TN Science Standards Implementation Guide – Part 1

Examining the 2018-19 Adopted Tennessee Academic Standards for Science

Tennessee Department of Education | October 2017

Introduction:

Context

The Tennessee Academic Standards for Science were developed by Tennessee educators through a standards revision process that began in 2014. The educators consulted many different resources during the planning phases of standards development and through that research they agreed that the foundation for the TN Science standards would be the principles presented in the National Research Council's 2012 publication, *A Framework for K-12 Science Education*.[1] The *framework* presents a new model for science instruction that is a stark contrast to what has come to be the norm in science classrooms. Thinking about science had become memorizing concepts and solving mathematical formulae. Practicing science had become prescribed lab situations with pre-determined outcomes. The *framework* proposes a three-dimensional approach to science education that capitalizes on a child's natural curiosity. This guide presents a methodical approach to uncovering the connections between the Tennessee Academic Standards for Science and the *framework*. The goal of this guide is to help educators begin to develop an understanding of three-dimensional standards and instruction.

Using this Guide

The intended audience for this guide includes teachers, administrators, and instructional coaches engaging in discussions to develop their understanding of the philosophy behind Tennessee's Academic Standards for Science. As districts and schools have individual approaches to professional development, this guide is structured so that participants may engage in individual sessions or a one- to two-day experience working through the guide in its entirety. Decisions regarding how to use this guide and the timing of sessions remains a district decision; however, in order for the guide to have its greatest impact, it is suggested that each session takes place on a different day with enough time between sessions so that feedback and observations can be shared in the next session.

Each session includes a list of resources that are freely available in PDF format and should be accessed prior to the beginning of a session. There are limited instances where online videos are part of the session. In such instances, the video can be watched prior to coming to the session if a group viewing is not feasible.

For Session Leaders

This guide was created to be brought into a small group and used to lead a productive discussion about the *framework* without significant amounts of preparation time. There is consensus, however, that a leader familiar with *A Framework for K-12 Science Education* beyond the information provided in this document will be far more effective in leading their team. It is highly recommended that session leaders spend some time immersed in the respective portions of the *framework* prior to leading their session.

Lessons may contain links to materials outside this discussion guide Leaders should consult the resources section to ensure that participants are provided advanced notice if laptops are needed or copies are to be printed in advance. Materials are designated as either *pre-reading* if they are to be read prior to a session, or *session reading* if time is allocated during the meeting for a specified reading.

[1] *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. National Research Council. 2012 Washington, DC: The National Academies Press.*

Session One: A Case for New Science Standards

Objective

The focus of this session is to develop a general understanding of the philosophy underpinning the need for new science standards. Participants should expect to leave with an understanding of why a shift in the Tennessee Science Standards is necessary.

The discussion portion of this first session is deliberately shorter to allow participants to locate, bookmark, and familiarize themselves with *A Framework for K-12 Science Education* before session two.

Resources

Three Science Words We Should Stop Using (Session Reading)

https://www.wired.com/2013/03/three-science-words-we-should-stop-using/

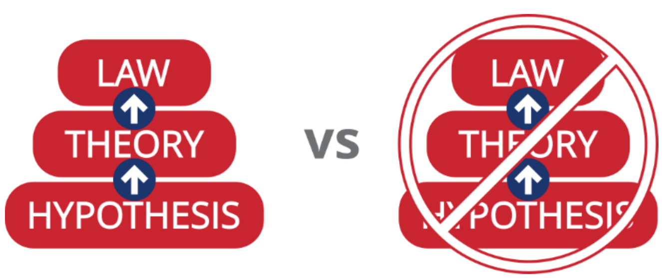
A Framework for K-12 Science Education (Session Reading)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press.
https://doi.org/10.17226/13165.

Framework Sections and Page Numbers

A Framework for K-12 Science Education: Summary – Pages 1-4
https://www.nap.edu/read/13165/chapter/2

Pre-reading Discussion



Individually, consider the graphic presented above. How do you approach a conversation about these three terms in your class? Better yet, write out a quick definition/example of each of these terms.

Hypothesis –

Theory -

Law -

Take a moment and share your thoughts and definitions on these three words, as well as your interpretation of the graphic presented.

Reading 1: Three Words We Should Stop Using

Take a few minutes to read through the WIRED magazine article, "Three Science Words We Should Stop Using." A link has been provided under the Resources section of this session guide.

