

# Independent School District of Boise City

## Science 4

## District Course #4006

### 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

- Idaho Ecosystem Notebook
- STC Electricity
- STC Physics of Sound (limited numbers)
- STC Land & Water

Domains of Science	Nature of Science Systems (S1)	Nature of Science Inquiry (S1)	Technology & Problem Solving (S5)
<b>Physical Science (S2)</b> <ul style="list-style-type: none"><li>• Electricity &amp; Magnetism</li><li>• Sound &amp; Light</li></ul>	Complex Systems	Conducting Investigations	Different Technologies
<b>Life Science (S3)</b> <ul style="list-style-type: none"><li>• Idaho Ecosystems</li></ul>			
<b>Earth Science (S4)</b> <ul style="list-style-type: none"><li>• Land &amp; Water</li><li>• Fossils</li></ul>			

Unit	Nature of Science: Systems, Inquiry, Technology & Problem Solving		Integrate Into All Units				
1	<b>Instructional Objective</b> Develop an Understanding of Complex Systems		Standard Reference				
			Science 4.S.1.1	LA 4.LA.1.8 4.LA.2.2 4.LA.2.3	Math 4.M.5.2		
No.	Objectives		Resources		Assessment		
	Know:	Be Able To:	Text	Labs or Activities	S N	E O C	I S A T
01	Systems consist of an organized group of related objects that form a whole.	Explain that a system consists of an organized group of related objects that form a whole.	Book Intro.				
02	Systems contain subsystems.	Identify at least one of the subsystems of an object, plant, or animal (e.g., an airplane contains subsystems for propulsion, landing, and control).	Book Intro.				
03	A system can do things that none of its subsystems can do by itself.	Specify how a system can do things that none of its subsystems can do by themselves (e.g., a forest <i>ecosystem</i> can sustain itself, while the trees, soil, plant, and animal <i>populations</i> cannot).	Book Intro.	Idaho Ecosystems			
04	Systems have inputs and outputs. Changes in inputs may change the outputs of a system.	a. Describe what goes into a system (input) and what comes out of a system (output) (e.g., electrical energy (input) goes into a circuit and light energy (output) is emitted b. Describe the effect on a system if its input is changed (e.g., add or subtract batteries to the circuit)	Book Intro.	Electric Circuits			
05	One defective part can cause a subsystem to malfunction, which in turn will affect the system as a whole.	Predict what might happen to a system if a part in one or more of its subsystems is missing, broken, worn out, mismatched, or misconnected.	Book Intro.	Electric Circuits			
06	A scientific model is a simplified representation of an object, event, system, or process created to understand the natural world.	Make, describe, & use models	Book Intro.	Land & Water; Electric	X		

				Circuits			
2	<b>Instructional Objective</b> Understand Scientific Inquiry & Develop Critical Thinking Skills		<b>Standard Reference</b>				
			<b>Science</b> 4.S.1.6	<b>LA</b> 4.LA.1.8 4.LA.2.2 4.LA.2.3	<b>Math</b> 4.M.5.1		
No.	<b>Objectives</b>		<b>Resources</b>		<b>Assessment</b>		
	<b>Know:</b>	<b>Be Able To:</b>	<b>Text</b>	<b>Lab Kit</b>	<b>S</b> <b>N</b>	<b>E</b> <b>O</b> <b>C</b>	<b>I</b> <b>S</b> <b>A</b> <b>T</b>
01	Investigations involve asking and answering questions and comparing the answers with evidence from the real world.	Ask & write questions that can be answered by conducting scientific tests.	Book Intro		X		
02	An experiment involves a comparison. For an experiment to be valid and fair, all of the things that can possibly change the outcome of the experiment should be kept the same, if possible.	Work collaboratively with other students to carry out an investigation, selecting appropriate tools and demonstrating safe and careful use of equipment.	Book Intro		X		
03	Investigations involve systematic collection and recording of relevant observations and data	Gather, record, and organize data using the appropriate <b>Core Contents</b> , tables, graphs, or maps					
04	Repeated trials are necessary for reliability.	State verbally the need to repeat observations in order to be certain the results are reliable.	Book Intro		X		
05	All observations must be reported honestly & accurately.	Record observations honestly & accurately.	Book Intro		X		
06	Explanations can be made after many observations.	Predict how the recorded observations might answer the question & analyze alternative explanations.	Book Intro		X		
07	Scientists communicate the results of their investigations verbally and in writing.	Generate a conclusion from a scientific investigation and show the conclusion is supported by evidence and other scientific principles.	page 4, 66 Book Intro		X		
08	Scientific method is an organized framework for	Use scientific inquiry to develop critical thinking skills by:	pg.xxvii		X		X

