

**Indiana Wesleyan University Unit Plan  
Science Education—2011 NSTA Standards**

General rationale. The candidate will write a series of lessons that adhere to a common topic or theme. These lessons will be organized and documented as a “unit plan.” The unit plan will include an overview (topic, duration, grade level, goals/standards, activities, materials, assessments, adaptations), block plan, lesson plans and unit assessment tools. The candidate should learn to integrate his/her knowledge of developmental learning theory and curriculum/instruction design to produce an effective Unit Plan. It is important the candidate begins to explore his/her ability to organize, sequence and structure information into a cohesive learning experience for students. The candidate will utilize the basic guidelines of Direct Instruction to incorporate all the elements of lesson design. The candidate will practice his/her developing skills in curriculum, instruction, management and assessment. This is a first attempt at unit planning in the content-specific teacher training program. These skills should be further developed in the science methods courses (EDU382SC) and practicum/student teaching experiences.

Science unit plan rationale. The unit plan for the middle school or high school science classroom is designed to plan a single science concept, or big idea, from beginning to end. Further, the science unit plan requires the development of lessons that include science concepts and principles, unifying concepts, the nature of science, inquiry into scientific concepts, issues in science, and science in the local community.

Structure of the Assignment:

1. Use the unit plan format from the Student Teaching Handbook (science version attached below).
2. Reference the Lesson Plan and Unit Plan evaluation rubrics.
3. Utilize the Lesson Plan Checklist to develop various design elements.
4. Remember: simple to complex and concrete to abstract  
various types of instruction (discovery, group, cognitive)

Required unit plan elements:

<ul style="list-style-type: none"><li>• Unit content: the ‘big idea’ students will learn over the course of the unit</li><li>• Unit rationale</li><li>• NSTA standards</li><li>• Instructional design; learning activities</li><li>• Materials and resources</li></ul>	<ul style="list-style-type: none"><li>• Assessment strategies and instruments</li><li>• Management Strategies</li><li>• Adaptations for students with special needs</li><li>• Planning for classroom and student safety</li><li>• Unit Block Plan</li></ul>
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## Science Education Unit Plan Format

Co-op Teacher \_\_\_\_\_ Initial [ ]

Topic \_\_\_\_\_ Title of Unit \_\_\_\_\_

Duration of Unit \_\_\_\_\_ Student Teacher \_\_\_\_\_

Grade \_\_\_\_\_

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- I. Unit content (science concepts and principles): what is the 'big idea?'
- II. Rationale: why should students learn this material?
- III. Standards: what NSTA standards are addressed in this unit?
- IV. Instructional Design; learning activities. Address these NSTA standards in your unit plan:
  - NSTA 2a: Plan multiple lessons using a variety of inquiry approaches that demonstrate their knowledge and understanding of how students learn science.
  - NSTA 2b/3b: Include active inquiry lessons where students collect and interpret data in order to develop and communicate concepts and understand scientific processes, relationships and natural patterns from empirical experiences.
  - NSTA 2c: Design instruction and assessment strategies that confront and address naïve concepts/preconceptions.
  - NSTA 3a: Use a variety of strategies that demonstrate the candidates' knowledge and understanding of how to select the appropriate teaching and learning activities – including laboratory or field settings - to help all students learn.
- V. Materials and resources: what materials, including appropriate technology, will be needed to teach this content? Address this NSTA standard in your unit plan:
  - NSTA Standard 3: Candidates design and select learning activities, instructional settings, and resources--*including technology*, to achieve those goals
- VI. Assessment strategies: what assessments will you employ to determine if students have learned this content? Address this NSTA standard in your unit plan:
  - NSTA 3c: Plan fair and equitable assessment strategies to analyze student learning and to evaluate if the learning goals are met. Assessment strategies are designed to continuously evaluate preconceptions and ideas that students hold and the understandings that students have formulated.
- VII. Management strategies: what management issues need to be addressed as a result of the unique nature of this content (i.e., equipment handling, handling of chemicals, proper care and storage of materials, etc.)
- VIII. Adaptations for students with special needs:
- IX. Safety. What safety issues will you encounter as a result of teaching this content, and how will you address those concerns? Address these NSTA standards in your unit plan:

- NSTA 3d: Plan a learning environment and learning experiences for all students that demonstrate chemical safety, safety procedures, and the ethical treatment of living organisms within their licensure area.
- NSTA 4a: Design activities in a 5-12 classroom that demonstrate the safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used within their subject area science instruction.
- NSTA 4b: Design and demonstrate activities in a 5-12 classroom that demonstrate an ability to implement emergency procedures and the maintenance of safety equipment, policies and procedures that comply with established state and/or national guidelines. Candidates ensure safe science activities appropriate for the abilities of all students.
- NSTA 4c: Design and demonstrate activities in a 5-12 classroom that demonstrate ethical decision-making with respect to the treatment of all living organisms in and out of the classroom. They emphasize safe, humane, and ethical treatment of animals and comply with the legal restrictions on the collection, keeping, and use of living organisms.

