

Independent School District of Boise City

Science 6

District Course #6006

Course Description

Science at the elementary level will explore concepts in three main areas: earth science, physical science, and life science. One of the best ways to explore these concepts is through the use of our Hands on Science Laboratory Kits. These kits are the foundation of our elementary program and should have first priority in the curriculum continuum. Measurement, Systems Thinking, Inquiry, Technology and Problem Solving, the processes used to learn and understand science concepts, will be integrated into each unit of science. Units may be taught in any order, due to the constraints and/or availability of lab kits and materials.

Adopted Materials

Title: *Science*
Publisher: Scott Foresman

Title: *Using Science Notebooks in Elementary Classrooms*
Publisher: NSTA Press

Hands on Science Laboratory Kits

- STC Motion & Design
- STC Variables

Course Scope

	Nature of Science Systems (S1)	Nature of Science Inquiry (S1)	Technology & Problem Solving (S1)
Physical Science (S2) <ul style="list-style-type: none">• Motion and Design	INPUTS, OUTPUTS, BOUNDARIES, & FLOWS	USING INQUIRY TO DEVELOP SCIENTIFIC QUESTIONS & ABILITIES	MEASUREMENT, TECHNOLOGY, & PROBLEM SOLVING
Life Science (S3) <ul style="list-style-type: none">• Flow of Energy Through Ecosystems• Cycling of Matter Through Ecosystems			
Earth & Space Science (S4) <ul style="list-style-type: none">• Earth, Atmosphere, and Environmental Issues			

Unit	Nature of Science: Systems, Inquiry, Technology and Problem Solving		Integrate in all Units				
1	Instructional Objective Understand Systems, Orders and Organizations		Standard Reference				
			Science 6.S.1.1 6.S.1.5	LA 6.LA.1.2 6.LA.2.2	Math 6.M.3.4 6.M.3.6		
No.	Objectives		Resources		Assessment		
	Know:	Be Able To:	Text	Labs or Activities	S N	E O C	I S A T
01	Any system may be thought of as containing subsystems and of being a subsystem of larger systems.	Given a system, identify subsystems and a larger encompassing system (e.g., the food chain is a system made up of producers, consumers, and decomposers and is part of a larger food web which is part of an ecosystem)	Chapter 6 and 7		X		X
02	Systems have inputs and outputs. Changes in inputs may change the flow of outputs within a system.	Describe what goes into a system (input) and what comes out of a system (output) (e.g., solar energy (input) is absorbed by plants and the food molecules (output) is produced by photosynthesis)	Chapter 6 and 7		X		
03	The boundaries of a system can be drawn differently depending on the features of the system being investigated, the size of the system, and the purpose of the investigation.	Explain how the boundaries of a system can be drawn to fit the purpose of a study (e.g., to study how insect populations change ...the system might be a canopy in a rain forest, the rain forest floor or a leaf located in emergent layer)	Chapter 6 and 7		X		
2	Instructional Objective Understand Scientific Inquiry and Develop Critical Thinking Skills		Standard Reference				
			Science 6.S.1.2 6.S.1.6 6.S.1.8	LA 6.LA.1.2 6.LA.2.2 6.LA.4.2 6.LA.6.2 6.LA.6.3	Math 6.M.5.2 6.M.5.3		
No.	Objectives		Resources		Assessment		
	Know:	Be Able To:	Text	Labs	S	E	I

				or Activities	N	O C	S A T
01	Scientific Inquiry involves asking and answering questions and comparing the answer with what scientists already know about the world.	Generate a question that can be answered through scientific investigation. This may involve refining a broad question using observations to make inferences.	Text Intro	FOSS Variables Kit including Science Stories	X		X
02	Collecting, analyzing, and displaying data are essential aspects of all investigations.	a. Collect data based on the refined question. Interpret the data in the experiment conducted. Analyze data and make inferences about relationships. b. Communicate results using pictures, tables, and diagrams that are clear, accurate, and informative.	Text Intro	FOSS Variables Kit including Science Stories	X		X
03	For an experiment to be valid, all (controlled) variables must be kept the same whenever possible, except for the independent variable being tested, and the dependent variable being measured and recorded. If a variable cannot be controlled, it must be reported and accounted for.	Plan and conduct a controlled experiment to test a hypothesis about a relationship between two variables. Determine which variables should be kept the same (controlled), which independent variable should be changed, and which dependent variable is to be measured and recorded. Report any variables not controlled and explain how they might affect results.	Text Intro	FOSS Variable Kit including science stories	X		X
04	Models are used to represent objects, events, systems, and processes. Models can be used to test hypotheses in experiments.	Create a model/experiment to collect data about objects, events, systems, or processes. Use a model/experiment to explore the relationship between two variables. Compare and contrast the results.	Text Intro	FOSS Variables Kit including science stories	X		X
3	Instructional Objective Understand how technology and problem solving work together in science.	Standard Reference					
		Science 6.S.1.3 6.S.5.2	LA 6.LA.1.2 6.LA.2.2 6.LA.4.2 6.LA.6.3	Math 6.M.2.1			
No.	Objectives		Resources		Assessment		

