

COURSE: Science	GRADE(S): 4 th Grade
UNIT: Introduction: The Processes of Science	

<p>NATIONAL STANDARDS:</p> <p>SCIENCE THEMES: Systems and interactions, models, patterns of change, stability (constancy), energy, scale.</p> <p>PROCESS SKILLS: Observing, classifying, measuring, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing.</p>
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<p>STATE STANDARDS:</p> <p>3.1.4.A Know that natural and human-made objects are made up of parts.</p> <ul style="list-style-type: none"> Identify and describe what parts make up a system. Identify system parts that are natural and human-made (e.g., ball point pen, simple electrical circuits, plant anatomy). Describe the purpose of analyzing systems. Know that technologies include physical technology systems (e.g., construction, manufacturing, and transportation), informational systems and biochemical-related systems. <p>3.1.4.B Know models as useful simplifications of objects or processes.</p> <ul style="list-style-type: none"> Identify different types of models. Identify and apply models as tools for prediction and insight. Apply appropriate simple modeling tools and techniques. Identify theories that serve as models (e.g., molecules). <p>3.1.4.C Illustrate patterns that regularly occur and reoccur in nature.</p> <ul style="list-style-type: none"> Identify observable patterns (e.g., growth patterns in plants, crystal shapes in minerals, climate, and structural patterns in bird feathers). Use knowledge of natural patterns to predict next occurrences (e.g., seasons, leaf patterns, and lunar phases). <p>3.1.4.D Know that scale is an important attribute of natural and human made objects, events and phenomena.</p> <ul style="list-style-type: none"> Identify the use of scale as it relates to the measurement of distance, volume and mass. Describe scale as a ratio (e.g., map scales). Explain the importance of scale in producing models and apply it to a model. <p>3.1.4.E Recognize change in natural and physical systems.</p> <ul style="list-style-type: none"> Recognize change as fundamental to science and technology concepts. Examine and explain change by using time and measurement. Describe relative motion. Describe the change to objects caused by heat, cold, light or chemicals. <p>3.2.4.A Identify and use the nature of scientific and technological knowledge.</p> <ul style="list-style-type: none"> Distinguish between a scientific and a belief. Provide clear explanations that account for observations and results. Relate how new information can change existing perceptions. <p>3.2.4.B Describe objects in the world using the five senses.</p> <ul style="list-style-type: none"> Recognize observational descriptors from each of the five senses (e.g., see-blue, feel-rough). Use observations to develop a descriptive vocabulary. <p>3.2.4.C Recognize and use the elements of scientific inquiry to solve problems.</p> <ul style="list-style-type: none"> Generate questions about objects, organisms and/or events that can be answered through scientific investigations. Design an investigation. Conduct an experiment.

- State a conclusion that is consistent with the information.
- 3.2.4.D Recognize and use the technological design process to solve problems.**
 - Recognize and explain basic problems.
 - Identify possible solutions and their course of action.
 - Try a solution.
 - Describe the solution, identify its impacts and modify if necessary.
 - Show the steps taken and the results.
- 3.7.4.A Explore the use of basic tools, simple materials and techniques to safely solve problems.**
 - Describe the scientific principles on which various tools are based.
 - Group tools and machines by their function.
 - Select and safely apply appropriate tools and materials to solve simple problems.
- 3.7.4.B Select appropriate instruments to study materials.**
 - Develop simple skills to measure, record, cut, and fasten.
 - Explain appropriate instrument selection for specific tasks.
- 4.8.4.A Identify the biological requirements of humans.**
 - Explain how a dynamically changing environment provides for sustainability of living systems.
 - Identify several ways that people use natural resources.
- 4.8.4.C Explain how human activities may change the environment.**
 - Identify everyday human activities and how they affect the environment.
 - Identify examples of how human activities within a community affect the natural environment.

ASSESSMENT ANCHORS:

S4.A.1 Reasoning and Analysis

- S4.A.1.1 Identify and explain the pros and cons of applying scientific, environmental, or technological knowledge to possible solutions to problems.
- S4.A.1.3 Recognize and describe change in natural or human-made systems and the possible effects of those changes.
- S4.A.2.1 Apply skills necessary to conduct an experiment or design a solution to solve a problem.
- S4.A.2.2 Identify appropriate instruments for a specific task and describe the information the instrument can provide.

KEY CONCEPTS:

1. Distinctions are made among observations, conclusions, inferences, and predictions.
2. Hypotheses are formulated based on cause and effect relationships.
3. Variables that must be held constant in an experimental situation are defined.
4. Appropriate instruments are selected to measure linear distance, volume, mass, and temperature.
5. Appropriate metric measures are used to collect, record, and report data.
6. Data is displayed using bar and basic line graphs.
7. Numerical data which is contradictory or unusual in experimental results is recognized.
8. Predictions are made based on data from picture graphs, bar graphs, and basic line graphs.

