

TRB³

Elementary Science Teacher Resource Book

A PROFESSIONAL DEVELOPMENT
RESOURCE FOR TEACHING
CORE CURRICULUM

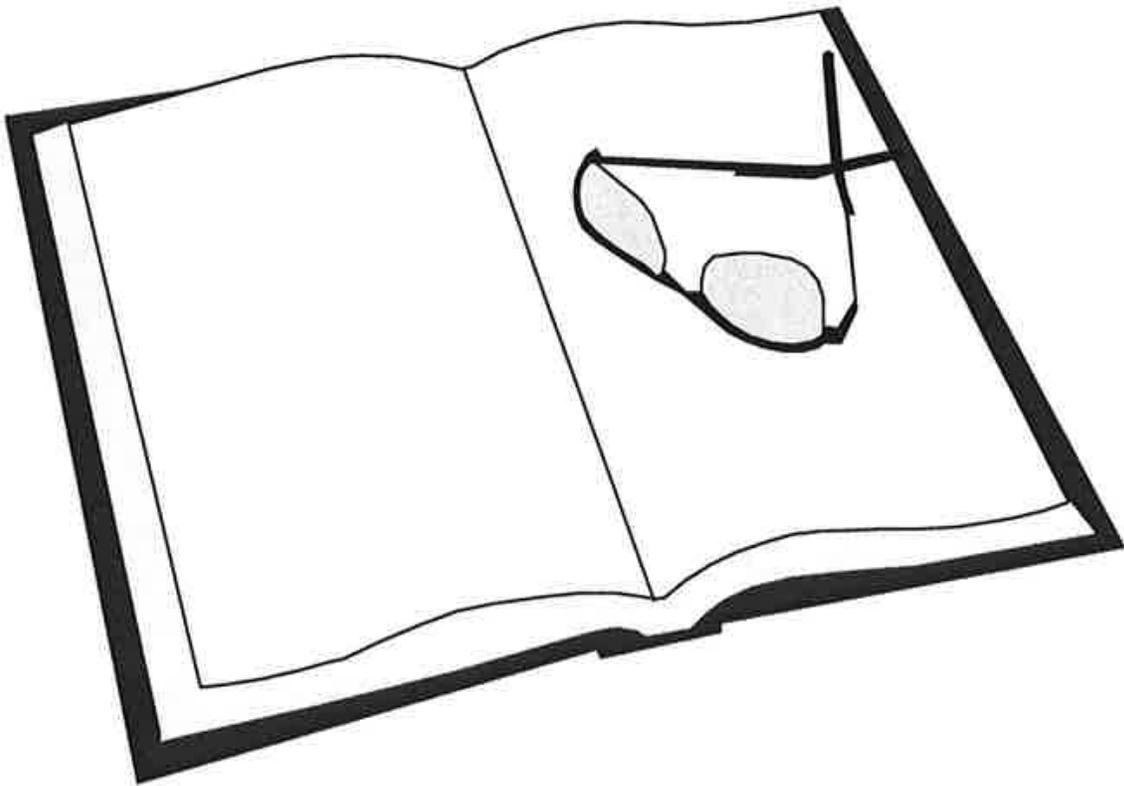
GRADE 4

LITERACY -- STRATEGIES – ASSESSMENT

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2. Elementary Science Core Description



Utah Elementary Science Core Curriculum

Introduction

Science is a way of knowing, a process for gaining knowledge and understanding of the natural world. The Science Core Curriculum places emphasis on understanding and using skills. Students should be active learners. It is not enough for students to read about science; they must do science. They should observe, inquire, question, formulate and test hypotheses, analyze data, report, and evaluate findings. The students, as scientists, should have hands-on active experiences throughout the instruction of the science curriculum.

The Elementary Science Core describes what students should know and be able to do at the end of each of the K-6 grade levels. It was developed, critiqued, piloted, and revised by a community of Utah science teachers, university science educators, State Office of Education specialists, scientists, expert national consultants, and an advisory committee representing a wide variety of people from the community. The Core reflects the current philosophy of science education that is expressed in national documents developed by the American Association for the advancement of Science, the National Academies of Science. This Science Core has the endorsement of the Utah Science Teachers Association. The Core reflects high standards of achievement in science for all students.

