

Introduction to Indiana's Academic Standards for Science – 2010

Indiana's Academic Standards for Science were last revised in 2000. This new document, Indiana's Academic Standards for Science – 2010, reflects the ever-changing science content and the underlying premise that science education should be an inquiry-based, hands-on experience. These standards were adopted by the Indiana State Board of Education in April, 2010, and will be implemented in the 2011-12 school year.

Indiana's Academic Standards for Science – 2010 reflect a few significant changes that are worth noting. Primarily, there are fewer standards and each grade level focuses on the big ideas for each of these sub-disciplines: physical science; earth science; life science; and science, technology and engineering. The overarching organization of the standards has also changed; they are divided into two sections: Process Standards and Content Standards, which are described in greater detail below.

Process Standards

The Process Standards are the processes and skills that students are expected to learn and be able to do within the context of the science content. The separation of the Process Standards from the Content Standards is intentional; in doing so we want to make explicit the idea that what students are doing while they are learning science is extremely important. The Process Standards reflect the way in which students are learning and doing science and are designed to work in tandem with the science content, resulting in robust instructional practice.

The Process Standards are organized in the following grade bands: K-2, 3-5, 6-8. Within each grade band, the Process Standards address a particular topic or topics. Kindergarten introduces The Nature of Science, while grades 1 through 5, reflect two parts: The Nature of Science and The Design Process. In grades 6 through 8, Reading for Literacy in Science and Writing for Literacy in Science have been added to emphasize these processes in science. For high school, the Process Standards include Reading and Writing for Literacy in Science as well as The Nature of Science.

As noted in the previous paragraph, grades 6 through 8 and high school content courses will include Reading and Writing for Literacy in Science. It is important to note that these Process Standards emerged with the adoption of the Common Core State Standards in the area of Reading and Writing for Literacy in Science. The Literacy Standards establish that instruction in reading, writing, speaking, listening, and language is a shared responsibility. The Literacy Standards are predicated on teachers in the content areas using their unique disciplinary expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the literacy standards are meant to complement rather than supplant content standards in the disciplines.

Part of the motivation behind the disciplinary approach to literacy promulgated by the Literacy Standards is extensive research establishing the need for college- and career-ready students

to be proficient in reading complex informational text independently in a variety of content areas. Most of the required reading in college and workforce training programs is informational in structure and challenging in content. Postsecondary education programs typically provide students with both a higher volume of such reading than is generally required in K-12 schools and comparatively little scaffolding.

The Literacy Standards make clear that significant reading of informational texts should also take place outside ELA classrooms in order for students to be ready for college and careers. Future assessments will apply the sum of all the reading students do in a grade, not just their reading in the ELA context. The Literacy Standards demand that a great deal of reading should occur in all disciplines.

The Literacy Standards also cultivate the development of three mutually reinforcing writing capacities: writing to persuade, to explain, and to convey real or imagined experience. College and career readiness requires that writing focus significantly on writing to argue and to inform or explain.

The Literacy Standards use grade level bands to present the standards. Teachers teaching at the beginning of the grade band may need to provide scaffolding for students to be successful, where teachers teaching at the end of the grade band should expect students to demonstrate the standards independently.

Content Standards

In grades 1 through 8, the Content Standards are organized in four distinct areas: 1) physical science; 2) earth science; 3) life science; and 4) science, technology and engineering. Kindergarten has only the first three areas: physical, earth and life science. In each of these areas there is at least one core standard, which serves as the big idea at that grade level for that content area. For the high school science courses, the content standards are organized around the core ideas in each particular course, which are represented by the core standard. The core standard is not meant to stand alone or be used as an individual standard, but instead is meant to help teachers organize their instruction around the “big ideas” in that content area and for grades K-8, at that particular grade level. Beneath each core standard are indicators which serve as the more detailed expectations within each of the content areas.

