe how the performance tasks in Active Physics connect to real-world situations.
7. Identify alternative forms of student assessment necessary to evaluate students of diverse abilities and backgrounds as they move through their investigations and pre-performance activities.
8. Establish a working analytical rubric for each performance task.
9. Identify that any change in velocity is acceleration.
10. Demonstrate that gravitational force is proportional to mass and inversely proportional to the square of the distance of separation.
11. Identify observable forces that can be traced to electric forces acting between atoms and molecules.
12. Demonstrate that there is no absolute frame of reference from which to observe motion.
13. Demonstrate that forces interact depending upon their magnitude and direction.
15. Demonstrate how variations in forces can control the properties of materials.
16. Explain the interaction of forces at a distance.
17. Demonstrate how magnetic and electrical forces are aspects of the same force.
18. Explain various forces that act within an atom.
19. Describe the fundamental nature of energy and its importance to the sciences.
20. Identify the importance of the conservation of energy and mass to the study of energy itself.
21. Explain the concept of energy transfer as it relates to different systems.
22. Describe the relationship between the properties of particles and waves.
23. Describe the origins of electromagnetic and mechanical wave types.
24. Demonstrate how investigative techniques may vary, but the general trend of investigation is standard worldwide.
25. Explain how group analysis of a situation broadens the overall understanding of all those involved.
26. Identify the ways in which science and scientists contribute to society.
27. Identify contributions of people of diverse backgrounds to the development of scientific concepts and theories.
28. Describe the processes of scientific thinking that lead to scientific discoveries.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Reading strategies for science text comprehension
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work
EVALUATION (STAFF): A Changes in Classroom Practices
IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

1. Participants will implement curriculum as intended by the district.
2. Participants will provide a written evaluation of the implementation of one of the Active Physics performance tasks.
3. Participants will administer a common district exam to all their students.
4. Participants will provide feedback at the district level on implementation and possible ways for improvement.
5. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
General Objectives:
This course is designed to enhance the science content development of elementary classroom teachers and connect it to effective classroom practices in science education. It is designed as a continuation of the Life, Earth, and Physical Sciences (LEaPS) Project or similar intensive science content instruction. Teachers who have previously completed 60 hours of in-depth science content will be provided instruction in analysis of curriculum implementation, Understanding by Design, unit and lesson planning, effective use of technology in the classroom, data analysis, reading and learning strategies, peer collaboration, and mentoring to maximize their efforts as they work to transfer the previously acquired content knowledge into informed classroom instruction.

Specific Objectives:
This course is designed to:

1. assessment of science concepts Enable teachers to analyze their curriculum implementation through identifying the actual curriculum they teach as compared to what they believe they are presenting.
2. Assist teachers in identifying appropriate strategies to align teaching practices to the intended curriculum using the district curriculum and the Sunshine State Standards.
3. Use the Understanding by Design curriculum framework to develop science unit plans that target key science concepts effectively.
4. Enable teachers to transfer the intended curriculum into lesson plans using the 5 E’s instructional model (engage, explore, explain, extend, and evaluate).
5. Connect in-depth science content knowledge gained in previous instruction to age-appropriate science concepts for the classroom.
6. Design and implement lessons that include hands-on science investigations in the classroom, at home, and in the community.
7. Use appropriate scientific visualizations, including Internet technology, to convey scientific concepts.
8. Explore and develop effective uses of diverse technology in instruction.
9. Design and use Photostory appropriately in a science lesson and evaluate its effectiveness.
10. Design and use Webquest appropriately in a science lesson and evaluate its effectiveness.
11. Use classroom and large-scale data sources (e.g., FCAT, district assessments) to inform daily teaching planning and practice.
12. Construct appropriate and diverse sets of formative and summative assessments that can be effectively used to guide instruction in the classroom.
13. Utilize appropriate reading strategies (e.g., CRISS strategies) to improve student comprehension of science text and science trade books in classroom libraries.
14. Provide students with learning strategies that will enable them to become metacognitive learners.
15. Collaborate with colleagues on effective unit and lesson planning, classroom presentations, and student.
16. Use Blackboard technology to continue collegial and professional discussions concerning science content and teaching practices.
17. Engage in collegial discussions with teachers at the grade, school, and district levels to explore ways to improve the quality of science teaching and learning.

18. Learn effective adult learning strategies for mentoring colleagues in science.

Description of Activities:

Activities will include several of the following:

1. Use of various technology formats
2. Hands-on activities
3. Lectures and presentations
4. Demonstration lessons
5. Discussions
6. Individual and group work

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): F Other performance assessment

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant product related to training

Evaluation Criteria:

Duval County Public Schools Evaluation of In-Service Form

1. Participants will analyze in writing the intended and enacted science curricula for their grade level.
2. Participants will produce a unit plan and a lesson plan for science that reflects the Sunshine State Standards for Science and effectively addresses the district science curriculum.
3. Participants will include examples of appropriate visualizations and use of diverse technology in science lessons that are written using the 5 E format.
4. Participants will demonstrate how they will effectively use a classroom set of science equipment to provide opportunities for their students to experience hands-on investigations.
5. Participants will use Blackboard and other forms of communication throughout the year to communicate with their content professors and colleagues on issues that relate to content and process concerns.
6. Participants will describe in writing how their use of student data has informed and influenced their teaching practices in the classroom.
7. The Professional Development Evaluation Form will be used to evaluate the delivery of this component.
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of the content of the Next Generation Mathematics and Science Sunshine State Standards while providing research-based instructional strategies that support implementation and assessment of these standards in the primary elementary classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand:

1. The differences between the 1996 mathematics standards and the Next Generation mathematics standards for the K-2 grade span.
2. The Base 10 System by recognizing the connections between number representation and how those representations are used as tools for computation.
3. A variety of methods including invented strategies, Base-10 Blocks, and Partial Sums and differences can be used to develop understanding of multi-digit addition and subtraction.
4. That understanding place value facilitates learning basic arithmetic facts and makes possible more complicated calculations via “regrouping” or “trading.”
5. The use of attributes for identifying and classifying shapes in an appropriate manner.
6. Precise mathematical definitions are based upon examples and non-examples.
7. The process of sorting and identification of geometric shapes such as polygons based upon the attributes of the shape.
8. Geo-boards and pattern blocks can be used to investigate precise geometric vocabulary and form definitions for given polygons.
9. Students may develop misconceptions of geometric shapes based solely on visual recognition of shapes.
10. That the five mathematical process standards (Problem Solving, Reasoning and Proof, Communication, Connections, and Representation) may be thought about as means of learning mathematics as well as outcomes of a mathematics education.
11. How the cognitive complexity of the benchmark can be used to guide instruction and assessment in mathematics and science.
12. The differences between the 1996 science standards and the Next Generation science standards for the K-2 grade span.
13. Scientific inquiry is multi-faceted and involves formulating questions, constructing investigations, collecting data, evaluating the data, and communicating the results.
14. Science is inherently a creative process.
15. The four strands of science learning and how they impact science instruction.
16. The difference between an observation and an inference.
17. All matter has recognizable properties.
18. Rocks are composed of minerals and rocks are classified by how they form.
19. Rocks can change over time.
20. Soil is formed from broken down rocks and organic material.
21. The Sun is the source of all energy on Earth
22. Plants and animals interact and depend on each other and their environment to live.
23. Photosynthesis is the process whereby plants make glucose and release oxygen.
24. Both plants and animals use oxygen during the process of respiration.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

LEARNING METHOD: A workshop

EVALUATION (STUDENT): F Other performance assessment

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product

EVALUATION CRITERIA:

1. Participants will demonstrate increased knowledge of specific objectives through reflection and specific assignments for each module.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisors, Science and Mathematics
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of the content of the Next Generation Mathematics and Science Sunshine State Standards while providing research-based instructional strategies that support implementation and assessment of these standards in the intermediate elementary classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand:

1. The differences between the 1996 mathematics standards and the Next Generation mathematics standards for the 3-5 grade span.
2. Concrete models are used to assist students with their understanding of multiplication.
3. A variety of methods must be utilized to develop abstract understanding of multiplication.
4. A conceptual understanding of the distribution method using whole numbers will assist students as they move into variables in algebra.
5. In division a relationship exists between the divisor, dividend and quotient.
6. Multiple strategies are used to develop a solid foundation for division.
7. Cognitively Guided Instruction is used to explore the fact that students have more trouble with partitioning problems than measurement types of problems.
8. Fractions can be visually represented using area models, linear models, and set models.
9. A variety of models should be used to explore how numerators and denominators relate to the whole fraction.
10. The differences between a repeating and a growing pattern.
11. Charts can be used to organize work to help find relationships, generalize a rule with a variable, and find a visual reason a rule makes sense.
12. The five mathematical process standards (Problem Solving, Reasoning and Proof, Communication, Connections, and Representation) may be thought about as means of learning mathematics as well as outcomes of a mathematics education.
13. How the cognitive complexity of the benchmark can be used to guide instruction and assessment in mathematics and science.
14. The differences between the 1996 science standards and the Next Generation science standards for the 3-5 grade span.
15. Scientific inquiry is multi-faceted and involves formulating questions, constructing investigations, collecting data, evaluating the data, and communicating the results.
16. Science is inherently a creative process.
17. The four strands of science learning and how they impact science instruction.
18. The difference between an observation and an inference.
19. The perceived size of an object is affected by the observer’s distance from the object.
20. The specific order of planets in our Solar System.
21. The primary source of light for Earth is the Sun.
22. The properties of light.
23. All organisms must adjust to changes in their environment in order to survive.
24. Environments experience both short and long term changes.
25. Adaptations in organisms can be structural and/or behavioral.
26. Organisms can sometimes pass some of these adaptations on to their offspring.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): F Other performance assessment

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product

EVALUATION CRITERIA:

1. Participants will demonstrate increased knowledge of specific objectives through reflection and specific assignments for each module.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisors, Science and Mathematics
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of the content of the Next Generation Mathematics and Science Sunshine State Standards while providing research-based instructional strategies that support implementation and assessment of these standards in the middle school classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand:

1. The differences between the 1996 science standards and the Next Generation science standards for the 6-8 grade span.
2. How the cognitive complexity of the benchmark can be used to guide effective instruction and assessment in science.
3. The format of the learning schedule (Understanding by Design) as it relates to daily lesson planning and resource selection.
4. The 5 E Model for science instruction (engage, explore, explain, extend, evaluate) and implement in the classroom.
5. Scientific inquiry is multi-faceted and involves formulating questions, constructing investigations, collecting data, evaluating the data, and communicating the results.
6. Structured inquiry and how an inquiry approach to teaching science motivates and engages all students.
7. Science is inherently a creative process.
8. The four strands of science learning and how they impact science instruction.
9. The difference between an observation and an inference.
10. The earth is a dynamic planet composed of moving lithospheric plates.
11. Lithospheric plates separate and collide leading to diverse geologic features.
12. The theory of evolution explains the development of organisms over time.
13. The many types of evidence collected to support the theory of evolution.
14. The evolutionary process acts continuously on populations.
15. The difference between a scientific theory and law.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

**LEARNING METHOD:** A Workshop

**EVALUATION (STUDENT):** F Other performance assessment

**EVALUATION (STAFF):** A Changes in Classroom Practices

**IMPLEMENTATION:** P Participant Product

**EVALUATION CRITERIA:**

1. Participants will demonstrate increased knowledge of specific objectives through reflection and specific assignments for each module.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT:** Supervisor, Science
TITLE: Science Inquiry and Content for Elementary Teachers

NUMBER: 1-015-36-00  POINTS TO BE EARNED: 60

GENERAL OBJECTIVE:

The purpose of this component is to provide teachers with the knowledge and skills to support inquiry experiences for their students and improve teachers’ understanding of content in physical, life, and earth/space sciences.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify and explain the continuum of inquiry, from teacher-directed to guided inquiry to student-centered inquiry.
2. Understand how to support students in designing and implementing investigations through effective use of science process skills.
3. Recognize testable questions in science and the kinds of data needed to answer these questions.
4. Identify independent and dependent variables in an experiment as well as the conditions that must be kept constant.
5. Identify strategies and appropriate activities for elementary classroom inquiry experiences for students with diverse abilities and backgrounds.
6. Understand how to organize the science classroom for safety and management of materials and activities.
7. Describe and model effective safety practices for actively teaching and learning science.
8. Explore and effectively model the use of appropriate measurement tools for elementary science classrooms.
9. Identify various properties of matter and distinguish between examples of mass, weight, volume, and density.
10. Identify characteristics of the states of matter in terms of visible appearances and at the atomic level.
11. Explain the differences between physical and chemical changes.
12. Distinguish between mixtures and solutions.
13. Identify examples of potential and kinetic energy.
14. Explain how potential and kinetic energy are related.
15. Explore balanced and unbalanced forces.
16. Understand and apply laws of motion.
17. Explain the relationships among gravity, weight, and mass.
18. Explore electricity and magnetism and the relationship between them.
19. Describe the cell theory.
20. Identify parts of animal and plant cells and describe the functions of these parts.
21. Identify the kingdoms of living things and describe examples and characteristics of each.
22. Analyze the relationships among organisms in food chains and food webs, giving examples of how energy flows through living systems.
23. Explain the purposes of photosynthesis and respiration.
24. Describe the results of human interactions with the environment, both positive and negative.
25. Explain and model the cause of Earth’s seasons.
26. Illustrate and explain the phases of the Moon.
27. Describe and give examples of changes to Earth’s surface through weathering, erosion, and deposition.
28. Describe global conditions and patterns that affect weather.
29. Explore how the flow of energy and matter cause interactions among Earth’s air, water, land, and living systems.
30. Describe the formation and characteristics of the solar system.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

8. Hands-on activities
9. Lecture
10. Discussion
11. Individual and group reflection (verbal and in writing)
12. Small/large group work
13. Reading strategies for science text comprehension
14. Search for and evaluation of appropriate web sites

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

   For 24-30 points:

2. Participants will design and implement an age-appropriate inquiry science lesson in the classroom and evaluate student work from this lesson.
3. Participants will provide reflective feedback in writing on the science content learned in the workshop and how it has affected their teaching in the classroom.

   For additional points beyond 30 (may repeat workshop once):

4. Participants will design and implement a different inquiry science lesson in the classroom and evaluate student work from this lesson.

5. Participants will provide reflective feedback in writing on the science content learned in the workshop and how it has affected their teaching in the classroom.

