Evidence-Based Instructional Practices

Clarifying and Sharing Clear Learning Goals and the Kentucky Academic Standards (KAS) for Science

The Clarifying and Sharing Clear Learning Goals Overview provides the research base associated with this evidence-based instructional practice.

What are connections between the Evidenced-Based Instructional Practice #2: Clarifying and Sharing Clear Learning Goals and the *KAS for Science*?

The *Kentucky Academic Standards for Science* identify what students should be able to demonstrate by the end of grade-level or grade-band instruction. The standards, written as performance expectations (PEs), are an integration of three different dimensions: disciplinary core ideas (DCIs), science and engineering practices (SEPs) and crosscutting concepts (CCCs). The DCIs are the conceptual content understanding of which students should have knowledge. The SEPs and CCCs are the dimensions that are used in service of the DCIs as students come to the conceptual understandings as they experience and actively engage with the sciences.

As the dimensions interact with one another, the learning goals and success criteria should be multi-dimensional. There are two reasons for this: learning goals drive instructional design and assessment development. Developing learning goals in which the SEP and CCC are used in service of the DCI, lessons will be driven by students actively engaging in the sciences as they work to make sense of phenomena or develop solutions to problems. Multi-dimensional learning goals ensure that the assessment task in which students demonstrate their understanding goes beyond simple recall. Students are expected to demonstrate their understanding of the core ideas the way a scientist would communicate their understanding as they investigate phenomena.

As learning goals are multidimensional, so too are the success criteria. By developing success criteria that focus on a single dimension, the emphasis for instruction changes. As students are grappling with understanding core ideas, the success criteria show how students will demonstrate their understanding. The goal of science instruction is for students to make sense of phenomena or solve problems, which results in a shift in instructional design. Students will be using SEPs and CCCs as they come to conceptual understandings; therefore, the success criteria should include either one or both of these meaning making dimensions along with the DCI.

What does this look like in practice? Let us take the example learning goal and success criteria found in Table 4.9 Examples of Learning Goals and Success Criteria to identify how the dimensions interact with one another. The example focuses on Grade 2 learning in which students are learning about observable properties of matter (materials) and how these properties can be used to classify the materials.

	Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Learning Goal: We are learning to use patterns from our observations to place different materials into groups based on ways they are the same and different In this Learning Goal, emphasis is on the use of the SEP and CCC by students as they come to an understanding that different materials can have different observable properties.	**Analyzing and Interpreting Data** ("....from our observations....")	**Structures and Properties of Matter** ("...different materials....")	**Patterns** ("....groups based on ways they are the same and different.")
Success Criterion: I can explain how I will find patterns in different materials.	**Planning and Carrying Out Investigations** ("....how I will find...")	**Structures and Properties of Matter** ("...different materials....")	**Patterns** ("...find patterns...")
Success Criterion: I can name the patterns I see in different materials.		**Structures and Properties of Matter** ("...different materials....")	**Patterns** (...name the patterns...")

These success criteria illustrate how the SEP and/or the CCC are used by students to demonstrate their understanding of observable properties of matter. Note that the dimensions, in this case the SEP, do not need to mirror that of the learning goal.

What are planning considerations for the successful implementation of the Evidenced-Based Instructional Practice #2: Clarifying and Sharing Clear Learning Goals to ensure that all students have equitable access and opportunity to learn the standards contained in the *KAS for Science?*

Educators should understand the three dimensions, as described in *A Framework for K12 Science Education*, in order to develop grade-appropriate learning goals and success criteria.

- Educators understand and are familiar with the conceptual understandings (DCIs) expected for their grade level.
- Educators understand the importance of the SEPs in the development of scientific knowledge.
- Educators understand how the CCC are used to bridge understandings across the science disciplines.

Students come to school with experiences and background knowledge.

- Educators can tap into student and community-based funds of knowledge in order to take advantage of these cultural understandings as students explore phenomena.
- Educators can utilize student interest in order to identify phenomena to investigate or engineering problems to solve. Collaborate with students to identify their interests and experiences. Utilizing information from this collaboration, educators can make learning meaningful and relevant.

Learning goals and success criteria are key components of the formative assessment process.

- The learning goals that are developed are often associated with the learning progressions identified that will move students to the understanding of science concepts.
- Throughout the process of learning, and as teachers receive formative information during instruction, learning goals and their related success criteria should be addressed with students.

What strategies and resources can support the implementation of Evidence-Based Instructional Practice #2: Clarifying and Sharing Clear Learning Goals within the *KAS for Science?*

- In order to design effective and appropriate instruction, educators must understand the expectations for learning.
    - The Kentucky Department of Education (KDE) has developed a protocol for breaking down a standard. This protocol leads educators through a process for developing an understanding of the conceptual understanding requirements for the DCIs. This will allow teachers to gauge appropriate depth and rigor when developing lessons or reviewing for possible use.
- These resources provide guidance in the development of, and importance for, learning goals and success criteria in the science classroom.
    - The KDE professional learning module, Phenomena for Instruction, walks participants through a thought process that will engage student interest and community needs for lesson/unit development.
    - The KDE professional learning module, Three-Dimensional Tasks: Session B, walks participants through the process of developing three-dimensional learning goals and success criteria. Participants will then develop a task that will measure the identified learning goal.
    - Kentucky Educational Television (KET), with support from KDE and the assistance of Washington County science teachers, has developed a professional learning course **Demonstrating Formative Assessment in the Science Classroom: Using the FARROP to Inform Practice.** This course demonstrates the use of learning goals and success

criteria in the science classroom.
    - The STEMTeachingTool brief **How to define meaningful daily learning objectives for science investigations** provides resources and strategies for the importance of developing learning objectives/goals that are related to questions for investigation.

- These STEMTeachingTools briefs provide further strategies in support of developing learning relevant for students
    - **Why should students investigate contemporary science topics—and not just "settled" science:** Describes how investigation of contemporary science topics supports meaningful learning.
    - **Getting their hands dirty: Engaging learners in authentic science practices outside the classroom:** Describes how using the outdoors supports student engagement in, and relevance of, learning.
    - **How can science instruction leverage and develop student interests? Short answer: In so many different ways!:** Provides suggestions as to how educators can connect with student and community interests.
    - **Designing and participating in community and citizen science efforts to support equity and justice:** Describes how the use of citizen science projects promotes relevant learning.