Finally, in the development of these revised science standards, careful attention was paid to how ideas are articulated across the grade levels so that content and skills that students will need to succeed in a particular sub-discipline are introduced in an appropriate manner in the early elementary grades and then progressed as students move towards high school.

Grade 1

Students in first grade study the composition of objects, the nature of solids and liquids, the properties of soil, and the relationship of living things to one another and to their environment. Students learn about naturally occurring and human made materials and design and construct a habitat for an animal. Within this study students employ the key principles of the nature of science and the design process.

Process Standards

The Nature of Science

Students gain scientific knowledge by observing the natural and constructed world, performing and evaluating investigations and communicating their findings. The following principles should guide student work and be integrated into the curriculum along with the content standards on a daily basis.

- Use a scientific notebook to record predictions, questions and observations about data with pictures, numbers or in words.
- Conduct investigations that may happen over time as a class, in small groups, or independently.
- Generate questions and make observations about natural processes.
- Make predictions based on observations.
- Discuss observations with peers and be able to support your conclusion with evidence.
- Make and use simple equipment and tools to gather data and extend the senses.
- Recognize a fair test.

The Design Process

As citizens of the constructed world, students will participate in the design process. Students will learn to use materials and tools safely and employ the basic principles of the engineering design process in order to find solutions to problems.

- Identify a need or problem to be solved.
- Document the design throughout the entire design process.
- Brainstorm potential solutions.
- Select a solution to the need or problem.
- Select the materials to develop a solution.
- Create the solution.
- Evaluate and test how well the solution meets the goal.
- Communicate the solution with drawings or prototypes.
- Communicate how to improve the solution.

Content Standards

Standard 1: Physical Science

Core Standard:

Describe objects in terms of the materials that compose them and in terms of their physical properties.

- 1.1.1 Use all senses as appropriate to identify the component parts of objects and the materials from which they are made.
- 1.1.2 Characterize materials as solid or liquid, investigate their properties, record observations and explain the choices to others based on evidence (i.e., physical properties).
- 1.1.3 Experiment with simple methods for separating solids and liquids based on their physical properties.

Standard 2: Earth and Space Science

Core Standard:

Observe, describe and ask questions about soil components and properties.

- 1.2.1 Observe and compare properties of sand, clay, silt and organic matter. Look for evidence of sand, clay, silt and organic matter as components of soil samples.
- 1.2.2 Choose, test and use tools to separate soil samples into component parts.
- 1.2.3 Observe a variety of soil samples and describe in words and pictures the soil properties in terms of color, particle size and shape, texture, and recognizable living and nonliving items.
- 1.2.4 Observe over time the effect of organisms like earthworms in the formation of soil from dead plants. Discuss the importance of earthworms in soil.

Standard 3: Life Science

Core Standard:

Observe, describe and ask questions about living things and their relationships to their environments.

- 1.3.1 Classify living organisms according to variations in specific physical features (e.g., body coverings, appendages) and describe how those features may provide an advantage for survival in different environments.
- 1.3.2 Observe organisms closely over a period of time in different habitats such as terrariums, aquariums, lawns and trees. Draw and write about observations.
- 1.3.3 Observe and explain that plants and animals have basic needs for growth and survival: plants need to take in water and need light, and animals need to take in water and food and have a way to dispose of waste.
- 1.3.4 Describe how animals' habitats, including plants, meet their needs for food, water, shelter and an environment in which they can live.
- 1.3.5 Observe and describe ways in which animals and plants depend on one another for survival.

Standard 4: Science, Engineering and Technology

Core Standard:

Determine properties of natural and man-made materials and their most important uses.

- 1.4.1 Use all senses as appropriate to sort objects as being composed of materials that are naturally occurring, human made or a combination of the two.
- 1.4.2 Choose two animals that build shelters within their habitats. Compare the shelters in terms of the materials and tools they use and the type and purpose of shelter they provide.
- 1.4.3 Construct a simple shelter for an animal with natural and human-made materials.