**COMPONENT CONTACT:** Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of knowledge and skills from the physical, life and environmental, and earth and space sciences and their ability to design and implement inquiry science lessons.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Accurately measure mass, volume, and temperature to the correct number of significant figures with given equipment.
2. Explain and calculate density.
3. Describe and identify physical and chemical changes.
4. Describe the electron cloud model of the atom, including subatomic particles, their locations, and their charges.
5. Identify the symbols, atomic numbers, mass numbers, and numbers of protons, neutrons, and electrons in elements 1-18 on the periodic table.
6. Understand the organization of elements on the periodic table.
7. Identify common compounds and their formulas.
8. Describe the characteristics of sound, including the components of sound waves, loudness, and pitch.
9. Identify common contact and non-contact forces.
10. Describe the advantages and disadvantages of friction and how friction is overcome in moving objects.
11. Distinguish between speed and acceleration, giving common examples.
12. Describe the forces acting on objects and calculate net force in given situations.
13. Explain and give examples of each of Newton’s laws of motion.
14. Describe how each of the simple machines changes the direction or amount of the force needed in doing work.
15. Compare situations in which work is done.
16. Diagram and label the electromagnetic spectrum in order of increasing or decreasing frequency.
17. Distinguish between mass and weight on Earth and other planets.
18. Construct a scale model of the Solar System and calculate the scale distance to the nearest star beyond the sun (Proxima Centauri).
19. Demonstrate why the phases of the moon occur.
20. Describe the mission of various space probes, such as Hubble or Pathfinder.
21. Describe characteristics of various stars, including our sun.
22. Identify the Milky Way galaxy and diagram our solar system in it.
23. Identify the purpose and events of mitosis and meiosis.
24. Describe the advantages and disadvantages of asexual and sexual reproduction.
25. Explain what genes and alleles are, giving examples.
26. Determine the genotype and phenotype of offspring from a monohybrid cross using a Punnett square.
27. Compare dominant and recessive genes.
28. Distinguish between heterozygous and homozygous genotypes.
29. Give examples of incomplete dominance and co-dominance.
30. Describe specific adaptations that help organisms survive and reproduce in specific environments.
31. Recognize that genetic material is inherited that enables individual organisms to survive and reproduce.
32. Identify how fossils may be used to show evidence of change in organisms over long periods of time.
33. Describe how science ethics affect the treatment of organisms involved in research.
34. Distinguish steps along a continuum of inquiry from teacher-directed to guided inquiry to student-centered.
35. Recognize testable questions in science and the kinds of data needed to answer these questions.
36. Identify independent and dependent variables in an experiment as well as the conditions that must be kept constant.
37. Identify strategies and appropriate activities for middle school classroom inquiry experiences for students with diverse abilities and backgrounds.
38. Develop age-appropriate, inquiry-based lessons and activities that effectively support student learning.
39. Understand how to organize the science classroom for safety and management of materials and activities.
40. Explain the components of the 5 E’s instructional model: Engage, Explore, Explain, Extend, and Evaluate.
41. Identify the roles of teacher and students in each step of the 5 E’s.
42. Analyze a science lesson according to the 5 E’s model and the degree of inquiry present in the lesson.
43. Plan and deliver an effective science lesson using the 5 E’s instructional model.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Reading strategies for science text comprehension
7. Use of audio-visual materials and the Internet
8. Production of materials for classroom use

**LEARNING METHOD:** A Workshop

**EVALUATION (STUDENT):** C Portfolios of Student Work

**EVALUATION (STAFF):** A Changes in Classroom Practices

**IMPLEMENTATION:** P Participant Product related to training

**EVALUATION CRITERIA:**

Duval County Public Schools Evaluation of In-service Form

1. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

   For 24-30 points:

2. Participants will design and implement an age-appropriate inquiry science lesson in the classroom and evaluate student work from this lesson.
3. Participants will provide reflective feedback in writing on the science content learned in the workshop and how it has affected their teaching in the classroom.

   For additional points beyond 30 (may repeat workshop once):

4. Participants will design and implement a different inquiry science lesson in the classroom and evaluate student work from this lesson.

5. Participants will provide reflective feedback in writing on the science content learned in the workshop and how it has affected their teaching in the classroom.

**COMPONENT CONTACT:** Supervisor, Science
TITLE: Academy of Science

NUMBER: 1-015-38-00

POINTS TO BE EARNED: 120

GENERAL OBJECTIVE:

Participants will improve their understanding of the district science curricula, their ability to recognize, plan, and implement exemplary science inquiry lessons, and their proficiency in assessing and evaluating student performance.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify what is worthy for students to understand including the Sunshine State Standards for science (Stage 1).
2. Become aware of the vertical connections between science benchmarks, concepts, and skills across grade levels.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Lecture
3. Discussion
4. Individual and group reflection (verbal and in writing)
5. Small/large group work
6. Reading strategies for science text comprehension
7. Search for and evaluation of appropriate web sites

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form
1. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

   For 60 points:

2. Participants will design a multi-week science unit using the Understanding by Design format.
3. Participants will provide reflective feedback on this process and how it has impacted their teaching in the classroom.

   For additional points beyond 60:

4. Participants will implement their unit in the classroom.
5. Participants will present their findings to their peers.

COMPONENT CONTACT: Supervisor, Science
TITLE: Grades K-2 Science: Content, Implementation and Assessment

NUMBER: 1-015-39-00 POINTS TO BE EARNED: 60
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of the content of the Next Generation Science Sunshine State Standards that address biological and nature of science concepts while providing research-based instructional strategies that support implementation and assessment of these standards in the secondary science classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Understand the differences between the 1996 science standards and the Next Generation science standards for Biology.
2. Identify the four strands of science learning and how they impact science instruction.
3. Have an awareness of Webb’s depth of knowledge levels and how each level relates to the cognitive complexity of each benchmark.
4. Understand the distribution and interaction of organisms with the environment.
5. Understand how energy and nutrients move within the environment.
6. Understand how human activities affect the environment.
7. Identify where selected activities or investigations are along the continuum of inquiry.
8. Explain, with examples, how to move an activity toward guided or open inquiry.
9. Explore the characteristics of inquiry learning as well as strategies that create an environment that engages students.
10. Explore how science is inherently a creative process.
11. Distinguish between observations and inferences through the exploration of selected examples.
12. Apply the Explicit-Reflective approach to nature of science instruction.
13. Use observations and inferences to form conclusions and write testable questions.
15. Identify how scientific inquiry is multi-faceted and involves formulating questions, constructing investigations, collecting data, evaluating the data, and communicating the results.
16. Compare and contrast the 1996 benchmarks and Next Generation benchmarks for the theory of natural selection and evolutionary change.
17. Identify student misconceptions concerning natural selection and strategies to overcome them.
18. Discuss concept maps as a tool for pre-assessment, instruction, and assessment.
19. Explore the use of simulation experiments to assist students understand the outcome of selective pressures on populations and mechanisms for evolution.
20. Understand the principles of the 5 E model for science planning and instruction.
21. Explore the components of the district learning schedule and its use in the design of daily classroom instruction.
22. Plan and implement a 5 E lesson plan for selected benchmarks and provide follow-up reflections on it.
23. Explore the concept of backwards design and how it is used to plan assessment and instruction.
24. Explore current district learning schedule for their use of backwards design.
25. Provide experience with unit planning using a backwards design approach that focuses instruction on desired outcomes.
26. Investigate the use of biotechnology in the biological sciences today.
27. Explore the CPALMS website as an aligned resource for teachers to assist with planning and aligning instruction
28. Identify safe work practices for teachers and safe lab practices for students in the science classroom and laboratory.
29. Provide background on scientific topics in biology that may be considered controversial with appropriate strategies to engage students in a scientific, non-judgmental approach.
30. Explain the difference between teaching for procedural knowledge and teaching for conceptual understanding and the appropriate use of assessments that identify student understandings.
31. Design a scientific experiment that effectively addresses a testable problem, identifies independent and dependent variables and controlled conditions, collects data to support a logical conclusion, and leads to another possible question.
32. Investigate effective strategies to debrief an inquiry investigation.
33. Investigate effective strategies to assist students in producing quality performance tasks.
34. Identify effective teaching strategies that should be employed when implementing the district-adopted biology materials.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:
1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use
LEARNING METHOD: A Workshop
EVALUATION (STUDENT): F Other Performance Assessment
EVALUATION (STAFF): A Changes in Classroom Practices
IMPLEMENTATION: P Participant Product

EVAULATION CRITERIA:

1. Participants will demonstrate increased knowledge of specific objectives through reflection and specific assignments for each module.