UNIT OBJECTIVES:

1. *Apply skills necessary to conduct an experiment or design a solution to solve a problem.*
 - Investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
 - There are different kinds of investigations depending on the questions they are trying to answer. Types of investigations include describing objects, events, and organisms; classifying them; and doing a fair test (experimenting).
 - To communicate an observation accurately, one must provide a clear description of exactly what is observed, and nothing more. Those conducting investigations need to

understand the difference between *what is seen* and what inferences, conclusions, or interpretations can be drawn from the observation.

- An inference is a conclusion based on evidence about events that *have already occurred*. Accurate observations and evidence are necessary to draw realistic and plausible conclusions.
- A scientific prediction is a forecast about what *may happen* in some future situation. It is based on the application of scientific principles and factual information.
- Systematic investigations require standard measures (metric), consistent and reliable tools, and organized reporting of data. The way the data are displayed can make it easier to uncover important information. This can assist in making reliable scientific forecasts of future events.

2. *Recognize that scientific inquiry is not a single method but a flexible process that involves the following:*

- Using the senses and scientific equipment to make careful observations
- Asking specific questions about observations that can be answered using the tools of science.
- Forming hypotheses that explain what is observed.
- Testing hypotheses through repeated experiments and other tests, and through collecting and recording data.
- Analyzing and drawing conclusions from the data.
- Asking new questions, making new observations, and forming new hypotheses based on these findings.

3. *Distinguish between a scientific fact and opinion.*

- A scientific fact is an observation that has been confirmed repeatedly and is accepted as true (although its truth is never final).
- An opinion is a person's ideas and thoughts towards something. It is an assessment, judgment or evaluation of something.

4. *Observe and record change by using time and measurement.*

- Investigations require standard measures, consistent and reliable tools, and organized reporting of data. The way the data are displayed can make it easier to uncover important information. This can assist in making reliable scientific forecasts of future.

5. *Identify appropriate tools and instruments to be used for specific tasks. Listed below are examples of tools students should be familiar with using.*

- Magnifying lenses which make objects appear larger and can be easily transported; Microscopes use several lenses to make objects appear much more detailed; Telescopes magnify objects that are far away.
- Funnels are used when pouring a substance; Filter paper is used to separate solids from liquids.
- Timers and stopwatches are used to measure the amount of time that has passed
- Graph paper to make charts and graphs to display data.
- Barometer to measure air pressure, wind sock and weather vane indicate wind direction; rain gauge measures the amount of rain that has fallen
- Measuring: length-ruler, mass-balance scale, volume-beaker, and temperature/thermometer.

6. Provide clear explanations that account for observations and results and relate how new information can change existing perceptions.

SUGGESTED ACTIVITIES:

Students will:

1. Differentiate among simple observations,

ASSESSMENTS:

- ✧ Teacher Observations
- ✧ Lab Reports
- ✧ Lab Results

conclusions, inferences, and predictions, and correctly apply the terminology in oral and written work.

2. Analyze a set of twenty or fewer objects, measures, or pictures; classify into basic categories to organize the data (descriptive or numerical); and construct bar graphs and line graphs depicting the distribution of the data.
3. Use millimeters, centimeters, meters, kilometers, milliliters, liters, grams, and kilograms in measurement.
4. Choose the appropriate instruments including centimeter rulers, meter sticks, graduated cylinders, beakers, scales and balances, and Celsius thermometers for making basic metric measures.
5. Make predictions based on picture graphs, bar graphs and basic line graphs.
6. Generate questions about objects, organisms, or events that can be answered through scientific investigations.
7. Design and implement an investigation (a fair test) to test one variable.
8. Provide clear explanations that account for observations and results and relate how new information can change existing perceptions.
9. Observe a natural phenomenon (e.g., weather changes, length of daylight/night, and movement of shadows, animal migrations, and growth of plants), record observations, and then make a prediction based on those observations.
10. State a conclusion that is consistent with the information/data. Identify appropriate tools or instruments for specific tasks and describe the information they can provide (e.g., measuring: length-ruler, mass-balance scale, volume-beaker, temperature-thermometer; making observations: hand lens, binoculars, and telescope).

RESOURCES:

Harcourt Science Series

Worksheets in Curriculum Activity Binder

REMEDIATION:

- ✧ Peer support
- ✧ Cooperative Groups
- ✧ Individual assistance with labs

ENRICHMENT:

Student can create his own lab experiment on presented topics and present results to the class.