Discussion Questions 1

1) *What are the consequences for Tennessee students progressing through school and graduating without a scientific understanding of these terms?*
2) *Do you have specific moments or activities in your class where you address these words? Working collaboratively, how can you reframe these instances to reflect a more scientific understanding of these three words?*
3) *How do your locally adopted instructional materials present the scientific method and the ideas of scientific laws and theories?*
4) *If necessary, how can you further facilitate the discussion of the above ideas?*

Reading 2: A Framework for K-12 Science Education – Summary

When we consider that the terms hypothesis, theory, and law are so easily misrepresented, it leads to questions about how changes in science instruction may help eliminate and/or prevent such confusion for Tennessee students. As science education trended towards memorization of concepts, without actual exploration by students, there became less dependence on the understanding of how science really works. This dangerous procession was recognized in broader circles of science education and became the focus of the National Research Council and is the basis for their 2012 publication, *A Framework for K-12 Science Education*. Tennessee educators relied heavily on the evidence presented in the *framework* when writing the Tennessee science standards. This document will be the focus of the next three sessions. At this time, participants should read, *A Framework for K-12 Science Education:*

Summary – Pages 1-4, in preparation for discussion.

Discussion Questions 2

1) *What are the three dimensions recommended in The Framework?*
2) *Briefly differentiate between each of the three dimensions without using specific examples from any of the dimensions.*
3) *Reflecting on the present (adopted 2010) Tennessee Science Standards, which of these dimensions are supported by the standards?*
4) *What steps are you already taking to help to create a cohesive understanding of science that develops over time?*
5) *What steps is your district taking to create continuity in the development of a student's scientific understanding?*

Concluding Thoughts

Part of our role as educators is to address misconceptions. Rather than abandoning the use of the three words presented in Dr. Allain's artcle, perhaps consider refining their use in Tennessee.

Hypothesis – a testable prediction.
*Throughout the remaining sessions, our focus will shift to presenting ways for our students to **do** science. If we incorporate this new working definition, we lead students to do science rather than simply making guesses.*

Law – a pattern in nature.
The earlier in their education that students are exposed to a new working definition, the sooner they will expel the idea that a law is a theory that has been promoted. Elementary students experience real, tangible laws such as Newton's Laws as they apply varying forces and observe patterns in the behavior of the objects experiencing the forces. This is a great opportunity to begin to address why Newton's Laws were never theories. They are simply patterns that occur without exception.

Theory – an explanation of a pattern in nature.
Over time, explanations of the natural world have changed as consensus shifts occur when new empirical evidence is uncovered. Addressing (and even using components of) obsolete theories can allow students to simplify their thought processes and focus their thinking on relevant details. As their

*understanding develops, they have the opportunity to **experience** the need for better explanations in light of new evidence.*

Implementation

Consider when and how you address the nature of scientific progress, both formally and informally in conversation. Are there opportunities to dispel misconceptions your students may have about the roles and definitions of scientific theories or scientific laws? Do you currently use any activities or instructional materials that need support to dispel misconceptions?

In Preparation for Session Two

Session two will address the crosscutting concept dimension of three-dimensional instruction (pp. 83-102). In preparation, participants are encouraged to review these concepts and bring with them a copy of this portion of the *framework*.

Going Beyond

For those interested in a great discussion of the historical development and shifts from deductive to inductive reasoning in context to the scientific method, consider the TED talk given by Naomi Oreskes: Why We Should Trust Scientists. The link to the video is below.

https://www.ted.com/talks/naomi_oreskes_why_we_should_believe_in_science

Session Two: Dimension One – Crosscutting Concepts

Feedback from Session One

Do you find yourselves noticing when people use the word “theoretically” or the phrase, “in theory” colloquially? How do these phrases used in everyday language differ from their proper scientific uses? How have you changed how you personally use the words from session one, instructionally and informally.

Objective

The objective for this session is to develop an understanding of the crosscutting concepts as they are presented in the *A Framework for K-12 Science Education* Elementary and middle grade courses explore multiple scientific disciplines in a single year; the crosscutting concepts are concepts that can be taught across the disciplines. High school courses generally have all content organized into a single discipline. High school students should be presented with material in such a way that the crosscutting concepts can be tied to pre-existing knowledge from outside disciplines.

Resources

A Framework for K-12 Science Education (Session Reading)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press.
https://doi.org/10.17226/13165.