Organization of the Elementary Science Core

The Core is designed to help teachers organize and deliver instruction.

The Science Core Curriculum's organization:

- Each grade level begins with a brief course description
- The INTENDED LEARNING OUTCOMES (ILOs) describe the goals for science skills and attitudes. They are found at the beginning of each grade, and are an integral part of the Core that should be included as part of instruction.
- The SCIENCE BENCHMARKS describe the science content students should know. Each grade level has three to five Science Benchmarks. the ILOs and Benchmarks intersect in the Standard, Objectives and indicators.
- A STANDARD is a broad statement of what students are expected to understand. Several Objectives are listed under each standard.

- Science is a way of knowing, a process for gaining knowledge and understanding of the natural world.



- An OBJECTIVE is a more focused description of what students need to know and be able to do at the completion of instruction. If students have mastered the Objectives associated with a given Standard, they are judged to have mastered that Standard at that grade level. Several Indicators are described for each Objective.
- An INDICATOR is a measurable or observable student action that enables one to judge whether a student has mastered a particular Objective. indicators are not meant to be classroom activities, but they can help guide classroom instruction.

Guidelines

- Reflect the Nature of Science
- Coherent
- Developmentally Appropriate
- Encourage Good Teaching Practices
- Comprehensive
- Feasible
- Useful and Relevant
- Encourages Good Assessment Practices
- The Most Important Goal

Eight Guidelines Were Used in Developing the Elementary Science Core

Reflects the Nature of Science

Science is a way of knowing, a process of gaining knowledge and understanding of the natural world. The Core is designed to produce an integrated set of Intended Learning Outcomes (ILOs) for students. Please see the Intended Learning Outcomes document for each grade level core.

As described in these ILOs, students will:

1. Use science process and thinking skills.
2. Manifest science interests and attitudes.
3. Understand important science concepts and principles.
4. Communicate effectively using science language and reasoning.
5. Demonstrate awareness of the social and historical aspects of science.
6. Understand the nature of science.

Coherent

The Core has been designed so that, wherever possible, the science ideas taught within a particular grade level have a logical and natural connection with each other and with those of earlier grades. Efforts have also been made to select topics and skills that integrate well with one another and with other subject areas appropriate to grade level. In addition, there is an upward articulation of science concepts, skills, and content. This spiraling is intended to prepare students to understand and use more complex science concepts and skills as they advance through their science learning.

Developmentally Appropriate

The Core takes into account the psychological and social readiness of students. It builds from concrete experiences to more abstract understandings. The Core describes science language students should use that is appropriate to each grade level. A more extensive vocabulary should not be emphasized. In the past, many educators may have mistakenly thought that students understood abstract concepts (such as the nature of the atom), because they repeated appropriate names and vocabulary (such as electron and neutron). The Core resists the temptation to tell about abstract concepts at inappropriate grade levels, but focuses on providing experiences with concepts that students can explore and understand in depth to build a foundation for future science learning.

Encourages Good Teaching Practices

It is impossible to accomplish the full intent of the Core by lecturing and having students read from textbooks. The Elementary Science Core emphasizes student inquiry. Science process skills are central in each standard. Good science encourages students to gain knowledge by doing science: observing, questioning, exploring, making and testing hypotheses, comparing predictions, evaluating data, and communicating conclusions. The Core is designed to encourage instruction with students working in cooperative groups. Instruction should connect lessons with students' daily lives. The Core directs experiential science instruction for all students, not just those who have traditionally succeeded in science classes. The vignettes listed on the "Utah Science Home Page" at <http://www.usoe.k12.ut.us/curr/science> for each of the Core standards provide examples, based on actual practice, that demonstrate the excellent teaching of the Science Core is possible.

Comprehensive

The Elementary Science Core does not cover all topics that have traditionally been in the elementary science curriculum; however, it does provide a comprehensive background in science. By emphasizing depth rather than breadth, the Core seeks to empower students rather than intimidate them with a collection of isolated and eminently forgettable facts. Teachers are free to add related concepts and skills, but they are expected to teach all the standards and objectives specified in the Core for their grade level.