## Unit Block Plan

Columns should reflect number of days per unit.

1. Unit Content: what 'big idea' will you address in this unit?
2. Unit goals: what should students know and be able to do at the conclusion of this unit?
3. Rationale: why should students learn this material?
4. Standards: what NSTA and/or Indiana science standards will be covered in this unit?
5. Develop a block outline of each day's instruction.

Day 1	Day 2	Day 3	Day 4	Day 5
<p><b>Learning Outcomes:</b> What should students know and be able to do at the end of the lesson?</p> <p><b>Purpose:</b> Aligned with learning outcomes. How does this lesson fit within the unit?</p> <p><b>Anticipatory Set:</b> what is your 'hook'? How will you engage students' interest?</p> <p><b>Instructional design:</b> body of lesson Model, guided practice, as necessary NSTA 2a; 2b; 2c; 3a. How will you structure the lesson? What experiences will you design to involve students actively in the learning process?</p> <p><b>Materials and Resources:</b> NSTA 3 (include technology)</p> <p><b>Assessment strategies:</b> NSTA 3c Formative: checking for understanding Summative: what will students do to demonstrate learning?</p> <p><b>Management Strategies:</b> given the content of this lesson, how will you manage time, students, and materials?</p> <p><b>Closure:</b> Review of learning</p> <p><b>Adaptations:</b> what lesson modifications are necessary to meet the needs of all students?</p> <p><b>Safety Issues</b> NSTA 3d; 4a; 4b; 4c</p>				
Day 6	Day 7	Day 8	Day 9	Day 10

Indiana Wesleyan University  
Science Unit Plan and Block Plan Development and Assessment Rubric—2011 NSTA Standards

**Unit Content**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
	The unit content is appropriate for the students being taught, but lacks the depth or breadth expected. Factual errors are present. <input type="checkbox"/>	The unit content is appropriate for the students being taught, but lacks the depth or breadth expected. Factual errors are present. <input type="checkbox"/>	The unit content is significant in the discipline, is appropriate for the age and developmental level of the students being taught, and is presented in sufficient depth and breadth. The content is factually correct. <input type="checkbox"/>	The unit content is significant in the discipline, is appropriate for the age and developmental level of the students being taught. The depth and breadth of the planned content coverage exceeds expectations. <input type="checkbox"/>

**Unit Rationale**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
	The unit rationale is missing or is incomplete. <input type="checkbox"/>	The unit rationale does not indicate how the content fits within the course of study or makes an insufficient case for why students should learn the material. <input type="checkbox"/>	The unit rationale makes an effective case for how the content fits within the course of study and why students should learn it. <input type="checkbox"/>	The unit rationale makes a compelling case for how the content fits within the course of study, why students should learn it, and how it will engage their interest. <input type="checkbox"/>

**Unit Standards**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
Connection to NSTA Standards	The unit plan contains no connection or reference to a standard course of study or to state and/or national curriculum standards. <input type="checkbox"/>	The unit plan contains some connection or reference to a standard course of study or to state and/or national curriculum standards. <input type="checkbox"/>	The unit plan includes connections to core curriculum with clear references to a course of study or to state and/or national curriculum standards. <input type="checkbox"/>	The unit plan supports core curriculum content appropriate to the targeted student group and is well integrated with a course of study and aligned with appropriate state and/or national standards. <input type="checkbox"/>

