Science Explorers

Children in Kindergarten through Fifth Grade may attend monthly sessions affording them the opportunity to experiment with various scientific principles. If they attend all sessions in a year's time, they will have the opportunity to interact with the following standards.

Indiana Academic Standards, Science

http://dc.doe.in.gov/Standards/AcademicStandards/PrintLibrary/science.shtml

Homeschoolers, Kindergarten through Fifth Grade

Standard 1 — The Nature of Science and Technology

It is the union of science and technology that forms the scientific endeavor and that makes it so successful. Although each of these human enterprises has a character and history of its own, each is dependent on and reinforces the other. This first standard draws portraits of science and technology that emphasize their roles in the scientific endeavor and reveal some of the similarities and connections between them. In order for students to truly understand the nature of science and technology, they must model the process of scientific investigation through inquiries, fieldwork, lab work, etc. Through these experiences, students will practice designing investigations and experiments, making observations, and formulating theories based on evidence.

K.1.1 Raise questions about the natural world.

K.1.2 Begin to demonstrate that everyone can do science.

1.1.1 Observe, describe, draw, and sort objects carefully to learn about them.

1.1.2 Investigate and make observations to seek answers to questions about the world, such as "In what ways do animals move?"

1.1.4 Use tools, such as rulers and magnifiers, to investigate the world and make observations.

2.1.1 Manipulate an object to gain additional information about it.

2.1.2 Use tools — such as thermometers, magnifiers, rulers, or balances — to gain more information about objects.

2.1.3 Describe, both in writing and verbally, objects as accuratel

2.1.4 Make new observations when there is disagreement among initial observations.

2.1.5 Demonstrate the ability to work with a team but still reach and communicate one's own conclusions about findings.

2.1.6 Use tools to investigate, observe, measure, design, and build things.

3.1.1 Recognize and explain that when a scientific investigation is repeated, a similar result is expected.

3.1.2 Participate in different types of guided scientific investigations, such as observing objects and events and collecting specimens for analysis.

3.1.3 Keep and report records of investigations and observations* using tools, such as journals, charts, graphs, and computers.

3.1.4 Discuss the results of investigations and consider the explanations of others.

3.1.5 Demonstrate the ability to work cooperatively while respecting the ideas of others and communicating one's own conclusions about findings.

4.1.2 Recognize and describe that results of scientific investigations are seldom exactly the same. If differences occur, such as a large variation in the measurement of plant growth, propose reasons for why these differences exist, using recorded information about investigations.

4.1.3 Explain that clear communication is an essential part of doing science since it enables scientists to inform others about their work, to expose their ideas to evaluation by other scientists, and to allow scientists to stay informed about scientific discoveries around the world.

4.1.4 Describe how people all over the world have taken part in scientific investigation for many centuries.

4.1.5 Demonstrate how measuring instruments, such as microscopes, telescopes, and cameras, can be used to gather accurate information for making scientific comparisons of objects and events. Note that measuring instruments, such as rulers, can also be used for designing and constructing things that will work properly.

4.1.6 Explain that even a good design may fail even though steps are taken ahead of time to reduce the likelihood of failure.

4.1.7 Discuss and give examples of how technology, such as computers and medicines, has improved the lives of many people, although the benefits are not equally available to all.

4.1.8 Recognize and explain that any invention may lead to other inventions.

5.1.1 Recognize and describe that results of similar scientific investigations may turn out differently because of inconsistencies in methods, materials, and observations.

5.1.3 Explain that doing science involves many different kinds of work and engages men, women, and children of all ages and backgrounds.

5.1.4 Give examples of technology, such as telescopes, microscopes, and cameras, that enable scientists and others to observe things that are too small or too far away to be seen without them and to study the motion of objects that are moving very rapidly or are hardly moving.

5.1.5 Explain that technology extends the ability of people to make positive and/or negative changes in the world.

5.1.7 Give examples of materials not present in nature, such as cloth, plastic, and concrete, that have become available because of science and technology.

