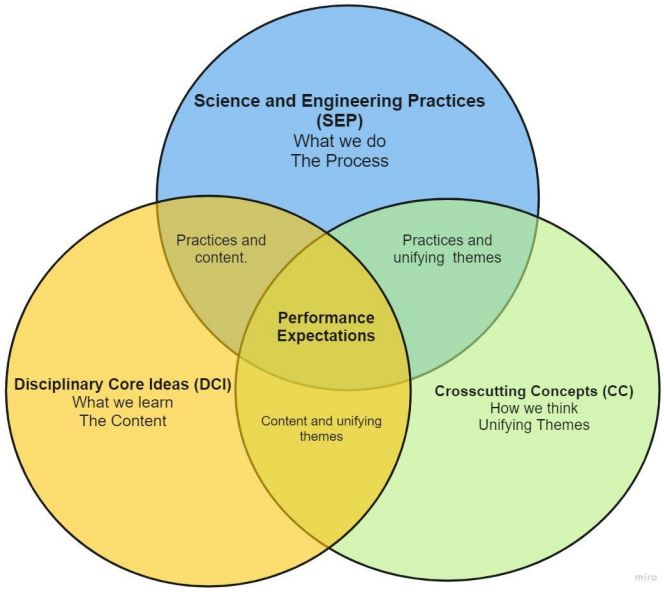
INDIANA DEPARTMENT of EDUCATION

THREE-DIMENSIONAL LEARNING: SCIENCE INDIANA ACADEMIC STANDARDS

The K-12 Science Indiana Academic Standards outline the knowledge, science, and engineering practices that all students should learn by the end of high school. The standards are three-dimensional, as each student performance expectation (standard) engages students at the nexus of the following three dimensions:

- Science and Engineering Practices (SEP)
- Crosscutting Concepts (CC)
- Disciplinary Core Ideas (DCI)



Science and Engineering Practices

The eight practices describe what scientists use to investigate, build models, and construct theories of the world around them, or that engineers use to build and design systems. These concepts are essential for all students to learn.

SEP.1.	Asking questions (for science) and defining problems (for engineering).
SEP.2.	Developing and using models.
SEP.3.	Planning and carrying out investigations.
SEP.4.	Analyzing and interpreting data.

SEP.5.	Using mathematics and computational thinking.
SEP.6.	Constructing explanations (for science) and designing solutions (for engineering).
SEP.7.	Engaging in arguments from evidence.
SEP.8.	Obtaining, evaluating, and communicating information.

Crosscutting Concepts (CC)

The seven CCs bridge disciplinary boundaries and core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the DCIs and develop a coherent, scientifically-based view of the world.

- **CC.1.** *Patterns:* Observed patterns of forms and events guide organization and classification and prompt questions about relationships and the factors that influence them.
- **CC.2.** *Cause and Effect: Mechanism and explanation*: Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.
- **CC.3.** *Scale, Proportion, and Quantity*: In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.
- **CC.4.** *Systems and System Models*: Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.
- **CC.5.** *Energy and Matter: Flows, cycles, and conservation*: Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.
- **CC.6.** *Structure and Function*: The way in which an object or living thing is shaped and its substructure determines many of its properties and functions.
- **CC.7.** *Stability and Change*: For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

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Disciplinary Core Ideas (DCI)

The DCIs describe the content that occurs at each grade or course. The K-12 Science Indiana Academic Standards focus on a limited number of core ideas in science and engineering, both within and across the disciplines and built on the notion of learning as a developmental progression. The DCIs are grouped into four domains.

- **Physical Science (PS)**
- **Life Science (LS)**
- **Earth and Space Science (ESS)**
- **Engineering, Technology, and Applications of Science (ETS)**

The biggest shift associated with the revised Science Indiana Academic Standards is the articulation of the three dimensions that make up each standard. No longer can content knowledge stand alone as a standard. Content (referred to as DCIs) must always be blended with SEPs and CCs. Elements from each of these three dimensions are blended to create performance expectations (PEs). PEs are end points. To successfully prepare students to meet these goals, instructional materials must provide learning experiences at the intersection of these three dimensions.

Resources

- Everything You Need to Know About Three-Dimensional Learning: NSTA
- Indiana Academic Standards webpage