**Instructional design; Learning Activities**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
Variety of strategies and inquiry approaches NSTA 2a	The instructional strategies and/or inquiry approaches included in the candidate's unit plan are not adequate for the subject matter. They do not demonstrate how students learn science. <input type="checkbox"/>	The candidate's unit plan includes strategies and inquiry approaches that demonstrate his or her knowledge but lacks understanding of how students learn science <input type="checkbox"/>	The candidate's unit plan includes a variety of strategies and inquiry approaches that demonstrate his or her knowledge and understanding of how students learn science. <input type="checkbox"/>	The candidate's unit plan includes multiple strategies and inquiry approaches carefully aligned with unit subject matter that demonstrate his or her thorough knowledge and understanding of how students learn science. <input type="checkbox"/>
Active inquiry lessons NSTA 2b/3b	The unit plan does not include active inquiry lessons. <input type="checkbox"/>	The unit plan includes active inquiry lessons where students collect and interpret data. <input type="checkbox"/>	The unit plan includes active inquiry lessons where students collect and interpret data in order to develop and communicate concepts and understand scientific processes, relationships and natural patterns. <input type="checkbox"/>	The unit plan includes empirical experiences supporting a variety of inquiry lessons designed to engage students actively in the collection and interpretation of data in order to develop and communicate concepts and understand scientific processes, relationships and natural patterns. <input type="checkbox"/>

**Instructional design; Learning Activities, con't.**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
Confronting naïve concepts and preconceptions NSTA 2c	The candidate's instruction and assessment strategies do not confront or address students' naïve concepts and/or preconceptions. <input type="checkbox"/>	The candidate's instruction and assessment strategies address students' naïve concepts and/or preconceptions. <input type="checkbox"/>	The candidate designs instruction and assessment strategies that confront and address naïve concepts/ preconceptions. <input type="checkbox"/>	The candidate researches and designs a variety of instruction and assessment strategies that confront and address naïve concepts/ preconceptions. <input type="checkbox"/>
Selection of teaching and learning activities NSTA 3a	The candidate's teaching strategies do not demonstrate knowledge or understanding of how to select appropriate teaching and learning activities. <input type="checkbox"/>	The candidate uses strategies that demonstrate his or her developing knowledge and understanding of how to select appropriate teaching and learning activities. <input type="checkbox"/>	The candidate uses a variety of strategies that demonstrate his or her knowledge and understanding of how to select the appropriate teaching and learning activities – including laboratory or field settings - to help all students learn. <input type="checkbox"/>	The candidate regularly and appropriately uses a variety of strategies that demonstrate his or her knowledge and understanding of how to select the appropriate teaching and learning activities – including laboratory or field settings - to help all students learn. <input type="checkbox"/>

**Materials and Resources**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
The candidate designs and selects learning resources-- including technology, to achieve unit learning goals. NSTA Standard 3	Few resources are cited for teachers and students. Some materials appear to be inappropriate for the developmental or other needs of students. There appears to be a haphazard connection to lesson standards and a random collection of unrelated materials.  Borrowed materials and resources are not adapted or identified. <input type="checkbox"/>	An attempt has been made to list adequate and appropriate resources for teachers and students, but additional resources may be necessary to adequately meet unit standards and goals.  Resources and materials borrowed from outside sources are poorly adapted and/or identified. <input type="checkbox"/>	A variety of identifiable resources, including technology, is used to support student learning relative to unit standards. Resources are well organized by type or function, by whom, and for what purposes.  Resources and materials are created specifically and intentionally for the unit; resources and materials borrowed from outside sources are identified as such and are adapted specifically for the purposes of the unit. <input type="checkbox"/>	A rich variety of resources facilitate meeting standards through, for example, the creative use of technology, developmentally-appropriate literature, primary sources, guest speakers, etc. Each resource serves an identifiable purpose in the unit and increases all students' learning.  Resources and materials are created specifically and intentionally for the unit; resources and materials borrowed from outside sources are identified as such and are adapted specifically for the purposes of the unit. <input type="checkbox"/>

**Assessment**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
Assessment Plan	Little or no connection exists between the assessment plan and unit standards and goals. <input type="checkbox"/>	The links between the assessment plan and unit standards and goals could be clearer. Students are provided few alternatives to demonstrate their learning. <input type="checkbox"/>	The assessment plan is clearly linked to and addresses all unit standards and goals <input type="checkbox"/>	The assessment plan is clearly aligned with and addresses all unit standards and goals. Identified assessments allow students to demonstrate learning in a variety of ways. <input type="checkbox"/>