Standard 2 — Scientific Thinking

There are certain thinking skills associated with science, mathematics, and technology that young people need to develop during their school years. These are mostly, but not exclusively, mathematical and logical skills that are essential tools for both formal and informal learning and for a lifetime of participation in society as a whole. Good communication is also essential in order to both receive and disseminate information and to understand others' ideas as well as have one's own ideas understood. Writing, in the form of journals, essays, lab reports, procedural summaries, etc., should be an integral component of students' experiences in science.

K.2.1 Use whole numbers, up to 10, in counting, identifying, sorting, and describing objects and experiences.

K.2.2 Draw pictures and write words to describe objects and experiences.

1.2.1 Use whole numbers, up to 100, in counting, identifying, measuring, and describing objects and experiences.

1.2.2 Use sums and differences of single digit numbers in investigations and judge the reasonableness of the answers.

1.2.3 Explain to other students how to go about solving numerical problems.

1.2.4 Measure the length of objects having straight edges in inches, centimeters, or non-standard units.

1.2.5 Demonstrate that magnifiers help people see things they could not see without them.

1.2.6 Describe and compare objects in terms of number, shape, texture, size, weight, color, and motion.

1.2.7 Write brief informational descriptions of a real object, person, place, or event using information from observations.

2.2.1 Give estimates of numerical answers to problems before doing them formally.

2.2.2 Make quantitative estimates of familiar lengths, weights, and time intervals and check them by measurements.

2.2.3 Estimate and measure capacity using cups and pints.

2.2.5 Draw pictures and write brief descriptions that correctly portray key features of an object.

3.2.1 Add and subtract whole numbers* mentally, on paper, and with a calculator.

3.2.2 Measure and mix dry and liquid materials in prescribed amounts, following reasonable safety precautions.

3.2.4 Appropriately use simple tools, such as clamps, rulers, scissors, hand lenses, and other technology, such as calculators and computers, to help solve problems.

3.2.5 Construct something used for performing a task out of paper, cardboard, wood, plastic, metal, or existing objects.

3.2.6 Make sketches and write descriptions to aid in explaining procedures or ideas.

3.2.7 Ask "How do you know?" in appropriate situations and attempt reasonable answers when others ask the same question.

4.2.1 Judge whether measurements and computations of quantities, such as length, area, volume, weight, or time, are reasonable.

4.2.2 State the purpose, orally or in writing, of each step in a computation.

4.2.4 Use numerical data to describe and compare objects and events.

4.2.5 Write descriptions of investigations, using observations and other evidence as support for explanations.

5.2.2 Use appropriate fractions and decimals when solving problems.

5.2.3 Choose appropriate common materials for making simple mechanical constructions and repairing things.

5.2.6 Write instructions that others can follow in carrying out a procedure.

5.2.7 Read and follow step-by-step instructions when learning new procedures.

5.2.8 Recognize when and describe that comparisons might not be accurate because some of the conditions are not kept the same.

Standard 3 — The Physical Setting

One of the grand success stories of science is the unification of the physical universe. It turns out that all natural objects, events, and processes are connected to each other. This standard contains recommendations for basic knowledge about the overall structure of the universe and the physical principles on which it seems to run. This standard focuses on two principle subjects: the structure of the universe and the major processes that have shaped planet Earth, and the concepts with which science describes the physical world in general – organized under the headings of *Matter and Energy* and *Forces of Nature*. In Kindergarten, students learn that objects are made of different materials and that they move in different ways.

K.3.1 Describe objects in terms of the materials they are made of, such as clay, cloth, paper, etc.

K.3.2 Investigate that things move in different ways, such as fast, slow, etc.

1.3.4 Investigate by observing and then describe how things move in many different ways, such as straight, zigzag, round-and-round, and back-and-forth.

1.3.5 Recognize that and demonstrate how things near Earth fall to the ground unless something holds them up.

2.3.5 Investigate that things can be done to materials — such as freezing, mixing, cutting, heating, or wetting — to change some of their properties. Observe that not all materials respond in the same way.

2.3.7 Investigate and observe that the way to change how something is moving is to give it a push or a pull.

2.3.8 Demonstrate and observe that magnets can be used to make some things move without being touched.

3.3.9 Demonstrate that things that make sound do so by vibrating, such as vocal cords and musical instruments.

4.3.11 Investigate, observe, and explain that things that give off light often also give off heat.

4.3.12 Investigate, observe, and explain that heat is produced when one object rubs against another, such as one's hands rubbing together.