	answering questions.	<ul style="list-style-type: none"> <li>• Writing &amp; analyzing questions that can be answered by conducting scientific experiments.</li> <li>• Reading &amp; following technical instructions.</li> <li>• Stating a hypothesis based on observations.</li> <li>• Conducting scientific investigations using a control &amp; a variable.</li> <li>• Selecting &amp; using appropriate tools &amp; techniques to gather &amp; display data.</li> <li>• Comparing alternative explanations &amp; predictions.</li> <li>• Communicating scientific procedures &amp; explanations.</li> </ul>					
3	<b>Instructional Objective</b> Understand the Relationship Between Science & Technology.		<b>Standard Reference</b>				
			<b>Science</b> 4.S.1.6	<b>LA</b> 4.LA.1.8 4.LA.2.2 4.LA.2.3	<b>Math</b> 4.M 2.1		
No.	<b>Objectives</b>		<b>Resources</b>		<b>Assessment</b>		
	<b>Know:</b>	<b>Be Able To:</b>	<b>Text</b>	<b>Labs or Activities</b>	<b>S</b>	<b>E</b>	<b>I</b>
01	Technology involves changing the natural world to meet human needs or wants.	Give examples of how humans change the natural world.	Book Intro				
02	Available technology is used to assist in solving problems.	Give examples of how people around the world use different materials or technologies to solve the same problem (e.g., chopsticks vs. forks for eating).	Book Intro				
03	Collaboration can be an important part of scientific solutions.	Demonstrate teamwork behaviors during a science experiment.	Book Intro				
04	Possible solutions should be tested to see if they solve the problem	Define a problem; research the problem to view how others have tried to develop solutions; generate new solutions; choose the best possible solution and build a model or prototype; test the solution and modify the design if necessary; communicate the solution and test results.	Book Intro		X		
05	Building a model or prototype is one way to test a possible solution		Book Intro				
06	Solutions to problems must be communicated if the problem is to be solved		Book Intro		X		

Unit	Electricity and Magnetism		District Reference 4006				
4	<b>Instructional Objective</b> Explore the characteristics of electrical energy.		Standard Reference				
			Science 4.S.2.3	LA 4.LA.1.8 4.LA.2.2 4.LA.2.3	Math		
No.	Objectives		Resources		Assessment		
	Know:	Be Able To:	Text	Labs or Activities	S N	E O C	I S A T
01	All safety rules when working with different forms of energy.	Discuss ways that electricity is used safely in the home & throughout the community to make their lives easier & better.	Ch. 13 Lesson 5	STC Electric Circuits Kit			
02	A complete circuit is required to light a light bulb.	Using a battery, wires, & bulbs, build a simple circuit.	Ch. 13 Lesson 2	STC Electric Circuits Kit	X		
03	Different devices & materials play special roles in a circuit.	Measure changes in current flow (using a circuit tester) when different conductors, insulators, and diodes are added to a circuit.	Ch. 13 Lesson 4	STC Electric Circuits Kit	X		
04	Electricity flowing through a circuit may produce heat & light.	Make a light bulb filament.	Ch. 13 Lesson 1	STC Electric Circuits Kit			
05	Different strategies can be used to trouble shoot circuits.	Use a circuit tester to investigate or troubleshoot circuits that are not working properly.	Ch. 13 Lesson 2	STC Electric Circuits Kit	X		
06	The difference between a series and parallel circuit.	Build two different configurations for a circuit at your lab table, and use electrical symbols to create two circuit diagrams in your notebook.					
07	Electric circuits are used to design & build useful devices.	Design & construct switches, flashlights, &/or wire a house.	Ch. 13 Lesson 5	STC Electric Circuits Kit	X		
5	<b>Goal: Instructional Objective</b>		<b>Standard Reference</b>				