**Assessment, con't.**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
Assignment descriptions and rubrics	Assessments are poorly described; rubrics are not included. <input type="checkbox"/>	Assessment descriptions are unclear; rubrics are not well thought out. <input type="checkbox"/>	All assessments are adequately described; rubrics for most assessments are included. <input type="checkbox"/>	The descriptions for all assessments are clear and sufficiently detailed to enable full student understanding of what is being asked of them.  Rubrics detailing the essential elements of each assessment as well as levels of performance for each element are included. <input type="checkbox"/>
Formative and summative assessments	The assessment plan does not include both formative and summative assessments. <input type="checkbox"/>	Included assessments are included but appear to be an afterthought and/or not essential elements of the instructional design. <input type="checkbox"/>	The assessment plan includes both formative and summative assessments. <input type="checkbox"/>	Both formative and summative assessments are completely aligned with unit standards/goals/objectives and are included as essential elements of the design and structure of the unit plan. <input type="checkbox"/>
Assessment strategies NSTA 3c	The candidate's assessment plans and strategies are not fair or equitable. His or her assessment strategies are not designed to evaluate preconceptions and ideas that students hold and the understandings that students have formulated. <input type="checkbox"/>	The candidate plans assessment strategies to analyze student learning and to evaluate if the learning goals are met. Assessment strategies are not consistently designed to evaluate preconceptions and ideas that students hold and the understandings that students have formulated. <input type="checkbox"/>	The candidate plans fair and equitable assessment strategies to analyze student learning and to evaluate if the learning goals are met. His or her assessment strategies are designed to continuously evaluate preconceptions and ideas that students hold and the understandings that students have formulated. <input type="checkbox"/>	The candidate plans a variety of fair and equitable assessment strategies to analyze the degree to which students have met planned learning goals. His or her assessment strategies are designed to identify and continuously evaluate students' preconceptions and ideas and their previously-formulated understandings. <input type="checkbox"/>

**Management Strategies**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
	The unit management plan is incomplete or poorly conceived; there is little connection between the plan and unit activities. <input type="checkbox"/>	A management plan is included, but important considerations are left out and/or the scope of the management plan is not sufficient to address the unique requirements of the unit plan. <input type="checkbox"/>	The unit management plan takes into account the content of the unit, the materials and activities included in the unit, and the needs of the children being taught. <input type="checkbox"/>	The unit management plan is thoughtfully and thoroughly designed; the plan is designed to enable all students to be on task and successfully engaged in the business of learning. <input type="checkbox"/>

**Special Needs Adaptations**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
	No consideration for special-needs students is included in the unit plan. <input type="checkbox"/>	Included adaptations are incompletely developed and/or are not well correlated with UP goals and objectives. <input type="checkbox"/>	The unit plan includes appropriate adaptations for special-needs students. <input type="checkbox"/>	Adaptations for students with special needs are thorough and detailed. Adaptations are designed to allow special-needs students to participate fully in lesson activities. <input type="checkbox"/>

**Safety in the Science Classroom**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
<p>Planning learning experiences NSTA 3d</p>	<p>The candidate does not plan adequate safety procedures.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate plans learning experiences that demonstrate safety procedures in his or her classroom.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate plans a learning environment and learning experiences for all students that demonstrates chemical safety, safety procedures, and the ethical treatment of living organisms within his or her licensure area(s).</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate anticipates areas of concern for his or her instructional unit, and plans a learning environment and a variety of learning experiences for all students demonstrating chemical safety, safety procedures, and the ethical treatment of living organisms within his or her licensure area(s).</p> <p style="text-align: right;"><input type="checkbox"/></p>
<p>Duty of care for materials NSTA Standard 4a</p>	<p>The candidate fails to design activities that demonstrate safe and proper techniques for the preparation, storage, dispensing, supervision, or disposal of materials.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate designs minimally-effective activities to demonstrate safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of materials.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate designs activities in a P-12 classroom that demonstrate safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used within his or her subject area science instruction.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate regularly and consistently designs highly-effective activities in a P-12 classroom that demonstrate safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used within his or her subject area science instruction.</p> <p style="text-align: right;"><input type="checkbox"/></p>
<p>Implementation of emergency procedures and maintenance of safety equipment, policies, and procedures NSTA Standard 4b</p>	<p>The candidate does not develop or implement effective emergency procedures; he or she does not maintain safety equipment, policies and procedures in compliance with established state and/or national guidelines. He or she does not ensure safe science activities for his or her students.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate designs minimally-effective plans in the process of implementing emergency procedures; his or her maintenance of safety equipment, policies and procedures is not in full compliance with established guidelines. He or she does not ensure that science activities are consistently appropriate for all students.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate implements activities documenting his or her ability to put emergency procedures into effect; he or she maintains safety equipment, policies and procedures in compliance with established state and/or national guidelines. The candidate ensures safe science activities appropriate for the abilities of all students.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate implements highly effective activities documenting his or her ability to implement emergency procedures; maintenance of safety equipment, policies and procedures complies with state and/or national guidelines. He or she carefully designs science activities to ensure the safety of all students.</p> <p style="text-align: right;"><input type="checkbox"/></p>
<p>Duty of care for living organisms NSTA Standard 4c</p>	<p>The candidate fails to design classroom activities that demonstrate ethical decision-making with respect to the treatment of living organisms. He or she does not emphasize safe, humane, or ethical treatment of animals and/or does not comply with the legal restrictions on the collection, keeping, and use of living organisms.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate designs but does not consistently implement classroom activities that demonstrate ethical decision-making with respect to the treatment of living organisms. He or she understands safe, humane, and ethical treatment of animals, but does not consistently comply with the legal restrictions on the collection and keeping of living organisms.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate designs and demonstrates classroom activities that demonstrate ethical decision-making with respect to the treatment of all living organisms in and out of the classroom. He or she emphasizes safe, humane, and ethical treatment of animals and complies with the legal restrictions on the collection, keeping, and use of living organisms.</p> <p style="text-align: right;"><input type="checkbox"/></p>	<p>The candidate's modeling of classroom activities demonstrating ethical decision-making with respect to the treatment of all living organisms results in students following his or her example. His or her example causes students to treat animals safely, humanely, and ethically. The classroom complies with legal restrictions on the collection, keeping, and use of living organisms.</p> <p style="text-align: right;"><input type="checkbox"/></p>