	Know:	Be Able To:	Text	Labs or Activities	S N	E O C	I S A T
01	Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.	Research examples of how scientists promote technological advances (e.g., how Sir Isaac Newton discovered a spectrum of color in white light; advanced warning systems for natural disasters like hurricanes, tornadoes, etc.)	Career Pages at end of chapters	FOSS Variable Kit including science stories	X		
02	The process of problem solving begins by defining a problem, identifying criteria for a successful solution, followed by research to better understand the problem, and brainstorming potential solutions.	Formulate a problem that can be solved by the design process, and identify criteria for success. Apply the scientific method to obtain results.		FOSS Variable Kit	X		X
03	Measurement is an essential piece in the scientific inquiry process.	Measure in both metric and the U.S. Customary (with an emphasis in metric) and select tools to make the appropriate measurements.		FOSS Variable Kit	X		X

Unit	Physical Science	District Course 6006					
4	Instructional Objective Understand how different forces effect the movement, speed and direction of an object.	Standard Reference					
		Science 6.S.2.2	LA 6.LA.1.2 6.LA.2.2	Math 6.M.5.5			
No.	Objectives		Resources			Assessment	
	Know:	Be Able To:	Text	Labs or Activities	S N	E O C	I S A T
01	Friction is a <i>force</i> that acts to slow or stop the motion of objects.	Demonstrate and explain the frictional <i>force</i> acting on an object with the use of a physical model.	Chapter 15; Lesson 1&2	Motion and Design STC Kit	X		X
02	Unbalanced <i>forces</i> will cause changes in the speed or direction of an object's motion.	Determine whether the <i>forces</i> on an object are balanced or unbalanced and justify with	Chapter 15; Lesson 1&2	Motion and Design STC			

		observational evidence.		Kit			
03	Gravitational force is the force of attraction between objects in the universe.	Conduct experiments that would compare the effect of push/pull on an object using controls and variables.	Chapter 15; Lesson 1&2	Motion and Design STC Kit			
04	Potential energy is the energy an object has due to its position.	Demonstrate potential and kinetic energy.	Chapter 17; Lesson 1	Motion and Design STC Kit	X		X
05	Kinetic energy is the energy of a moving object.	Compare and contrast potential and kinetic energy.	Chapter 17; Lesson 1	Motion and Design STC Kit			
06	Newton's First Law of Motion-an object at rest stays at rest and an object in motion remains in motion at constant speed and in a straight line, unless acted on by an unbalanced force.	Construct a vehicle to meet certain requirements. Make inferences about the motion of the vehicle	Chapter 15; Lesson 4	Motion and Design STC Kit	X		X
07	Newton's Second Law of Motion-the acceleration of an object depends on the mass of the object and the size of the net force applied.	Demonstrate and compare the effects of more or less weight on string pulled vehicles.	Chapter 15; Lesson 4	Motion and Design STC Kit			
08	Newton's Third Law of Motion-when a force is applied to an object, the object exerts an equal force in the opposite direction	Test how resistance influences a vehicle's motion using spring scales.	Chapter 15; Lesson 4	Motion and Design STC Kit			

Unit	Life Science	District Course 6006				
5	Instructional Objective Understand the flow of energy through ecosystems.	Standard Reference				
		Science 6.S.3.2	LA 6.LA.1.2 6.LA.2.2 6.LA.4.2 6.LA.6.3	Math 6.M.5.1 6.M.5.2		
No.	Objectives		Resources		Assessment	
	Know:	Be Able To:	Text	Labs or Activities	S N	E O C