Feasible

Teachers and others who are familiar with Utah students, classrooms, teachers, and schools have designed the Core. It can be taught with easily obtained resources and materials. A Teacher Resource Book (TRB) is available for elementary grades and has sample lessons on each topic for each grade level. The TRB is a document that will grow as teachers add exemplary lessons aligned with the new Core. The middle grade levels have electronic textbooks available at the Utah State Office of Education's "Utah Science Home Page" at <http://www.usoe.k12.ut.us/curr/science>.

Useful and Relevant

The curriculum relates directly to student needs and interests. It is grounded in the natural world in which we live. Relevance of science to other endeavors enables students to transfer skills gained from science instruction into their other school subjects and into their lives outside the classroom.

Encourages Good Assessment Practices

Student achievement of the standards and objectives in this Core are best assessed using a variety of assessment instruments. One's purpose should be clearly in mind as assessment is planned and implemented. Performance tests are particularly appropriate to evaluate student mastery of science processes and problem-solving skills. Teachers should use a variety of classroom assessment approaches in conjunction with standard assessment instruments to inform their instruction. Sample test items, keyed to each Core Standard, may be located on the Utah Science Home Page. Observation of students engaged in science activities is highly recommended as a way to assess students' skills as well as attitudes in science. The nature of the questions posed by students provides important evidence of students' understanding of science.

The Most Important Goal

Elementary school reaches the greatest number of students for a longer period of time during the most formative years of the school experience. Effective elementary science instruction engages students actively in enjoyable learning experiences. Science instruction should be as thrilling an experience for a child as seeing a rainbow, growing a flower, or holding a toad. Science is not just for those who have traditionally succeeded in the subject, and it is not just for those who will choose science-related careers. In a world of rapidly expanding knowledge and technology, all students must gain the skills they will need to understand and function responsibly and successfully in the world. The Core provides skills in a context that enables students to experience the joy of doing science.

Grade Level Topic Matrix for the Utah Elementary Science Core Curriculum Matrix of Standards

3	4	5	6
STANDARD I: Students will understand that the shape of Earth and the moon are spherical and that Earth rotates on its axis to produce the appearance of the sun and moon moving through the sky.	STANDARD I: Students will understand that water changes state as it moves through the water cycle.	STANDARD I: Students will understand that chemical and physical changes occur in matter.	STANDARD I: Students will understand that the appearance of the moon changes in a predictable cycle as it orbits Earth and as Earth rotates on its axis.
STANDARD II: Students will understand that organisms depend on living and nonliving things within their environment.	STANDARD II: Students will understand that the elements of weather can be observed, measured, and recorded to make predictions and determine simple weather patterns.	STANDARD II: Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion reshape Earth's surface.	STANDARD II: Students will understand the relationship and attributes of objects in the solar system.
STANDARD III: Students will understand the relationship between the force applied to an object and resulting motion of the object.	STANDARD III: Students will understand the basic properties of rocks, the processes involved in the formation of soils, and the needs of plants provided by soil.	STANDARD III: Students will understand that magnetism can be observed when there is an interaction between the magnetic fields of magnets or between a magnet and materials made of iron.	STANDARD III: Students will understand the relationship and attributes of objects in the solar system.
STANDARD IV: Students will understand that objects near Earth are pulled toward Earth by gravity.	STANDARD IV: Students will understand how fossils are formed, where they may be found in Utah, and how they can be used to make inferences.	STANDARD IV: Students will understand features of static and current electricity.	STANDARD IV: Students will understand the scale of size, distance between objects, movement, and apparent motion (due to Earth's rotation) of objects in the universe and how cultures have understood, related to and used these objects in the night sky.
STANDARD V: Students will understand that the sun is the main source of heat and light for things living on Earth. They will also understand that the motion of rubbing objects together may produce heat.	STANDARD V: Students will understand the physical characteristics of Utah's wetlands, forests, and deserts and identify common organisms for each environment.	STANDARD V: Students will understand that traits are passed from the parent organism to their offspring, and that sometimes the offspring may possess variations of these traits that may help or hinder survival in a given environment.	STANDARD V: Students will understand that microorganisms range from simple to complex, are found almost everywhere, and are both helpful and harmful.
			STANDARD VI: Students will understand properties and behavior of heat, light, and sound.