**Unit Block Plan (calendar of lessons):**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
	Not all elements in the Unit Block Plan are addressed; most elements are poorly or incompletely developed. <input type="checkbox"/>	Each required element in the Unit Block Plan is addressed; some elements are under developed. <input type="checkbox"/>	Each required element in the Unit Block Plan is appropriately addressed. <input type="checkbox"/>	Each required element in the Unit Block Plan is developed thoroughly and completely. The block plan provides visual 'proof' that the standards, goals and objectives are being met and are aligned with activities and assessments. <input type="checkbox"/>

**Grammar/Mechanics/Construction**

	<b>Needs Improvement 1</b>	<b>Emerging Competence 2</b>	<b>Competent 3</b>	<b>Outstanding 4</b>
	The unit plan may contain serious and distracting errors in grammar and punctuation as well as numerous irritating minor errors and frequent misspellings. <input type="checkbox"/>	Sentences are generally correct in structure; may display isolated serious errors in grammar and punctuation or frequent minor errors that do not interfere substantially with meaning or do not greatly distract the reader; occasional misspellings. <input type="checkbox"/>	Grammar is accurate; noun/verb agreement, and pronoun/antecedent agreement is mostly accurate; point of view is consistent; few errors in spelling and punctuation; no typographical errors. <input type="checkbox"/>	Grammar is consistently accurate; subjects agree with verbs in number and tense; pronouns agree with antecedents; point of view is consistent; spelling and punctuation are accurate; no typographical errors. <input type="checkbox"/>

<b>Unit Plan Summative Assessment</b>		Assessment	Unit Block Plan (Calendar of Events)
Unit Content	/4	Assessment Plan /4	/4
Unit Rationale	/4	Assessment Descriptions and Rubrics /4	Grammar/Mechanics/Construction /4
Unit Standards	/4	Formative and Summative Assessments /4	
		Assessment strategies /4	
Instructional Design: Learning Activities		Management Strategies /4	Total /64
Confronting concepts	/4	Adaptations Special Needs /4	<i>Passing = 48/64</i>
Selection of activities	/4	Safety in the Science Classroom	<i>No individual element score may be &lt; 2</i>
Materials and Resources	/4	Planning learning experiences /4	
		Duty of Care for Materials /4	
		Emergency Procedures /4	
		Duty of Care for Living Organisms /4	

**Unifying concepts.** Unifying concepts are broad patterns of thought that cut across all fields of science and help students think about science in an organized, systematic way. Unifying concepts are key ideas that underlie and integrate all scientific knowledge and connect with other disciplines such as mathematics and social studies, and create linkages within and among fields of science such as physics or biology.<sup>1</sup> *NSTA Standard 1*

The five National Science Education Standards unifying concepts include:<sup>2</sup>

*Systems, order, and organization.* Ways to observe and describe phenomenon that are related to each other and/or work together as a whole.