2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
TITLE: PROMiSE: Earth and Space Science Content Modules

NUMBER: 1-015-42-00   POINTS TO BE EARNED: 6-30

GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of the content of the Next Generation Science Sunshine State Standards that address earth and space concepts while providing research-based instructional strategies that support implementation and assessment of these standards in the secondary science classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify the differences between the 1996 science standards and the Next Generation science standards for Earth Space Science.
2. Have an awareness of Webb’s depth of knowledge levels and how each level relates to the cognitive complexity of each benchmark.
3. Investigate how the three levels of Webb’s Levels of Complexity effect instruction and assessment.
4. Identify how scientific inquiry is multi-faceted and involves formulating questions, constructing investigations, collecting data, evaluating the data, and communicating the results.
5. Explore how science is inherently a creative process.
6. Identify the four strands of science learning and how they impact science instruction.
7. Identify the patterns of organization of matter and energy in the universe.
8. Explore the variables that influence the relationship of objects in space to each other (i.e. mass, distance)
9. Identify the difference between an observation and an inference through the exploration of selected examples.
10. Use observations and inferences to form conclusions and write testable questions.
11. Apply the Explicit-Reflective approach to nature of science instruction.
12. Distinguish among theories, laws, hypotheses, and models.
13. Identify factors that affect the movement of surface and deep water currents within the ocean.
14. Use models to investigate science concepts and identify their benefits and limitations.
15. Trace the development of the Theory of Plate Tectonics.
16. Explain the major processes involved in plate movement.
17. Determine the features (or results) of a specific type of plate movement.
18. Discuss concept maps as a tool for pre-assessment, instruction, and assessment.
19. Explore the characteristics of inquiry learning as well as strategies that create an environment that engage students.
20. Identify where selected activities or investigations are along the continuum of inquiry.
21. Identify safe work practices for teachers and safe lab practices for students in the science classroom and laboratory.
22. Provide background on scientific topics in earth science that may be controversial with appropriate strategies to engage students in a scientific, non-judgmental approach.
23. Introduce lesson planning that is consistent with the 5 E lesson plan model.
24. Understand the principles of the 5 E model for science planning and instruction.
25. Plan and implement a 5 E lesson plan for selected benchmarks and provide follow-up reflections on it.
Revised 11/04
26. Explore the components of the district learning schedule and its use in the design of daily classroom instruction.
27. Explore the concept of backwards design and how it is used to plan assessment and instruction.
28. Provide experience with unit planning using a backward design approach that focuses instruction on desired outcomes.
29. Explain the difference between teaching for procedural knowledge and teaching for conceptual understanding and the appropriate use of assessments that identify student understanding.
30. Provide instruction in the use of the CPALMS site as an aligned resource for teachers to assist with instructional planning and aligning instruction.
31. Design a scientific experiment that effectively addresses a testable problem, identifies independent, dependent variables, and controls, collects data, can form a conclusion, and lead to another possible testable question.
32. Investigate effective strategies to debrief an explore (investigation) with students.
33. Investigate effective strategies to assist students with the development of quality performance tasks.
34. Identify effective teaching strategies that should be employed when implementing the district adopted earth science materials.

**DESCRIPTION OF ACTIVITIES:**

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

**LEARNING METHOD:**
A Workshop

**EVALUATION (STUDENT):**
F Other performance assessment

**EVALUATION (STAFF):**
A Changes in classroom Practices

**IMPLEMENTATION:**
P Participant Product

**EVALUATION CRITERIA:**

1. Participants will demonstrate increased knowledge of specific objectives through reflection and specific assignments for each module.

2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT:** Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to provide new, alternative certification, and temporarily certificated secondary science teachers with professional development in topics that support quality science instruction in the classroom. This workshop targets new and/or alternative certification secondary (grades 6-12) science teachers. It does not replace general workshops that districts have in place for new teachers but will augment that effort with specific focus on science instruction and assessment. Each of the ten induction modules can stand alone or be a coherent five-day workshop.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Introduce the Next Generation science standards for the 6-12 gradespan.
2. Explore how to unpack a benchmark to identify the appropriate content and skills.
3. Identify the three levels of Webb’s Levels of Complexity for the benchmarks.
4. Explore how cognitive complexity can be used to guide instruction and assessment in science.
5. Introduce teachers to the difference between teaching for procedural knowledge and teaching for conceptual knowledge.
6. Investigate informal and formal forms of assessment.
7. Explore appropriate usage for each type of formal and informal assessment.
8. Identify how each form of assessment can assist teachers plan instruction and help prepare students for high stakes tests such as the FCAT.
9. Explore how teachers create and facilitate positive learning environments that promote student participation in the learning process.
10. Begin to identify and develop appropriate science classroom procedures.
11. Identify the planning, procedures, and equipment necessary to ensure a safe laboratory setting.
12. Define the levels of inquiry.
13. Rank lessons on their levels of inquiry and identify when each is appropriate to use.
14. Explore the Nature of Science Body of Knowledge and how it must be used when teaching science.
15. Raise awareness of controversial topics in science, the obligation to teach them, and suggestions on how to approach such topics with students.
16. Investigate the district science curriculum for evidence of backward planning and how
that can be used to design effective daily instruction.
17. Investigate the 5 E lesson delivery model and identify the appropriate roles of the
teacher and student.
18. Write an appropriate 5 E lesson plan for the beginning of the school year.
19. Implement a 5 E lesson in the classroom.
20. Discuss how to implement effective lesson plans that align curriculum, instruction, and
assessment.
21. Explore the role of teacher content knowledge in the classroom especially as it relates to
the uncovering and addressing of student misconceptions.
22. Prepare for the rituals and routines of the first days of school and the first grading
period.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet
7. Production of materials for classroom use

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): F Other performance assessment

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION:

1. Survey of implementation of Next Generation Mathematics and Science standards using appropriate instructional strategies in the classroom.
2. Examples of student work and data on student achievement in both math and science after implementing content and/or teaching strategies explored in each module.

EVALUATION CRITERIA:

1. Participants will demonstrate increased knowledge of specific objectives through reflection and specific assignments for each module.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisors, Science
GENERAL OBJECTIVE:

The purpose of this component is to enhance teachers’ understanding of key concepts involved in the formation and development of common scientific theories, improve their ability to recognize and appropriately address student misconceptions concerning the development of theories, and engage their own students in classroom explorations, meaning making, and application of the content in new situations. Throughout the institute and during the four follow-up sessions, teachers will be challenged to examine findings generated through their own explorations, develop explanations, and revise their ideas as they gain greater depth of science content understanding.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Identify that there is no one scientific method.
2. Describe and explain what characterizes science and its methods.
3. Identify the role of creative thinking in the role of the development of scientific theories.
4. Recognize examples of non-linear scientific processes.
5. Differentiate between observation and inference.
6. Explain how scientific observations lead to scientific inferences and future testable questions.
7. Explain the difference between an experiment and other types of scientific investigations.
8. Compare and contrast between science and pseudoscience.
9. Identify other forms of knowing that are not science.
10. Explain that scientific knowledge is durable, robust and open to change.
11. Distinguish between theories and laws.
12. Differentiate between common use and scientific use of the terms theory and law.
13. Recognize that theories do not become laws nor do laws become theories.
14. Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.
15. Cite examples of how the development of a scientific theory is the culmination of many scientific investigations.
16. Describe how the role of consensus plays in the historical development of a theory.
17. Identify the role of models used in science including their limitations.
18. Describe how cell theory meets the criteria of the characteristics of scientific knowledge.
19. Identify how the cell theory changed over time.
20. Site evidence used to develop and verify the cell theory.
21. Identify the role of technological advances in the development of the cell theory.
22. Provide examples of current research that will lead to the continual development of the cell theory.
23. Participate in hands-on investigations that promote understanding of the development of the cell theory.
24. Describe how plate tectonics meets the criteria of the characteristics of scientific knowledge.
25. Identify the role of technological advances in the development of the plate tectonic theory.
26. Site evidence used to develop and verify the theory of plate tectonics.
27. Provide examples of current research that will lead to the continual development of the theory of plate tectonics.
28. Participate in hands-on investigations that promote understanding of the development of the plate tectonic theory.
29. Describe how the atomic theory meets the criteria of the characteristics of scientific evidence.
30. Site evidence used to develop and verify the atomic theory.
31. Identify the role of indirect evidence in the development of the atomic theory.
32. Utilize a model to demonstrate the development of the Rutherford model of the atom.
33. Identify the role of technological advances in the development of the atomic theory.
34. Provide examples of current research that will lead to the continual development of the atomic theory.
35. Participate in hands-on investigations that promote understanding of the development of the atomic theory.
36. Describe how the theory of evolution meets the criteria for the characteristics of scientific knowledge.
37. Site evidence used to develop and verify the theory of evolution.
38. Recognize that the geologic record represents changes that occurred on Earth over billions of years.
39. Identify the role of technological advances in the continual development of the theory of evolution.
40. Participate in hands-on investigations that promote understanding of the development of the theory of evolution.
41. Provide examples of current research that will lead to the continual development of the theory of evolution.
42. Deepen understanding of research related to teaching and learning in science classrooms through participation in book study.
43. Design and implement science lessons using the 5 E model.
44. Reflect on implementation of lessons and make revisions to improve lesson effectiveness.
45. Use samples of student work to look for evidence of student understanding of physical science concepts.
46. Participate in face-to-face and online discussions centered around the teaching and learning of physical science concepts.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): F Pretest and Posttest

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVALUATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate increased knowledge of specific objectives through pretest and posttest.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: SUPERVISOR SCIENCE
GENERAL OBJECTIVE:

The purpose of this component is to enhance teachers’ understanding of key concepts in matter and energy, improve their ability to recognize and appropriately address student misconceptions about these concepts, and engage their own students in classroom explorations, meaning making, and application of the content in new situations. Throughout the institute and follow-up sessions, teachers will be challenged to examine findings generated through their own explorations, develop explanations, and revise their ideas as they gain greater depth of science content understanding.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1. Understand the crucial role of measurement in science.
2. Explore a variety of aspects through which matter may be characterized.
3. Be able to describe in words the basic physical properties of matter: shape, texture, weight, quantifying and defining mass, determining volume of an irregular shape, density (qualitative, quantitative), and buoyancy and their relationship to each other.
4. Understand the phases of matter: solid, liquid, gas.
5. Given a set of data, construct a graph showing the phase changes for a given substance (nitrogen, water, dry ice, oxygen, and BHT).
6. Understand kinetic molecular theory.
7. Describe in words chemical changes and reactions.
8. Understand the characteristics of bonding (ionic, covalent, polar covalent, and metallic).
9. Given various scenarios, determine whether changes in matter are physical or chemical.
10. Recognize that atoms are the smallest unit of an element.
11. Recognize that atoms consist of sub-atomic particles called electrons, protons, neutrons and demonstrate an understanding of charges of these particles.
12. Understand the outermost part of the atom consists of “clouds” of electrons while the inner most part of the atom consists of the nucleus that contains the protons and, perhaps, some number of neutrons. The nucleus is tiny compared to the spatial extent of the electrons, and a large amount of empty space exists between the nucleus and the electrons.
13. Recognize that there are a finite number of elements that can be grouped in a periodic table.
14. Demonstrate understanding that an element’s placement in the periodic table provides information about its properties.

15. Give examples of elements that combine in a wide variety of ways to produce compounds.

16. Describe in words the difference between endothermic and exothermic reactions.

17. Given a description of how particular mixtures are made, determine whether the mixture is homogeneous or heterogeneous.

18. Identify the various components of solutions.

19. Given a substance or its chemical composition, be able to distinguish between a mixture and a pure substance.

20. Given a diagram, predict the flow of heat.

21. Describe how temperature changes through time for objects that are hot, cold, or warm.

22. Design a simple activity to demonstrate the difference between heat and temperature.

23. Recognize examples of radiation, convection, and conduction.


25. Read a graph and determine at what points phase changes occur and why.

26. Identify the abilities of various materials to conduct heat.

27. Use appropriate terminology to describe the attributes of waves.

28. Recognize that sound is a mechanical wave, needing matter for transmission and that transmission occurs more rapidly in some substances than others.

29. Describe the relationship between sound and vibration and how energy can transform from one form to another.

30. Understand the relationship between frequency of sound and pitch.

31. Explain the phenomenon of the Doppler Effect as it may occur in everyday life.

32. Describe how static electricity may be generated and demonstrated.

33. Identify general properties that determine if an object is either an electrical conductor or an insulator.

34. From a set of diagrams, recognize which circuits will permit or will not permit the flow of electricity.

35. Differentiate between parallel and series circuits.

36. Explain the basic principles of the operation of a battery.

37. Discuss the differences between permanent and electromagnets.

38. Recognize factors that determine the strength of an electromagnet.

39. Identify and discuss real-life applications of magnets and magnetism.

40. Recognize that light is an electromagnetic wave and does not require matter for transmission.

41. Identify possible outcomes when light strikes a material.

42. Recognize the usefulness of total internal reflection.

43. Apply the knowledge of light refraction to discuss the behavior of blue versus red light as it passes through a prism.

44. Apply the knowledge of light scattering to discuss the behavior of blue versus red light in the atmosphere.
45. Deepen understanding of research related to teaching and learning in science classrooms through participation in book study.
46. Design and implement science lessons using the 5 E model.
47. Reflect on implementation of lessons and make revisions to improve lesson effectiveness.
48. Use samples of student work to look for evidence of student understanding of physical science concepts.
49. Participate in face-to-face and online discussions centered around the teaching and learning of physical science concepts.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on activities
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Use of audio-visual materials and the Internet

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): F Pretest and Posttest

EVALUATION (STAFF): A Changes in Classroom Practices

IMPLEMENTATION: P Participant Product related to training

EVAULATION CRITERIA:

Duval County Public Schools Evaluation of In-service Form

1. Participants will demonstrate increased knowledge of specific objectives through pretest and posttest.
2. The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE(S):
The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for the Life Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:
Upon completion of this component, participants will:

1. Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.
2. Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.
3. Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).
4. Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.
5. Compare and contrast structure and function of various types of microscopes.
6. Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.
7. Relate the structure of each of the major plant organs and tissues to physiological processes.
8. Identify the major parts of the brain on diagrams or models
9. Describe the factors affecting blood flow through the cardiovascular system.
10. Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.
11. Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.
12. Describe how and why organisms are hierarchically classified and based on evolutionary relationships.
13. Explain the reasons for changes in how organisms are classified.
14. Discuss distinguishing characteristics of the domains and kingdoms of living organisms.
15. Describe the scientific explanations of the origin of life on Earth.
16. Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.
17. Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.
18. Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.
20. Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.
21. Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.
22. Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.
23. Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.
24. Explain the basic processes of transcription and translation, and how they result in the expression of genes.
25. Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.
26. Explain how and why the genetic code is universal and is common to almost all organisms.
27. Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.
28. Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.
29. Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.
30. Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.
31. Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.
32. Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.
33. Describe changes in ecosystems resulting from seasonal variations, climate change and succession.
34. Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.
35. Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
36. Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
37. Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.
38. Discuss the need for adequate monitoring of environmental parameters when making policy decisions.
39. Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.
40. Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

41. Identify the reactants, products, and basic functions of photosynthesis.

42. Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

43. Explain the interrelated nature of photosynthesis and cellular respiration.

44. Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.

45. Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.

46. Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

47. Define and investigate a problem based on the biology body of knowledge.

48. Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

49. Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

50. Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

51. Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

52. Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

53. Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

54. Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A (Workshop)

EVALUATION METHOD, STUDENT: C (Portfolios of Student Work)
EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)

IMPLEMENTATION METHOD: P (Participant Product)

EVALUATION CRITERIA:

1) Development of one or more inquiry investigations to teach selected concepts in selected NGSSS biology benchmarks

2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks

3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE(S):
The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for the Physical Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:
Upon completion of this component, participants will:

1. Differentiate among the four states of matter.
2. Differentiate between physical and chemical properties and physical and chemical changes of matter.
3. Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.
4. Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.
5. Relate properties of atoms and their position in the periodic table to the arrangement of the electrons.
6. Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.
7. Interpret formula representations of molecules and compounds in terms of composition and structure.
8. Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.
9. Explain how various factors, such as concentration, temperature, and presence of a catalyst, affect the rate of a chemical reaction.
10. Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.
11. Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.
12. Describe the properties of the carbon atom that make the diversity of carbon compounds possible.
13. Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.
14. Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.
15. Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.
16. Relate temperature to the average molecular kinetic energy.
17. Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.
18. Distinguish between endothermic and exothermic chemical processes.
19. Describe the quantization of energy at the atomic level.
20. Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).
21. Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.
22. Differentiate between chemical and nuclear reactions.
23. Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.
24. Interpret the behavior of ideal gases in terms of kinetic molecular theory.
25. Describe phase transitions in terms of kinetic molecular theory.
26. Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.
27. Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.
28. Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.
29. Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.
30. Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.
31. Discuss the effects of technology on environmental quality.
32. Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.
33. Describe how different natural resources are produced and how their rates of use and renewal limit availability.
34. Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.
35. Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
36. Describe and explain what characterizes science and its methods.
37. Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
38. Identify sources of information and assess their reliability according to the strict standards of scientific investigation.
39. Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.
40. Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.
41. Recognize the role of creativity in constructing scientific questions, methods and
42. Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).
43. Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.
44. Identify examples of pseudoscience (such as astrology, phrenology) in society.
45. Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.
46. Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.
47. Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.
48. Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.
49. Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.
50. Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.
51. Describe the function of models in science, and identify the wide range of models used in science.
52. Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.
53. Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

DESCRIPTION OF ACTIVITIES:
Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A (Workshop)
EVALUATION METHOD, STUDENT: C (Portfolios of Student Work)
EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)
IMPLEMENTATION METHOD P (Participant Product)

EVALUATION CRITERIA:

1) Development of one or more inquiry investigations to teach selected concepts in selected NGSSS chemistry benchmarks
2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks
3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of the concepts embedded in the Next Generation Sunshine State Standards for geology, meteorology, astronomy, and the nature and practice of science.

SPECIFIC OBJECTIVES:

Upon completion of this component, participants will:

1) Cite evidence used to develop and verify the scientific theory of the Big Bang theory.
2) Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.
3) Describe how the gravitational force between two objects depends on their masses and the distance between them.
4) Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).
5) Describe and predict how the initial mass of a star determines its evolution.
6) Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.
7) Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.
8) Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.
9) Relate the history of and explain the justification for future space exploration and continuing technology development.
10) Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.
11) Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.
12) Analyze the broad effects of space exploration on the economy and culture of Florida.
13) Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.
14) Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.
15) Describe and differentiate the layers of Earth and the interactions among them.
16) Connect surface features to surface processes that are responsible for their formation.
17) Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.
18) Analyze how specific geologic processes and features are expressed in Florida and elsewhere.
19) Describe the geologic development of the present day oceans and identify commonly found features.
20) Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.
21) Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.
22) Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.
23) Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.
24) Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.
25) Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.
26) Relate the formation of severe weather to the various physical factors.
27) Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.
28) Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.
29) Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.
30) Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.
31) Describe the scientific explanations of the origin of life on Earth.
32) Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
   a. pose questions about the natural world,
   b. conduct systematic observations,
   c. examine books and other sources of information to see what is already known,
   d. review what is known in light of empirical evidence,
   e. plan investigations,
   f. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),
   g. pose answers, explanations, or descriptions of events,
h. generate explanations that explicate or describe natural phenomena (inferences),

i. use appropriate evidence and reasoning to justify these explanations to others,

j. communicate results of scientific investigations, and

k. evaluate the merits of the explanations produced by others.

33) Describe and explain what characterizes science and its methods.
34) Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
35) Identify sources of information and assess their reliability according to the strict standards of scientific investigation.
36) Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.
37) Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.
38) Recognize the role of creativity in constructing scientific questions, methods and explanations.
39) Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).
40) Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.
41) Identify examples of pseudoscience (such as astrology, phrenology) in society.
42) Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.
43) Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.
44) Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.
45) Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.
46) Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.
47) Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.
48) Describe the function of models in science, and identify the wide range of models used in science.  
49) Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

DESCRIPTION OF ACTIVITIES:
Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A (Workshop)
EVALUATION METHOD, STUDENT: C (Portfolios of Student Work)
EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)
IMPLEMENTATION METHOD P (Participant Product)

EVALUATION CRITERIA:
1) Development of one or more inquiry investigations to teach selected earth and space science concepts in selected NGSSS benchmarks
2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks
3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE(S):
The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for the Physical Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:
Upon completion of this component, participants will:
1. Distinguish between scalar and vector quantities and assess which should be used to describe an event.
2. Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.
3. Interpret and apply Newton’s three laws of motion.
4. Describe how the gravitational force between two objects depends on their masses and the distance between them.
5. Apply the law of conservation of linear momentum to interactions, such as collisions between objects.
6. Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.
7. Recognize that Newton’s Laws are a limiting case of Einstein’s Special Theory of Relativity at speeds that are much smaller than the speed of light.
8. Recognize that time, length, and energy depend on the frame of reference.
9. Compare and contrast work and power qualitatively and quantitatively.
10. Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).
11. Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.
12. Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.
13. Relate temperature to the average molecular kinetic energy.
14. Describe the quantization of energy at the atomic level.
15. Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.
16. Differentiate among the four states of matter.
17. Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.
18. Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

19. Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

20. Differentiate among conductors, semiconductors, and insulators.

21. Investigate and explain the relationships among current, voltage, resistance, and power.

22. Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

23. Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

24. Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

25. Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

26. Interpret the behavior of ideal gases in terms of kinetic molecular theory.

27. Describe phase transitions in terms of kinetic molecular theory.

28. Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.

29. Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.

30. Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.

31. Discuss the effects of technology on environmental quality.

32. Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

33. Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

34. Describe and explain what characterizes science and its methods.

35. Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

36. Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

37. Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

38. Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

39. Recognize the role of creativity in constructing scientific questions, methods and explanations.

40. Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).
41. Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

42. Identify examples of pseudoscience (such as astrology, phrenology) in society.

43. Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

44. Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

45. Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

46. Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

47. Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

48. Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

49. Describe the function of models in science, and identify the wide range of models used in science.

50. Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

51. Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

**DESCRIPTION OF ACTIVITIES:****

Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

**LEARNING METHOD:** A (Workshop)

**EVALUATION METHOD, STUDENT:** C (Portfolios of Student Work)
EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)
IMPLEMENTATION METHOD P (Participant Product)

EVALUATION CRITERIA:

1) Development of one or more inquiry investigations to teach selected concepts in selected NGSSS Physics benchmarks
2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks
3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:
The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for Middle School theory of evolution benchmarks. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:
Upon completion of the component, participants will:

1) Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.
2) Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.
3) Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.
4) Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.
5) Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual.
6) Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world.
7) Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.
8) Give several examples of scientific laws.
9) Explain why theories may be modified but are rarely discarded.