Framework Sections and Page Numbers

A Framework for K-12 Science Education: Dimension 2 Crosscutting Concept
Chapter 4 (Pages 83-102)
https://www.nap.edu/read/13165/chapter/8

Pre-reading Discussion

You will find a group of scientific concepts listed below. Working together, create groups and descriptors for each of the groups you have created.

Liquid	Pendulum	Biotic	Dissolving	Trait
Friction	Erosion	Temperature	Weather	Circuit
Adaptation	Light	Senses	Ecosystem	Galaxy
Seasons	Food Web	Motion	Volcanoes	Life Cycle

Reading 1: Initial Responses to Crosscutting Concepts

Pages 83-85 present the underlying ideas behind the crosscutting concepts. Read these pages, and stop when you reach the patterns section.

Discussion Questions 1

1. *As a group, generate a consensus explanation for what makes a crosscutting concept different than a general scientific concept, such as inertia or inheritance.*
2. *The framework groups the crosscutting concepts into three groups: (1) patterns and cause-and-effect, (2) scale, proportion, and quantity, and (3) systems, energy, structure and function, and stability and change. Explain the general logic behind each of these groupings based on your initial understanding.*

Reading 2:

The remainder of the chapter (pages 85-101) details each of the crosscutting concepts and presents a progression for developing each of the concepts, which parallels a student's cognitive development. Determine one of the concepts to investigate more exhaustively, and read through the portion of the framework focusing on that particular concept.

Crosscutting Concept: ________________________________

Discussion Questions 2

1. *Share one aspect of the crosscutting concept that was a surprise or a connection they did not see initially.*

2. *Did anyone see that something they may have connected to a particular crosscutting concept is not really accurate? For example, having students perform calculations is not always (often not) an example of scale, proportion, and quantity.*
3. *As a group, decide on a single course/discipline to serve as the focus of discussion for this question. (You may not all teach the same grade or course, so choose a discipline where the greatest number of people can contribute. Remember, the focus is not discovery of content; it is exploration of your crosscutting concept.) What particular topics within your selected discipline have a clear connection to your crosscutting concept? (You might choose a course such as biology, chemistry, fifth grade science, or a discipline such as earth science or life science.)*
4. *Are there topics that did not initially seem connected to the crosscutting concept, but connections became clearer as your understanding of the crosscutting concept developed?*
5. *Brainstorm and consider ways that you can impart these same connections on your students. What activities, organizers, discussions would facilitate these connections?*

Concluding Thoughts

Reconsider the list of scientific concepts that you sorted at the beginning of this session. Regroup these concepts based on the crosscutting concept that most closely relates to each. There is not a single correct answer. You may find that many scientific concepts illustrate multiple crosscutting concepts. The power of this activity comes in the degree to which you must understand the crosscutting concepts to justify your response.

Implementation Exercise

Consider connections between the different topics that you teach in your class. Think through the sequence of your course, and write a list of around 25 of the most significant concepts that you teach throughout your class. Repeat the exercise that you just completed with the pre-selected terms, this time using the terms that you feel are at the core of your course-level or grade-level science standards. This activity will help you to ensure that you have connections to the crosscutting concepts throughout the year.

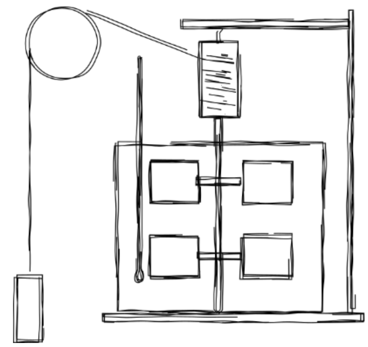
In Preparation for Session Three

Prior to session three, complete the implementation exercise and be prepared to quickly present this to the group. A gallery-walk of each group member’s concept groupings may be an efficient way to give and receive feedback.

Session three will focus on the practices used by scientists and engineers. These are the second dimension of the three-dimensional model. Participants are encouraged to pre-read this portion of the *framework.*

Going Beyond

The history of science includes instances of recognizing the interconnectedness of two seemingly isolated topics. Consider the work of James Prescott Joule, who empirically unified the concepts of the caloric from chemistry and energy from physics. The video clip, *Discovery of Energy ~ James Prescott Joule & William Thomson*, can be found online and presents great opportunity for a historical examination of crosscutting concepts.