							T
01	An <i>ecosystem</i> consists of all the <i>populations</i> living within a specific area and the nonliving <i>factors</i> they interact with. One geographical area may contain many <i>ecosystems</i> .	a. Explain that an <i>ecosystem</i> is a defined area that contains <i>populations of organisms</i> and nonliving <i>factors</i> . b. Give examples of <i>ecosystems</i> (e.g., Banff National Forest, Pacific Rainforest, one square meter of lawn) and describe their boundaries and contents.	Chapter 6; Lesson 1	Foothills Learning Center	X		X
02	Energy flows through an <i>ecosystem</i> from <i>producers</i> to <i>consumers</i> to <i>decomposers</i> . These relationships can be shown for specific <i>populations</i> on a <i>food web</i> .	Analyze the flow of energy in a local <i>ecosystem</i> , and draw a labeled <i>food web</i> showing the relationship among all of the ecosystem's plant and animal <i>populations</i> .	Chapter 7; Lesson 2	Birds of Prey	X		X
03	The major source of energy for <i>ecosystems</i> on the Earth's surface is sunlight. <i>Producers</i> (plants) transform the energy of sunlight into the chemical energy of food through <i>photosynthesis</i> . This food energy is used by plants, animals, and all other <i>organisms</i> to carry on life processes. Nearly all <i>organisms</i> on the surface of Earth depend on this energy source.	Identify how energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores, omnivores, carnivore, and decomposers.	Chapter 5; Lesson 2		X		X
04	<i>Ecosystems</i> are continuously changing. Causes of these changes include nonliving <i>factors</i> such as the amount of light, range of temperatures, and availability of water, as well as living <i>factors</i> such as the disappearance of different species through disease, predation, and overuse of resources or the introduction of new species.		Chapter 7; Lesson 4		X		X
05	Investigations of environmental issues should uncover <i>factors</i> causing the problem and relevant scientific concepts and findings that may inform an analysis of different ways to address the issue.						
06	How carbon and nitrogen pass through ecosystems in a continuous cycle	Analyze how materials cycle through ecosystems (e.g., create diagrams of different cycles of matter).					

Unit	Earth and Space Science		District Course 6006				
6	Instructional Objective Understand the interactions among the solid earth, oceans, and atmosphere, and organisms.		Standard Reference				
			Science 6.S.4.1 6.S.5.1 6.S.5.3	LA 6.LA.1.2 6.LA.2.1 6.LA.2.2 6.LA.4.2	Math 6.M.1.3		
No.	Objectives		Resources		Assessment		
	Know:	Be Able To:	Text	Labs or Activities	S N	E O C	I S A T
01	The atmosphere is a mixture of gases with different properties at different elevations.	Design a model showing the layers of the atmosphere and describe the characteristics of each individual layer.	Chapter 12; Lesson 1		X		X
02	Climate is a pattern of weather that occurs in an area over a long period.	Describe how the interaction of solar energy, air currents, water currents, and land masses determine global weather patterns.	Chapter 12; Lesson 3	Snow School at Bogus Basin	X		X
03	Weather is the condition of an atmosphere at a particular time and place.	Distinguish between and climate.					
04	The water cycle.	Explain the water cycle and its relationships to weather and climate.	Chapter 12; Lesson 2	Boise Water Shed	X		X
05	Cloud types and how they relate to specific weather changes.	Classify cumulus, cirrus, and stratus clouds and explain how they relate to weather changes.	Chapter 12; Lesson 2		X		X
06	Which resources are renewable and nonrenewable?	Compare and contrast the differences between renewable and nonrenewable resources and how they can be managed.	Chapter 11; Lesson 1		X		X
07	Choices humans make dealing with the environment have long term effects.	Compare over time how human impacts have affected South American and Canadian Pacific rainforests.	Chapter 7; Lesson 5 Chapter 11		X		X
08	Which factors cause environmental issues within	Research ecological consequences of human					

	an ecosystem.	interactions with the environment and defend a position based on your findings. (e.g., deforestation, landfills, construction, etc.)					
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Elementary Lab Kit Scope and Sequence