			<b>Science</b> 4.S.2.3	<b>LA</b> 4.LA.1.8 4.LA.2.2 4.LA.2.3	<b>Math</b>		
<b>No.</b>	<b>Objectives</b>		<b>Resources</b>		<b>Assessment</b>		
	<b>Know:</b>	<b>Be Able To:</b>	<b>Text</b>	<b>Labs or Activities</b>	<b>S N</b>	<b>E O C</b>	<b>I S A T</b>
01	Each magnet has an invisible field around it including a north & south pole.	Describe how a magnetic field surrounds each magnet.  Use Iron filings to Investigate different magnetic patterns using a variety of magnets.	Ch. 13 Lesson 3				
02	Magnetism is a force that can do work.	Demonstrate that magnets push & pull.	Ch. 13 Lesson 3		X		
03	Electricity creates a magnetic field that can do work.	Create a model of electromagnetism: (i.e., doorbell, motor, electromagnet).	Ch. 13 Lesson 4	p. 394,395	X		

<b>Unit</b>	<b>Sound &amp; Light</b>	<b>District Reference 4006</b>					
<b>6</b>	<b>Goal: Instructional Objective</b>  Explore the characteristics of sound & light energy	<b>Standard Reference</b>					
		<b>Science</b> 4.S.2.3	<b>LA</b> 4.LA.1.8 4.LA.2.2 4.LA.2.3	<b>Math</b>			
<b>No.</b>	<b>Objectives</b>		<b>Resources</b>		<b>Assessment</b>		
	<b>Know:</b>	<b>Be Able To:</b>	<b>Text</b>	<b>Labs or Activities</b>	<b>S N</b>	<b>E O C</b>	<b>I S A T</b>
01	Vibrating objects produce sound that travels in waves.	Define frequency, wavelength, transverse & longitudinal.	Ch. 14 Lesson 1		X		
02	The frequency of the wave affects the sound we hear.	Using an example of their choice, explain why pitch changes when variables are altered.	Ch. 14 Lesson 1	p. 404	X		

03	Sound travels at different speeds through solids, liquids, & gases.	Give an example or model of how the wave changes when traveling through solids, liquids, gases, & space.	Ch. 14 Lesson 1		X		
04	The human ear can distinguish between loudness and pitch.	Design & build an instrument from found objects & relate it to the function of the parts of an ear.	Ch. 14 Lesson 2		X		
05	There are sound wave frequencies that humans do not hear.	Draw conclusions & make inferences of examples of other instances of unheard sounds (i.e. echolocation, dog whistles, and hearing loss).	Ch. 14 Lesson 1		X		
06	Light is a form of energy that travels in waves.	List sources of light (i.e. sun, fire, lamp, bioluminescence, etc.).	Ch. 14 Lesson 3	Planet Earth DVD: "The Deep"	X		
07	There are light (electromagnetic) waves we see & waves we cannot see.	Create & label a diagram of the electromagnetic spectrum.	Ch. 14 Lesson 3		X		
08	Light bends & may behave in different ways when it strikes matter.	Using prisms and concave & convex lenses define & model/or give an example of each: reflection, refraction, absorption, transparency, translucence, & opaqueness.	Ch. 14 Lesson 4	1.0	X		
09	The human eye has specific structures allowing it to perceive light.	Diagram, label, & explain the form & function of the parts of the human eye.	Ch. 14 Lesson 4		X		