Session Three: Dimension Two – Science and Engineering Practices

Feedback from Session Two

At the end of the last session, you were asked to group the major topics of your course. If your group includes teachers of the same grade or subject, compare your lists. If your group is a mixed group of science teachers, present your lists and give feedback. Leaning on the expertise of others may reveal new perspectives on a concept.

Objective

The objective for this session is to explore the second dimension of the three-dimensional approach to science instruction. Participants should reconsider the scientific method and compare it to the science and engineering practices. By the end of the session, participants should be familiar with all practices, be able to differentiate between science and engineering practices, and consider how the skillset encompassed with each practice develops along a student's academic career.

Resources

Science In Action: How Science Works (Session Video)

California Academy of Sciences.

https://www.youtube.com/watch?v=Jj9iNphbY88

A Framework for K-12 Science Education (Session Reading)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press.

https://doi.org/10.17226/13165.

Framework Sections and Page Numbers

A Framework for K-12 Science Education: Dimension 1 Science and Engineering Practices

Chapter 3 (Pages 41-82)

https://www.nap.edu/read/13165/chapter/7

Pre-reading Discussion

Begin this session by watching the How Science Works video from the Resources section above, which explores the discovery of the Trogloraptor spiders.

Discuss how you presently address the scientific method, any activities you presently use to facilitate discussion of the method, and how the method differs from the activities of scientist.

Reading 1:

The *framework* elaborates on the need to make explicit science and engineering practices and provides a brief overview of each of these practices at the beginning of chapter three. Read through the introduction, paying particular attention to Box 3-2 on page 50.

Discussion Questions 1

1. *Consider the perspective of students who have completed your course. From their perspective, create a large (~15cm) pie chart divided into two portions: 1) time spent actively learning by using any of the practices and 2) time spent learning through direct instruction methods such as lecture and demonstration. Share out with the group.*
2. *Returning to your pie chart, divide portion one into eight shares representing an approximate percentage of time that your hypothetical student would say that you spend on each of those practices, and share with the group your strengths and weaknesses.*
3. *Consider as a group or department what you see as strengths and weaknesses. Do all individuals have the same strengths and weaknesses? How can you support each other?*
4. *Are there practices which represent a disproportionate amount of portion one? As a group, are you stretching the definitions of any of the science practices to check off one of the practices rather than providing a genuine opportunity for students? For example, are you considering a worksheet of math-based practice as your only instance of "Using mathematics and computational thinking?"*
5. *How do engineering practices differ from the science practices?*

Reading 2:

The second reading for this session reflects the wide spectrum of understanding that exists among educators surrounding the practices by allowing for the group to determine the reading. At this time, decide as a group a particular practice to further investigate. This group investigation of a single practice can be repeated on an individual or group basis for all practices at a later time. Find the section detailing your practice in pages 54-77 of the *framework*, and study that section.

Discussion Questions 2

1. *What elements of the practice that you selected were exactly what you anticipated from the name of the practice alone?*
2. *Were there elements of the selected practice that you did not anticipate? Share these observations.*
3. *How would the selected practice have developed from the first time a student utilized it in elementary school on through high school? What changes in a student's cognitive abilities make such progressions possible?*
4. *Describe one activity you presently do in class which already utilizes elements of this practice.*
5. *Are there ways to improve other activities that you already incorporate into your classroom to better incorporate this practice? Share examples.*

Concluding Thoughts

There are concepts and situations where lecture and demonstration may be the ideal way to communicate a particular idea. However, each time instruction defaults to one of these approaches, opportunity may be lost to expose our students to the practices of science. Consider the ratio below, presented by a math educator Dan Meyer:

$$\text{WorthOfInstructionalDecision} = \frac{\textbf{Instructional}\text{Value}}{\textbf{Minutes}\text{Expended}}$$

To maximize the worth of instruction, educators can certainly streamline delivery of content using direct instruction, therefore minimizing the minutes expended. However, by utilizing the science practices, educators increase instructional value by allowing students to understand and acquire the skills of a scientist in addition to more deeply probing the content during a process of learning.

Implementation

Before the next session, apply the knowledge you have acquired today by taking an activity you presently use and trying to connect the content of this activity to at least two different practices. Ideally, you will be teaching this lesson before the next session; keep the practices in focus throughout the instruction to be able to share what you learned from the experience.

In Preparation for Session Four

Session four will focus on the organization of the content a student learns throughout all grades. Be prepared to share your experiences from the implementation portion of today's session.

