Science & Engineering Practices in K-2

Science and engineering practices represent what scientists and engineers do as a matter of routine and illustrate how scientific knowledge and concepts develop through asking questions and conducting investigation, obtaining and analyzing data, constructing explanations, arguing claims supported by evidence, and communicating and evaluating information.

Science is the study of the universe and all of its contained phenomena.
Scientific practices start with questioning that leads to inquiry, seeking evidence to ultimately construct explanations and develop models that can be used to best describe and predict (at the present) how and why natural phenomena occur.

Engineering is the way we fulfill human needs and solve problems.
Engineering practices start with defining problems and identifying human needs; this process leads to designing, testing, and refining solutions in order to accumulate evidence necessary to determine the best possible solution (at the present) for the perceived need or problem.

Cross Cutting Concepts
1- Patterns
2- Cause and effect
3- Scale, proportion, and quantity
4- Systems and system models
5- Energy and matter: Flows, cycles, and conservation
6- Structure and function
7- Stability and change

Science & Engineering Practices
1- Asking questions
2- Developing and using models
3- Planning and carrying out investigations
4- Analyzing and interpreting data
5- Using mathematics and computational thinking
6- Constructing explanations
7- Engaging in scientific argument from evidence
8- Obtaining, evaluating, and communicating information
9- Constructing devices or designing solutions

Information is from:
https://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf KGM2018

Students need to know that different scientific tools are used to collect different kinds of data.

Kindergarten

- Magnifying lenses should be used to see the details of tiny objects.
- Eye-droppers should be used to transfer small amounts of liquid.

1st Grade

- Rulers should be used to measure to the nearest whole inch.
- Time should be measured in hours and to the nearest half hour.

2nd Grade

- Thermometers. Fahrenheit will be used to measure weather data only. All other temperature readings will be taken using the Celsius scale.
- Rain gauges should be used to measure the amount of rainfall in inches.
- Balances should be used to measures the mass of an object compared to a known mass. Mass is the amount of matter, or material, in an object.
- Measuring cups are tools that measure volume. A measuring cup measures volume in fluid ounces (oz), parts of a cup (c), milliliters (mL), or liters (L).

Our state provides Science kits and the funds to continue to replenish them. The kits we have to K-2 are listed below. As the kits are used, please keep the SEPs in mind. Teachers may alter some of the activities to engage students in the SEPs. Additionally, teachers should keep in mind the tools students should use at each grade level.

Kindergarten	Unit: Observing the World Through Senses Kit: Senses (Insights)	Unit: Objects & Materials Kit: Wood & Paper (FOSS)	Unit: Weather No Kit: Suggested Activities (RHSD)	Unit: Exploring Organisms & the Environment Kit: Animals 2x2 (FOSS) Living things (Insights)
1st Grade	Unit: Exploring Light & Shadows Kit: Light & Shadows (RHSD Kit)	Unit: Exploring Sun & Moon Kit: Suggested Activities (RHSD)	Unit: Earth's Natural Resources Kit: Pebbles, Sand, Silt (FOSS)	Unit: Plants & Their Environments Kit: New Plants (FOSS)
2nd Grade	Unit: Solids & Liquids (Magnets) Kit: Solids & Liquids (STC)	Unit: Exploring Pushes and Pulls Kit: Push, Pull & Go (Carolina)	Unit: Weather Kit: Weather (STC)	Unit: Animal & their Environments Kit: Insects (FOSS)

To obtain Science materials, please contact Jeannie Parker at
jparker@rhmail.org

Be specific in your request, indicating exactly what you need, and an exact count. Please say, "We need 35 4oz clear plastic cups with snap-on lids," rather than "We need enough cups for 3 classes. We have some lids but need some more."