Unit	Idaho Ecosystems		District Reference 4006				
7	<b>Instructional Objective</b> Investigate the diversity of plants & animals in Idaho.		Standard Reference				
			Science 4.S.3.1	LA 4.LA.1.8 4.LA.2.2 4.LA.2.3	Math		
No.	Objectives		Resources		Assessment		
	Know:	Be Able To:	Text	Labs or Activities	S N	E O C	I S A T
01	The four major Idaho ecosystems & locations.	Locate & label ecosystems on a state map.		Idaho Ecosystems, Unit 1,	X		

				Lesson 2			
02	A minimum of three indigenous plants from each ecosystem.	Match pictures of three plants indigenous to Idaho with names & specific traits.	Ch. 1 Lesson 3				
03	Vertebrate & invertebrate animals specific to Idaho.	Differentiate between, sort, or categorize from a variety of vertebrates & invertebrates native & nonnative to Idaho.	Ch. 1 Lesson 2,4	Idaho Ecosystems, Unit 2, Lesson 2	X		
04	Some indigenous animals of Idaho including extinct mammals.	Classify the five groups of vertebrates (mammal, reptiles, amphibians, birds, fish) based on characteristics.	Ch 1 Lesson 2	Idaho Ecosystems Unit 2, Lesson 2			
05	An indigenous animal of Idaho including its habitat, diet, & physical characteristics.	Collect data, research, report & present to an audience.		Ecosystems Notebook	X		
8	<b>Instructional Objective</b>  Develop an understanding of how plants and animals interact in ecosystems.		<b>Standard Reference</b>				
			<b>Science</b> 4.S.3.2	<b>LA</b> 4.LA.1.8 4.LA.2.2 4.LA.2.3	<b>Math</b>		
No.	<b>Objectives</b>		<b>Resources</b>		<b>Assessment</b>		
	<b>Know:</b>	<b>Be Able To:</b>	<b>Text</b>	<b>Labs or Activities</b>	S N	E O C	I S A T
01	An <i>ecosystem</i> includes all of the plant and animal <i>populations</i> and nonliving resources in a given area. Plants and animals depend on one another and the nonliving resources in their <i>ecosystem</i> to help them survive.	Identify the living and nonliving parts of an <i>ecosystem</i> .  Give examples to show how the plants and animals depend on one another for survival (e.g., worms decompose waste and return nutrients to the soil, which helps plants grow).  Describe how the plants and animals in an <i>ecosystem</i> depend on nonliving resources.	Ch. 3 Lesson 2	Idaho Ecosystems, Unit 2	X		
02	Plants make their own food using the energy from the sun. Animals get food by eating plants and/or other animals that eat plants. Plants make it possible for animals to use the energy of sunlight.	Explain that plants make their own food, and animals, including humans, get food by eating plants and/or eating other animals	Ch. 3 Lesson 2	Idaho Ecosystems, Unit 2	X		

03	Plants and animals are related in <i>food webs</i> with <i>producers</i> , <i>consumers</i> , and <i>decomposers</i> that break down wastes and dead <i>organisms</i> , and return nutrients to the soil.	Given a list of three common <i>organisms</i> , draw arrows properly in a simple <i>food web</i> and identify the <i>producers</i> and <i>consumers</i> .  Compare the role of <i>producers</i> , <i>consumers</i> , and <i>decomposers</i> in an <i>ecosystem</i> .	Ch. 3 Lesson 2			
04	<i>Ecosystems</i> can change rapidly or slowly. Big changes over a short period of time can have a major impact on the <i>ecosystem</i> and the <i>populations</i> of plants and animals living there.	Apply knowledge of a plant's or animal's relationship to its <i>ecosystem</i> and to other plant and animals to predict whether and how a slow or rapid change in the <i>ecosystem</i> might affect the <i>population</i> of that plant or animal.  Present findings of environmental changes that affect the extinction or endangerment of Idaho animals. (i.e., Hagerman Horse, Woolly Mammoth, Saber Tooth Cat, Salmon, Wolves, etc.)	Ch. 8 Lesson 2  Ch. 4 Lesson 4	p. 130	X	
05	All plants and animals change the <i>ecosystem</i> where they live. If this change reduces another organism's access to resources, that organism may move to another location or die.	Describe how one <i>population</i> may affect other plants and animals in the <i>ecosystem</i> .	Ch. 4 Lesson 4	p. 124 Persuasive Essay	X	
06	People affect <i>ecosystems</i> both positively and negatively.	List and describe three environmental issues in Idaho.  Describe ways that humans can improve the health of an <i>ecosystem</i> .	Ch. 4 Lesson 4		X	