Session four will also focus on understanding the division of science content between the four disciplinary core ideas. Participants are encouraged to review the introductory portion for each of the disciplinary core ideas prior to the next session in order to gain familiarity with each discipline.

Going Beyond: Computational Thinking

The practice of "using mathematics and computational thinking" is easily misconstrued. A logical thought exists: If I am assigning problems involving calculations, such as solving for the speed of a ball rolling across the floor, I have addressed this practice.

Scientific numeracy skills include more than the ability to manipulate algebraic expressions. If such a limitation exists, science becomes a mere exercise in math techniques. Computational *thinking* involves observing and evaluating trends in data to form mathematical relationships applicable to problem solving.

For a venture into computational thinking, consider the Google course: Computational Thinking for Educators: https://computationalthinkingcourse.withgoogle.com/unit.

Session Four: Dimension Three – Disciplinary Core Ideas

Feedback from Session Three

Share-out: Explain to the group an example of how you were able to modify or utilize an existing lesson to directly expose your students to one of the science practices. It would be most beneficial to the group if your sharing includes both the content covered and the practice used to cover the content.

Objective

By the end of this session, participants should have a clear understanding of how *A Framework for K-12 Science Education* was utilized by standards writers in the construction of the content portion of the Tennessee Science Standards. If time permits, it is strongly advised that K-8 teachers review both K-8 and high school standards and that high school teachers review K-8 standards as well as their own. By working through sections 1 and 2 of the *framework*, a clear vision for the development of both K-8 and high school standards will be addressed.

Resources

A Framework for K-12 Science Education (Session Reading)

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165.

TN Science Standards Reference: Suggestions for Implementing 3D Science Instruction

available at: https://www.tn.gov/education/article/science-standards

Framework Sections and Page Numbers

A Framework for K-12 Science Education: Dimension 3 Disciplinary Core Ideas

Chapters 5-8 (Pages 103-214)

https://www.nap.edu/read/13165/chapter/9

Pre-reading Discussion

Take a few moments to familiarize yourself with the learning progression found in the Science Standards Reference. Pay particular attention to the organization and arrangement of that section, as that will be the focus of this session. Share your observations about that learning progression with the group.

Discussion 1: Elementary and Middle Grades Standards

Within the Tennessee Science Standards, your group should choose a single standard from one grade level. For convenience moving forward, record the standard you will be investigating below.

Standard: ___________________________

Anatomic Standard Investigation

Every elementary and middle school standard will include a label for the grade of the standard, the disciplinary core idea for the standard, and the standard number.

1. *There are four different disciplines developed in the framework, which were all incorporated in the Tennessee Science Standards. To which of the four disciplines does your standard belong?*
2. *What are the other three disciplines?*

Forensic Standard Investigation

To understand how *A Framework for K-12 Science Education* was utilized in the development of the TN Science Standards, it is necessary to understand the substructure of the disciplinary core ideas, the component ideas. Inside Part II of the *framework*, turn to the first page of the disciplinary core idea for the standard selected. Each new disciplinary core idea begins with a broad description of that disciplinary core idea. Take a moment to read the description relevant to the selected standard.

1. *Each discipline is subdivided into several major groups of concepts known as disciplinary core ideas. Which disciplinary core idea is most closely related to your standard?*
2. *Consider the standard below; with your group, determine the standard number, grade number and disciplinary core idea for the standard.*

   2.ESS2.3
3. *Each disciplinary core idea is further divided into component ideas. These component ideas are listed in a table. This table can be found after the broad description for the disciplinary core idea you just finished reading. Write the component ideas of the disciplinary core idea relevant to your standard in the space below.* (NOTE: TENNESSEE STANDARDS MAINTAINED THE SAME NAMES AND SEQUENCING FOR THE DISCIPLINARY CORE IDEAS AS PRESENTED IN THE STANDARDS.)

a. ____

b. ____

c. ____

d. ____

e. ____

4. *With your group, discuss and determine which of the component ideas seems most relevant to the standard you have been investigating. Once you have made this determination, circle this component idea above, and flip forward in the framework until you reach the text discussing that component idea.*
5. *Each component idea will include background/introductory information. Briefly read through this introduction for your component idea.*
6. *After reading the introductory text, you will find endpoints, which describe what a student should know about that component idea by the end of either grades 2, 5, 8, or 12. Read through the endpoint appropriate to the standard you have selected, and discuss with your group whether or not you believe this endpoint is relevant to developing an understanding of your standard.* (NOTE: IF THE COMPONENT IDEA AND YOUR STANDARD SEEM DISJOINTED, RECONSIDER YOUR DISCUSSIONS FROM QUESTION 2.)

