

Grade – Fourth

Standard: Science as Inquiry

Skill: Use observation to pose questions that can be addressed through a scientific investigation

Context: Students will be expected to respond to items related to the following key concepts:

- Cells and cellular processes
- Heredity and biological evolution
- Interactions and energy flow
- Earth's processes and features
- Properties and changes
- Energy types
- Forces and motion
- Solar system and universe

Instructional suggestions: (Created to be user-friendly, teachers should be able to read these ideas and put them into practice in their classroom.)

- Have students practice putting patterns into tables. Have students look at a diagram and create a pattern.
- Print experiments from online sources and develop questions about the experiments for students to answer.
- Have students compare and contrast number patterns in a table.
- Have students design and investigate experiments about electricity (i.e. what makes a good insulator/conductor?)
- Have students grow plants and make a table to observe and record data; model the scientific method using mill worms to develop questions and observations (i.e. black and white paper – draw conclusions based on data collected).

- Students need to be able to correctly label all components of a scientific diagram and understand the importance in doing this.
- Students need to be able to interpret and infer from the data given and draw a conclusion.
- Students need exposure to analyzing and interpreting results (and the scientific vocabulary that goes with this process). Similes could be developed to show relationships between things and develop questions from that. An example that could be used to encompass all of the above might be to take something as simple as a plastic bottle that is completely full of water and freeze it. Allow students to develop questions about the before and after state of the bottle. Did the plastic grow? Did the ice expand? etc... (Provide students with a variety of opportunities to draw conclusions for everyday kinds of actions). Be sure to use grade-level appropriate science vocabulary with students. Some examples include: conduct, experiment, designed, investigation, appear, fair, observed, recorded, results, variable.

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Standard: Science as Inquiry

Skill: Design and conduct a scientific investigation

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Instructional suggestions: (Created to be user-friendly, teachers should be able to read these ideas and put them into practice in their classroom.)

- Have students practice identifying appropriate tools and instruments necessary to collect meaningful data.
- Plant beans in water and in dirt using one type of bean. Compare and measure growth using millimeter measurements.
- Have students design an experiment to conduct a scientific investigation. Record and analyze the data.
- Focus instruction on what a variable is, is it fair data, and comparing the experiments with the different variables.
- Once students have completed an experiment, have them build the data and graph it themselves. Students need skills in reading, interpreting and constructing data tables, graphing and reading diagrams and comparing/contrasting. Example: releasing a pendulum from various heights, allowing it to hit an object and measuring how far the object moves, based on the varying heights. Ask students if, by changing a variable between experiments is it accurate to compare the data, i.e., are we still comparing “apples to apples.” For example, if we changed the weight of the object being hit AND the height the pendulum is released, is it still the same experiment?
- Provide opportunities to use simple tools like rulers and scales. Have students gain additional experience analyzing data and graph from experiments that have already been done.
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Grade – Fourth

Standard: Science as Inquiry

Skill: Organize and represent data

Context: Students will be expected to respond to data related to the following key concepts:

- Cells and cellular processes
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Instructional suggestions: (Created to be user-friendly, teachers should be able to read these ideas and put them into practice in their classroom.)

- Teach scientific writing from data collection (science journal).
- Have students practice interpreting data and drawing conclusions from scientific journals, tables, and illustrations.
- Have students organize and represent data from previous planting bean activity and compare/contrast the data with another group.
- When making inferences, emphasize the importance of basing it on data or a given resource.
- Expose students to different types of graphs and represent data in a variety of ways (line, graph, bar, picture graphs). Example: create data by using a tally chart then have students represent them graphically in at least three different ways. Another example might be to have students take off their shoes and then collect

data on shoe size, organize the data and graph it in a variety of ways.

- Manipulate a bar graph on a computer and stretch it so that the bars look longer (disproportion). Allow students to observe that although it is the same data, it looks different.
- Teach scientific writing with a journal from their data collection

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Standard: Science as Inquiry

Skill: Draw conclusions and make connections with concepts and knowledge

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Instructional suggestions: (Created to be user-friendly, teachers should be able to read these ideas and put them into practice in their classroom.)

- Draw conclusions from the previous plant experiment results and explain the importance and implications of the experiment.
- Add more science-based nonfiction books to reading instruction and do mini-lessons utilizing those books.

- Inference and cause/effect relationships are important to emphasize.
- Use a science journal instead of reading log. Examples of science journals are available online. Students can make observations on a variety of items that are provided daily.
- Use animal adaptations to let students draw conclusions on how that animal survives. Example: A lion has retractable claws, how does that adaptation help it to survive?
- Quick science fair projects are available that provide a conclusion for students on an experiment. These provide the experiment, procedures and results/conclusion. You can cut off the explanation the books provide before giving to students. Allow students to draw their own conclusions. The procedures and results let them draw conclusions. Students can gain experience looking at someone else's experiment and practicing making conclusions (similar to what happens on the test).