- Systems** a regularly interacting or interdependent group of items forming a unified whole, a group of related natural objects or forces. Examples include water shed systems, solar system, nervous system, and weather systems.
- Order** an arrangement, group or class. Examples include the four seasons, life cycles, and planets of the solar system.
- Organization** an act or process of being organized, living systems have different levels of organization, sorting. Examples include periodic table of the elements, cells, tissues, organs, organisms, and biological classification systems

*Evidence, models, and explanation.* Used to understand or predict scientific phenomenon.

- Evidence** Defined by the National Science Education Standards as observations and data on which to base scientific explanations.
- Model** a structural design, usually a miniature representing something. Examples of models include simulations of the solar system, human body, a globe. Examples of abstract models (ideas that provide understanding) include a model of an atom, gas molecules colliding to produce pressure or structures too small or remote to be tangible. **Note:** Concrete models work best, especially with younger students.
- Evidence** something that furnishes proof. Examples of evidence include smell (evidence that a skunk has passed), leaves on the ground (evidence that it is fall) and frost on car windows (evidence that it is colder outside than inside).

*Change, constancy and measurement.* The concepts of constancy and change underlie most understandings of the natural and technological world. Change in systems can be quantified. Students should apply mathematical skills of accuracy, precision, scale, rate, and appropriate systems of measurement.

- Change** a process resulting in alteration. Examples include erosion and tree growth.
- Constancy** the state of being unchanged. Examples include the speed of light and

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<sup>1</sup> Adapted from <http://www.dpi.state.nc.us/docs/curriculum/science/scos/2004/10unifying.pdf>. Taken from the World Wide Web on July 7, 2009.

<sup>2</sup> Adapted from <http://www.mcps.k12.mt.us/portal/LinkClick.aspx?fileticket=a9YOrwkIakY%3D&tabid=819&mid=1789>. Taken from the World Wide Web on July 7, 2009.

freezing and boiling temperatures of materials at specific air pressures.  
**Measurement** the act or process of determining extent, dimension, capacity, quantity or size

*Evolution and equilibrium.* Evolution represents change in systems. Change may be abrupt or occur over various lengths of time. As systems react to forces and change, a state of equilibrium may develop where forces and changes occur in opposite and off-setting directions.

**Evolution** a process of change over a long period of time in a certain direction, usually from a lower simpler form to a more complex and, often, more efficient form. Examples include technological change, landscape change, and biological change.

**Equilibrium** a state of balance between opposing forces. Examples include ph balance, air pressure on a windless day, and predator-prey relationship.

*Form and function.* usually interrelated, for example, a fish has fins (form) which allows it to swim; a house is designed with a pointed roof (form) so that snow will slid off (function). The function of an object frequently relies on form: a bird could not fly without wings. Understanding of form and function may be at different levels of sophistication. All students should be able to explain at their level the forms and functions of objects and how the two are interrelated.

**Form** is the shape and structure of an object. Examples include the body shape of plants and animals.

**Function** the action that something has been designed to accomplish. Examples include the function of the heart which is to furnish oxygen and nutrients to cells, and the function of photosynthesis which is to feed the plant.

3. The nature of science. This section of your unit plan will include one or all of the following: a.) a discussion of the naturalistic explanations of your unit plan topic, supported by empirical data that are, at least in principle, testable against the natural world; b.) a discussion of the contributions to science in your particular unit topic that can be made and have been made by people the world over; or c.) A review of the history of your unit topic, including both evolutionary and revolutionary changes, including a discussion of how old ideas are replaced or supplemented by newer ones as new evidence is discovered and interpreted. *NSTA Standard 2*
4. Inquiry. The unit must be designed to involve students in some form of scientific inquiry. Using a discovery, mathematical modeling, or guided inquiry approach, students must be guided through the process of developing scientific ideas from data developed from observations and experimental results. *NSTA Standard 1*
5. Issues in science. Issue-oriented science engages all students in thinking about how science relates to their own personal lives and to societal challenges. Adolescent students will soon be independent adults, making numerous personal and political decisions that can be informed by scientific principles and processes. They will make decisions about personal health, consumer goods, and public policies related to the environment, to name just a few. To help your students prepare to make informed

decisions based on sound scientific principles, your unit must address some societal issue or problem that is relevant to the topic you are teaching. *NSTA Standard 4*

6. Science in the local community. To help your students make connections between the content they are learning and the real world, your unit will include some link to their local community. This might be accomplished through an actual or virtual field trip, by bringing in a community member to speak to your class, or by connecting the content of your unit to an actual problem that is currently being experienced by the school community using newspaper, internet, television news resources, etc. *NSTA Standard 7*