Discussion 2: High School Standards

Within the Tennessee Science Standards, your group should choose a single standard from a single science course. For convenience moving forward, record the standard you will be investigating below.

Standard: ___________________________

Anatomic Standard Investigation

Every high school standard will include a label for the course for the standard, the disciplinary core idea for the standard, and the standard number. At the high school level, there are courses for which the majority or perhaps all of the standards may come from a single disciplinary core idea. (NOTE: IF YOUR GROUP OPTED TO SKIP PAST THE ELEMENTARY STANDARDS INTRODUCTION, IT IS STRONGLY RECOMMENDED THAT YOU RECONSIDER TO GAIN A MORE COMPLETE UNDERSTANDING OF THE DISCIPLINARY CORE IDEAS.)

1. *There are four different disciplines developed in the framework, which were all incorporated in the Tennessee Science Standards. To which of the four disciplines does your standard belong?*
2. *What are the other three disciplines?*

Standard Learning Progression.

Often, students arrive in high school classes singing the "we were never taught this" anthem. Many times, teachers are **certain** that students were taught the material, but are not sure when or in what context. By understanding the structure of the TN science standards through the lens of the *framework*, it is possible to quickly pin-point both sequence and context in the development of a student's scientific understanding.

1. *Each discipline is subdivided into several major groups of concepts known as disciplinary core ideas. Which disciplinary core idea is most closely related to your standard?*
2. *Consider the standard below; with your group, determine the standard number, grade number and disciplinary core idea for the standard.*

BIO1.ETS2.1

3. *Within the framework, locate the chapter that relates to the disciplinary core idea that you identified in question one above. Read through the introduction to the disciplinary core idea at the beginning of that section.*
4. *Following the introduction to each discipline, you will have a table showing the further breakdown of that disciplinary core ideas and component ideas. Record the component ideas for your disciplinary core idea in the space below.*

a. ____

b. ____

c. ____

d. ____

e. ____

5. *Have a discussion to reach a consensus about which of the component ideas has the closest relationship to the standard you have selected. Based on the consensus of the group, turn forward until you reach that component idea and read over the introduction to that component idea.*
6. *The introduction is followed by endpoints, which describe what a student should have learned by the end of that endpoint. Discuss with your group how closely your standard relates to the endpoints for the component idea you have identified.* (NOTE: AS WITH LOWER GRADE STANDARDS, IF THE COMPONENT IDEA AND STANDARD SEEM DISJOINTED, RECONSIDER YOUR ANSWER TO THE PREVIOUS QUESTION.)
7. *Are there elements to the component idea which are not addressed in the course for your standard? If so, consider that the endpoints are for the end of grade 12, and may be addressed in another course. Perhaps your group can identify the applicable course.*

Concluding Thoughts: Learning Progression of Tennessee Science Standards

A central idea behind *A Framework for K-12 Science Education* is the idea that a student's understanding of science should develop in a manner that is supported by their own cognitive development. Recognizing this, the *TN Science Standards Reference* includes a section which arranges the standards by disciplinary core idea rather than grade level. Using this section of the Science Standards Reference, it is possible to efficiently track the development of a student's content understanding since kindergarten.

Implementation

Moving forward with a better understanding of the component ideas, spend some time reading through the endpoints in lower grades, focusing on those component ideas coming from disciplinary core ideas which appear in your standards. (NOTE: EACH STANDARD APPEARING IN THE SCIENCE STANDARDS REFERENCE HAS ALREADY BEEN LINKED BACK TO ITS COMPONENT IDEA FROM THE *FRAMEWORK*.)

Going Beyond

Thus far, the focus of the sessions has been on sections one and two of the *framework*. With a grasp of Tennessee Science Standards and three-dimensional instruction, consideration should now be given to implementing this new knowledge in lesson design. Section three (specifically Chapter 9: Integrating the Three Dimensions) provides recommendations and examples for moving the material presented into classroom activities.

Coming Soon

The intent of this discussion guide is to provide a methodical introduction to the Tennessee Academic Standards for Science and the three dimensions of science instruction. A second implementation guide will offer recommendations and approaches to altering existing content or creating new content for classroom use, as well as an overview of how science assessment changes to match science instruction.