<b>Unit</b>	<b>Land &amp; Water</b>		<b>District Reference 4006</b>			
<b>9</b>	<b>Instructional Objective</b>  Investigate the role that water plays in the reshaping of Earth's surface.		<b>Standard Reference</b>			
			<b>Science</b> 4.S.4.2	<b>LA</b> 4.LA.1.8 4.LA.2.2 4.LA.2.3	<b>Math</b>	
<b>No.</b>	<b>Objectives</b>		<b>Resources</b>		<b>Assessment</b>	
	<b>Know:</b>	<b>Be Able To:</b>	<b>Text</b>	<b>Labs or Activities</b>	<b>S N</b>	<b>E O C</b>

01	How elements of earth systems interact to shape the landscape.	Identify what they know and what they would like to know regarding land & water.	Ch. 6 Lesson 1	STC Land & Water Kit	X		
02	The water cycle.	Build & label a model of a water cycle showing the continuous cycle.	Ch. 6 Lesson 4	p. 180 p. 200	X		
03	Earth's surface is constantly changing through eroding soil & rock.	Investigate how deposition & erosion change the earth's surface by measuring stream length, width, and runoff.	Ch. 9 Lesson 1,2		X		
04	Soil has different properties	Analyze four soil components & describe their properties.	Ch. 9 Lesson 1,2		X		
05	Recognize that there are elements that may change the direction & flow of water.	Model the effect of rain & observe soil erosion. (slope, rapidity, & volume)	Ch. 9 Lesson 1,2				
06	Interactions among the elements of the Earth & circulating water change the landscape.	Identify the common parts of a stream; model the formations of a larger stream or river that has multiple sources.	Ch. 9 Lesson 3		X		
07	Humans interact with natural elements that effect changes in the landscape.	Model that alternative forms (dams, plants, home sites, developments) alter the natural landscape.	Ch. 10 Lesson 2				

### 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	TOPS Learning Systems, Light <a href="http://topscience.org/">http://topscience.org/</a> or <a href="http://topscience.org/info/ordering_information.html">http://topscience.org/info/ordering_information.html</a> for ordering information.
Grade 5	Microworlds	Rocks and Minerals	Mixtures & Solutions	

Grade 6	Environments		Motion & Design	Variables
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## 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 question 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.

**Additional Resources**

Story Starters & Science Notebooking by: Sandy Buczynski & Kristin Fontichiaro

TOPS Learning Systems: Light & Sound/ Batteries & Bulbs

Idaho Power – resource for speakers and kits

Center for Birds of Prey

Botanical Gardens – Idaho Plant Lore Tour

Foothills Learning Center – Erosion, plants, water use, cycle

Boise Water Shed – Land and Water

BLM Southwest Idaho Ecosystem Discovery: An Educator’s Guide

Idaho Fish and Game

Project Wet

Project Wild

Project Learning Tree

Grade 4 Treasures Leveled Mini Books that Correlate

Unit 1, Week 2 (Ecosystems-Desert)

Unit 1, Week 3 (Ecosystems-National Parks)

Unit 2, Week 3 (Land & Water-Dams)

Unit 2, Week 4 (Electricity-Inventors)

Unit 2, Week 5 (Ecosystems-Snakes)

Unit 3, Week 5 (Land & Water- Extreme Weather)