Grade \ Strand	Life	Earth	Physical	Technology/Math
Kindergarten			Fabric	Comparing & Measuring
Grade 1	Organisms	Pebbles, Sand, & Silt	Solids & Liquids	
Grade 2	Life Cycles of Butterflies	Weather / Air & Weather	Changes	Balancing & Weighing
Grade 3	Plant Growth & Development		Chemical Tests	Measurement
Grade 4		Land & Water	Electric Circuits	
Grade 5	Microworlds	Rocks and Minerals	Mixtures & Solutions	
Grade 6	Environments		Motion & Design	Variables

Using Science Notebooks

Model of Metacognition

- Students learn science by accessing prior science content knowledge;
- using science-process skills;
- and applying reading, writing, listening, and speaking skills to learn content

Language Arts

- The applications of LA skills are essential for students not only to develop a deep understanding of science content but also to attain scientific literacy.
- Science is the perfect area to integrate LA, especially expository writing in the form of student science notebooks.
- Notebooks are the best record of what science content is actually taught by teachers and learned by students.
- Notebooks provide an excellent assessment and feedback tool for teachers.
- The integration of LA and science can help teachers address the time issue that is so valuable in our system.

Science Notebooks 7 Essential Components

- Question, Problem, Purpose
- Prediction

- Developing a Plan
- Observation, Data, Charts, Graphs, Drawings, and Illustrations
- Claims of Evidence (analysis)
- Drawing Conclusions
- Reflection – Next Steps and New Questions

*Date and time should be recorded with each entry along with important headings or titles. The notebook is a record of what was observed or measured and this information is available for future use.

Getting Started

- Use writing prompts or sentence stems to get the writing started.
- When students are learning to write, drawings and/or illustrations convey understanding or misunderstanding of concepts.

Questions, Problems, Purpose

- Classroom discussions help students write investigable questions by asking "What do I want to find out?" or "What is the problem that needs resolution?"
- Start questions with HOW, WHAT, or WHICH.
- Avoid questions that can be answered with a "yes" or "no", or questions that start with WHY.

Prediction

- A prediction is what students think will happen:
 - I think ___ will happen because... or
 - If ___ then ___ because...
- "because" activates students' recall of prior knowledge.
- Predictions must relate to the focus question that starts the investigation.
- Drawings or illustrations can be used by young or ESL students to make predictions.
- Predictions may reveal misconceptions which gives insight into current student thinking.

Planning

- Writing prompts and scaffolds are used to get students started.
- Stage 1 – developing the general plan (variables and observations) with the help of written prompts.
- Stage 2 – developing the operational plan (steps) from the general plan.
- Build a data organizer to record observations or measurements.

Observations, Data, Charts, Graphs, Drawings, and Illustrations

- Involve the use of any of the five senses.
- Students' existing knowledge influences what they hear, see, or smell, which means they will not observe phenomena in the same way.
- Young and ESL students need to draw their observations first and label second
- Observations lead students to see patterns in the collected data.
- Teacher prompts can improve the quality of observations:
 - How are ___ the same as ___?
 - How are ___ different from ___?
 - What did you notice when you ___?

- Use guiding questions to develop charts or graphs of observations or data:
 - Which type of graph is the most appropriate to show your data: Bar, Line, or Pie?
 - What are you going to name or title your graph?
 - What is the best way to show your data: scale, intervals, or symbols?
 - (Older students) Where is your dependent and independent variable?
 - (Older students) What are you going to name each axis?
- Provide chart templates or graphic organizers to students when depicting cycles or relationships.

Three Challenges That Science Programs Face When Fostering Inquiry

- The formulation of scientific explanations from evidence
- Analysis of various types of scientific data
- The formulation of conclusions based on relevant evidence.

Claims and Evidence

- Teachers should provide an explanation framework (T chart) as a means of helping students develop the ability to analyze data:

Claims	Evidence
I claim that...	I claim this because...
<i>or</i>	<i>or</i>
I know that...	I know this because

Drawing Conclusions

- Students look for patterns, interpret, and explain their results.
- Students must use their claims and data to support their conclusions.
- Writing prompts help students for conclusions:
 - Today I learned...
 - I know this because...
- A conclusion is the final “answer” to the focus question or the solution to the problem identified at the beginning of the investigation.

Reflection: Next Steps, New Questions

- Frame questions just as before with scaffolds such as What...?, Which...?, or How...?
- Avoid question that can be answered with a “yes” or “no”, or questions that start with WHY.
- “I wonder what would happen if...?” is a sentence prompt that helps students begin the reflection process.