DESCRIPTION OF ACTIVITIES:
Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks
LEARNING METHOD: A (Workshop)
EVALUATION METHOD, STUDENT: C (Portfolios of Student Work)
EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)
IMPLEMENTATION METHOD P (Participant Product)

EVALUATION CRITERIA:

1) Development of one or more inquiry investigations to teach selected concepts in the NGSSS benchmarks dealing with the theory of evolution
2) Development of one or more lesson plans in the 5 E's format to teach the NGSSS benchmarks dealing with the theory of evolution
3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards in the physical science, earth and space science, life science, and nature of science bodies of knowledge. Appropriate instructional strategies will be modeled for use in the classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1. Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way.
2. Recognize the major common characteristics of all planets and compare/contrast the properties of inner and outer planets.
3. Distinguish among the following objects of the Solar System -- Sun, planets, moons, asteroids, comets -- and identify Earth's position in it.
4. Create a model to explain the parts of the water cycle and the roles of evaporation, condensation, precipitation, and transpiration in the water cycle.
5. Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.
6. Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time.
7. Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.
8. Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains.
9. Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water.
10. Design a family preparedness plan for natural disasters and identify the reasons for having such a plan.
11. Identify the organs in the human body and describe their functions, including the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, reproductive organs, kidneys, bladder, and sensory organs.
12. Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.
13. Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.
14. Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.
15. Explain the difference between an experiment and other types of scientific investigation.
16. Recognize and explain the need for repeated experimental trials.
17. Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
18. Identify a control group and explain its importance in an experiment.
19. Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method."
20. Recognize and explain the difference between personal opinion/interpretation and verified observation.
21. Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.
22. Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.
23. Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature.
24. Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.
25. Demonstrate and explain that mixtures of solids can be separated based on observable properties of their parts such as particle size, shape, color, and magnetic attraction.
26. Investigate and describe that many physical and chemical changes are affected by temperature.
27. Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.
28. Investigate and explain that energy has the ability to cause motion or create change.
29. Investigate and explain that an electrically-charged object can attract an uncharged object and can either attract or repel another charged object without any contact between the objects.
30. Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.
31. Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop).
32. Identify and classify materials that conduct electricity and materials that do not.
33. Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.
34. Investigate and describe that the greater the force applied to it, the greater the change in motion of a given object.
35. Investigate and describe that the more mass an object has, the less effect a given force will have on the object's motion.
36. Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced.

**DESCRIPTION OF ACTIVITIES:**
Activities will include several of the following:
1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A (Workshop)

EVALUATION METHOD, STUDENT: F (Other Performance Assessment)

EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)

IMPLEMENTATION METHOD P (Participant Product)

EVALUATION CRITERIA:

1) Development of one or more inquiry investigations to teach selected concepts in selected NGSSS benchmarks

2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks

3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts in the Next Generation Sunshine State Standards in the Earth Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will be modeled for use in the classroom.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will understand that:

1) Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way.

2) Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light.

3) Identify the Sun as a star that emits energy; some of it is in the form of light.

4) Recognize that the Sun appears large and bright because it is the closest star to Earth.

5) Recognize the major common characteristics of all planets and compare/contrast the properties of inner and outer planets.

6) Distinguish among the following objects of the Solar System -- Sun, planets, moons, asteroids, comets -- and identify Earth's position in it.

7) Relate that the rotation of Earth and apparent movements of the Sun, Moon, and stars are connected.

8) Observe that the patterns of stars in the sky stay the same although they appear to shift across the sky nightly, and different stars can be seen in different seasons.

9) Describe the changes in the observable shape of the Moon over the course of about a month.

10) Recognize that the Earth revolves around the Sun in a year and rotates on its axis in a 24-hour day.

11) Create a model to explain the parts of the water cycle. Water can be a gas, a liquid, or a solid and can go back and forth from one state to another.

12) Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

13) Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time.

14) Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.

15) Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains.

16) Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water.

17) Design a family preparedness plan for natural disasters and identify the reasons for having such a plan.
18) Identify the physical properties of common earth-forming minerals, including hardness, color, luster, cleavage, and streak color, and recognize the role of minerals in the formation of rocks.
19) Identify the three categories of rocks: igneous, sedimentary, and metamorphic.
20) Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable.
21) Identify resources available in Florida (water, phosphate, oil, limestone, silicon, wind, and solar energy).
22) Describe the basic differences between physical weathering and erosion.
23) Explain the difference between an experiment and other types of scientific investigation.
24) Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
25) Identify a control group and explain its importance in an experiment.
26) Recognize and explain the need for repeated experimental trials.
27) Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method."
28) Recognize and explain the difference between personal opinion/interpretation and verified observation.
29) Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.
30) Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.

DESCRIPTION OF ACTIVITIES:
Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A (Workshop)

EVALUATION METHOD, STUDENT: F (Other Performance Assessment)
EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)
IMPLEMENTATION METHOD P (Participant Product)
EVALUATION CRITERIA:

1) Development of one or more inquiry investigations to teach selected NGSSS benchmarks

2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks

3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:
The purpose of this component is to improve teachers’ understanding of concepts in the Next Generation Sunshine State Standards in the Life Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will be modeled for use in the classroom.

SPECIFIC OBJECTIVES:
Upon completion of the component, participants will understand that:

1) Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.
2) Investigate and describe how plants respond to stimuli (heat, light, gravity).
3) Identify processes of sexual reproduction in flowering plants, including pollination, fertilization (seed production), seed dispersal, and germination.
4) Identify the organs in the human body and describe their functions, including the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, reproductive organs, kidneys, bladder, and sensory organs.
5) Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.
6) Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, vertebrates and invertebrates, arthropods, those having live births and those which lay eggs) according to their physical characteristics and behaviors.
7) Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics.
8) Compare and contrast the major stages in the life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants.
9) Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.
10) Explain that although characteristics of plants and animals are inherited, some characteristics can be affected by environment.
11) Compare the seasonal changes in Florida plants and animals to those in other regions of the country.
12) Recognize ways plants and animals, including humans, can impact the environment.
13) Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.
14) Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers.
15) Recognize that plants use energy from the Sun, air, and water to make their own food.
16) Explain that animals cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.
17) Explain the difference between an experiment and other types of investigations.
18) Recognize and explain the need for repeated experimental trials.
19) Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
20) Identify a control group and explain its importance in an experiment.
21) Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method."
22) Recognize and explain the difference between personal opinion/interpretation and verified observation.
23) Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.
24) Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.