4.3.16 Investigate and describe that without touching them, material that has been electrically charged pulls all other materials and may either push or pull other charged material.

5.3.11 Investigate and describe that changes in speed* or direction of motion of an object are caused by forces*. Understand that the greater the force, the greater the change in motion and the more massive an object, the less effect a given force will have.

Standard 5 — The Mathematical World

Mathematics is essentially a process of thinking that involves building and applying abstract, logically connected networks of ideas. These ideas often arise from the need to solve problems in science, technology, and everyday life — problems ranging from how to model certain aspects of a complex scientific problem to how to balance a checkbook.

K.5.1 Use shapes — such as circles, squares, rectangles, and triangles — to describe different objects.

1.5.1 Use numbers, up to 10, to place objects in order, such as first, second, and third, and to name them, such as bus numbers or phone numbers.

1.5.2 Make and use simple picture graphs to tell about observations.

2.5.1 Recognize and explain that, in measuring, there is a need to use numbers between whole numbers, such as 2½ centimeters.

2.5.2 Recognize and explain that it is often useful to estimate quantities.

2.5.3 Observe that and describe how changing one thing can cause changes in something else, such as exercise and its effect on heart rate.

2.5.4 Begin to recognize and explain that people are more likely to believe ideas if good reasons are given for them.

2.5.5 Explain that some events can be predicted with certainty, such as sunrise and sunset, and some cannot, such as storms. Understand that people aren't always sure what will happen since they do not know everything that might have an effect.

3.5.5 Explain that one way to make sense of something is to think of how it relates to something more familiar.

4.5.4 Demonstrate how graphical displays of numbers may make it possible to spot patterns that are not otherwise obvious, such as comparative size and trends.

4.5.5 Explain how reasoning can be distorted by strong feelings.

5.5.1 Make precise and varied measurements and specify the appropriate units.

5.5.6 Describe and use drawings to show shapes and compare locations of things very different in size.

5.5.7 Explain that predictions can be based on what is known about the past, assuming that conditions are similar.

Standard 6 — Common Themes

Some important themes pervade science, mathematics, and technology and appear over and over again, whether we are looking at ancient civilization, the human body, or a comet. These ideas transcend disciplinary boundaries and prove fruitful in explanation, in theory, in observation, and in design. A focus on *Constancy and Change* within this standard provides students opportunities to engage in long-term and on-going laboratory and field work, and thus understand the role of change over time in studying The Physical Setting and The Living Environment.

K.6.1 Describe an object by saying how it is similar to or different from another object.

1.6.1 Observe and describe that models, such as toys, are like the real things in some ways but different in others.

1.6.2 Observe that and describe how certain things change in some ways and stay the same in others, such as in their color, size, and weight.

2.6.1 Investigate that most objects are made of parts.

2.6.2 Observe and explain that models may not be the same size, may be missing some details, or may not be able to do all of the same things as the real things.

2.6.3 Describe that things can change in different ways, such as in size, weight, color, age, and movement. Investigate that some small changes can be detected by taking measurements.

3.6.1 Investigate how and describe that when parts are put together, they can do things that they could not do by themselves.

3.6.2 Investigate how and describe that something may not work if some of its parts are missing.

3.6.3 Explain how a model of something is different from the real thing but can be used to learn something about the real thing.

3.6.4 Take, record, and display counts and simple measurements of things over time, such as plant or student growth.

4.6.1 Demonstrate that in an object consisting of many parts, the parts usually influence or interact with one another.

4.6.2 Show that something may not work as well, or at all, if a part of it is missing, broken, worn out, mismatched, or incorrectly connected.

4.6.4 Observe and describe that some features of things may stay the same even when other features change.

5.6.3 Recognize and describe that almost anything has limits on how big or small it can be.

5.6.4 Investigate, observe, and describe that things change in steady, repetitive, or irregular ways, such as toy cars continuing in the same direction and air temperature reaching a high or low value. Note that the best way to tell which kinds of changes are happening is to make a table or a graph of measurements.