DESCRIPTION OF ACTIVITIES:
Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A (Workshop)
EVALUATION METHOD, STUDENT: F (Other Performance Assessment)
EVALUATION METHOD, STAFF: A (Changes in Classroom Practice)
IMPLEMENTATION METHOD: P (Participant Product)

EVALUATION CRITERIA:
1) Development of several inquiry investigations to teach selected concepts in selected NGSSS benchmarks
2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks
3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:
The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for Middle School Earth Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:
Upon completion of the component, participants will:

1) Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.
2) Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.
3) Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.
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.
5) Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).
6) Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.
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.
8) Compare various historical models of the Solar System, including geocentric and heliocentric.
9) Explain the impact of objects in space on each other including:
10) the Sun on the Earth including seasons and gravitational attraction
11) the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body
12) Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
13) 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.
14) Summarize the effects of space exploration on the economy and culture of Florida.
15) Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores.
16) Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).
17) Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.
18) Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.
19) Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.
20) Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.
21) Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.
22) Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.
23) Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.
24) Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.
25) Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.
26) Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.
27) Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.
28) Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.
29) Differentiate between weather and climate.
30) Investigate how natural disasters have affected human life in Florida.
31) Describe ways human beings protect themselves from hazardous weather and sun exposure.
32) Describe how the composition and structure of the atmosphere protects life and insulates the planet.
33) Define a problem from the science curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation 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.
34) 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.
35) Differentiate replication (by others) from repetition (multiple trials).
36) Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.
37) Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.

38) Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.

39) Describe the methods used in the pursuit of a scientific explanation as seen in the field of biology.

40) Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual.

41) Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world.

42) Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.

43) Give several examples of scientific laws.

44) Explain why theories may be modified but are rarely discarded.

45) Identify the benefits and limitations of the use of scientific models.

**DESCRIPTION OF ACTIVITIES:**

Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

**LEARNING METHOD:** A Workshop

**EVALUATION (STUDENT):** C Portfolios of Student Work

**EVALUATION (STAFF):** A Changes in Classroom Practice

**IMPLEMENTATION:** P Participant Product

**EVALUATION CRITERIA:**

1) Development of one or more inquiry investigations to teach selected earth and space science concepts in selected NGSSS benchmarks

2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks

3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

**COMPONENT CONTACT:** Supervisor, Science
GENERAL OBJECTIVE:

The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for Middle School Life Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:

Upon completion of the component, participants will:

1) Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.

2) Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life.

3) Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.

4) Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.

5) Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.

6) Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.

7) Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

8) Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.

9) Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.

10) Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.

11) Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.

12) Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.
13) Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.

14) Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment.

15) Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.

16) Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

17) Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

18) Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.

19) Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.

20) 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.

21) Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

22) Define a problem from the science curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation 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.

23) 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.

24) Differentiate replication (by others) from repetition (multiple trials).

25) Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.

26) Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.

27) Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.

28) Describe the methods used in the pursuit of a scientific explanation as seen in the field of biology.

29) Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual.

30) Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world.
31) Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.
32) Give several examples of scientific laws.
33) Explain why theories may be modified but are rarely discarded.
34) Identify the benefits and limitations of the use of scientific models.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD:

A Workshop

EVALUATION (STUDENT):

C Portfolios of Student Work

EVALUATION (STAFF):

A Changes in Classroom Practice

IMPLEMENTATION:

P Participant Product

EVALUATION CRITERIA:

1) Development of several inquiry investigations to teach selected life science concepts in selected NGSSS benchmarks
2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks
3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
GENERAL OBJECTIVE:
The purpose of this component is to improve teachers’ understanding of concepts embedded in the Next Generation Sunshine State Standards for Middle School Physical Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will also be modeled to implement with their students.

SPECIFIC OBJECTIVES:
Upon completion of the component, participants will:

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.
2) Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.
3) Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.
4) 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.
5) Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.
6) 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.
7) Observe and explain that light can be reflected, refracted, and/or absorbed.
8) Recognize that light waves, sound waves, and other waves move at different speeds in different materials.
9) Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.
10) Investigate and describe the transformation of energy from one form to another.
11) Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.
12) Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.
13) 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.
14) 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.
15) Explore and describe the densities of various materials through measurement of their masses and volumes.
16) 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.
17) 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.
18) Recognize that elements are grouped in the periodic table according to similarities of their properties.
19) 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).
20) Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.
21) Distinguish among mixtures (including solutions) and pure substances.
22) Define a problem from the science curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation 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.
23) 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.
24) Differentiate replication (by others) from repetition (multiple trials).
25) Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.
26) Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.
27) Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.
28) Describe the methods used in the pursuit of a scientific explanation as seen in the field of chemistry and physics.
29) Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual.
30) Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world.
31) Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.
32) Give several examples of scientific laws.
33) Explain why theories may be modified but are rarely discarded.
34) Identify the benefits and limitations of the use of scientific models.

DESCRIPTION OF ACTIVITIES:

Activities will include several of the following:
1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A Workshop

EVALUATION (STUDENT): C Portfolios of Student Work

EVALUATION (STAFF): A Changes in Classroom Practice

IMPLEMENTATION: P Participant Product

EVALUATION CRITERIA:

1) Development of several inquiry investigations to teach various earth and space science concepts
2) Development of one or more lesson plans in the 5 E’s format to teach NGSSS benchmarks
3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science
TITLE: NGSSS Grade 5 Physical Science

GENERAL OBJECTIVE:
The purpose of this component is to improve teachers’ understanding of concepts in the Next Generation Sunshine State Standards in the Physical Science and Nature of Science bodies of knowledge. Appropriate instructional strategies will be modeled for use in the classroom.

SPECIFIC OBJECTIVES:
Upon completion of the component, participants will understand that:

1) Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature.
2) Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.
3) Demonstrate and explain that mixtures of solids can be separated based on observable properties of their parts such as particle size, shape, color, and magnetic attraction.
4) Investigate and describe that many physical and chemical changes are affected by temperature.
5) Describe the changes water undergoes when it changes state through heating and cooling using scientific terms such as melting, freezing, boiling, evaporation, and condensation.
6) Identify some familiar changes in materials that result in other materials with different characteristics, such as decaying plant or animal matter, burning, rusting, or cooking.
7) Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.
8) Distinguish between a form of energy and the source of the energy (such as light from a source of energy like the Sun or a lamp).
9) Investigate and describe that energy has the ability to cause motion or create change.
10) Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another.
11) Demonstrate that light can be reflected, refracted, and absorbed.
12) Investigate and explain that sound is produced by vibrating objects and that pitch depends on how fast or slow the object vibrates.
13) Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature.
14) Identify common materials that conduct heat well or poorly.
15) Investigate and explain that an electrically-charged object can attract an uncharged object and can either attract or repel another charged object without any contact between the objects.
16) Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.
17) Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop).
18) Identify and classify materials that conduct electricity and materials that do not.
19) Investigate and describe that magnets can attract magnetic materials and attract and repel other magnets.
20) Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.
21) Investigate and describe that the greater the force applied to it, the greater the change in motion of a given object.
22) Investigate and describe that the more mass an object has, the less effect a given force will have on the object's motion.
23) Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced.
24) Investigate and describe that the speed of an object is determined by the distance it travels in a unit of time and that objects can move at different speeds.
25) Explain the difference between an experiment and other types of scientific investigation.
26) Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
27) Identify a control group and explain its importance in an experiment.
28) Recognize and explain the need for repeated experimental trials.
29) Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method."
30) Recognize and explain the difference between personal opinion/interpretation and verified observation.
31) Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.
32) Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.

DESCRIPTION OF ACTIVITIES:
Activities will include several of the following:

1. Hands-on inquiry investigations
2. Demonstration lessons
3. Lecture
4. Discussion
5. Small/large group work
6. Integration of Internet technology
7. Production of materials for classroom use
8. Development of lesson plans to teach NGSSS benchmarks

LEARNING METHOD: A Workshop
EVALUATION (STUDENT): C Portfolios of Student Work
EVALUATION (STAFF): A Changes in Classroom Practice
IMPLEMENTATION: P Participant Product

EVALUATION CRITERIA:

1) Development of one or more inquiry investigations to teach selected concepts in selected NGSSS benchmarks

2) Development of one or more lesson plans in the 5 E’s format to teach selected NGSSS benchmarks

3) The Professional Development Evaluation Form will be used to evaluate the delivery of the component.

COMPONENT CONTACT: Supervisor, Science