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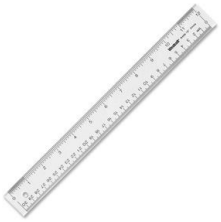
Ideas/Suggestions for Teaching the SEPs in K-2

Magnifying Lenses 	• Have students look at letters cut from a newspaper, their skin, a dollar bill, soil samples, leaves, flowers, fabric samples, a friend's eye, etc. • Have them sketch what they see with and without the lens. • Have them sketch what they wee in the 5x lens vs. the 10x lens. • Draw a line with ink and an "identical" line with pencil. See if they can tell which is which? How will they know? One is erasable.
Eye-droppers/ Pipettes  	• Students should practice transferring water from one location to another using the eye-droppers. • Students should also use pipettes to compare to the eye-droppers. • How many drops of water from an eye-dropper are needed to cause a sugar cube to begin to change? Students can examine the sugar cube with the magnifying lens. (tally marks?) • Which has bigger drops, eye-droppers or pipettes? What ideas can students come up with to test this? -How many drops does it take to fill a teaspoon with water? (eyedropper vs. pipette) -How many drops will fit on a penny - from an eye-dropper vs a pipette? -If we put 1 drop of water from an eye-dropper and 1 drop from a pipette on a sheet of construction paper, which will make the biggest water mark? Students can measure the diameter of the water spots with rulers or cubes. • How does height affect the size of the drop?
Rulers 	• Students should use rulers to measure the various dimensions of multiple objects--length and width of floor tiles, diameter of cups, toys, etc. • Students may measure the depth of water in a tube or in a cup. • How deep with the bubbles be if we add different amounts of soap? -Students add 1, 2, 3, 4, 5 drops of soap, shake then measure the depth of the bubbles.

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Clocks 	• Students may add 1 drop of food coloring to water and watch the clock to see how long it takes to dissolve. They can investigate whether or not they get the same results from water of different temperatures. • In egg dying kits, there is a pellet of food color. Students can investigate the time it takes to color water with a pellet vs. liquid food color. • Students may add a sugar cube to water and stir (or not stir) to observe and time the dissolving process. • Students can add salt to water and stir while watching the clock to see how long it takes for all of the crystals to dissolve. This can be an experiment by having students time table salt crystals vs. rock salt crystals.
Thermometers 	*When using a thermometer, make sure not to place the bulb of the thermometer on the bottom or sides of the container or touch the bulb when taking air temperature. When reading the temperature on a thermometer, it should be vertical and at eye-level with the top of the liquid in the glass tube. A thermometer measures temperature in degrees Fahrenheit (°F) and Celsius (°C) to the nearest degree.* ***Fahrenheit will be used to measure weather data only. All other temperature readings will be taken using the Celsius scale.*** *Use only thermometers with colored alcohol in them (such as red or blue), NEVER mercury thermometers (silver liquid in them).* • Hang a thermometer outside the classroom window. -During morning meeting have a student read and record the day's temperature. • Have students measure water temperature. (It is important that students have the opportunity to see the level of alcohol move in the glass tube.) This can be done by having students add hot water to cold water or vice versa. • Have students make a thermometer, then study their design to improve it. https://goo.gl/8q84Wy • Give students hot (safely hot) water to write the temperature each minute for 5 or so minutes. Make a graph from the temperatures. • Have students investigate how hard candy dissolves in water of different temperatures.

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Rain Gauges

A rain gauge is a tool that measures the amount of rainfall. To collect rainfall accurately, the rain gauge must be in an open area. To read the rain gauge, hold it at eye level. A rain gauge measures the amount of rainfall in inches (in).

- Rain gauges can be purchased or made by students. https://goo.gl/ocJp6Q Check the rain gauge at regular intervals--once per week, month, etc. Use the ruler on the gauge to measure rainfall in inches.

Balance Scale

Balance scales measure mass (the amount of matter in an object) in grams. An object of known mass is placed in one side and you add enough in the other side of the balance until the sides are even.

NOTE: ***1 milliliter of water has a mass of 1 gram.*** *Students can use known amounts of water to balance other objects.*

- Students may use the balance to measure water, salt, sand, sugar, etc.
- Students may measure the mass of different fruits and vegetables using the balance, then graph their measurements.
- Students studying coin values can find the mass of the different coin values that equal 25 cents or $1.
- Students may compare volumes of different substances, although the volume may differ masses may be equal.

Measuring Cups

When using the measuring cup to measure volume of a solid, be sure the top surface of the solid is level. o A measuring cup measures volume in fluid ounces (oz), parts of a cup (c), milliliters (mL), or liters (L).

- Have students make mixtures with measured amounts of ingredients.
- Students can investigate viscosity (liquid's ability to flow) by dropping a marble into equal amounts of various liquids. They would use the clock to see how long it takes the marble to reach the bottom of each.
- Students can investigate the density of different liquids by attempting to pour them into layers. https://goo.gl/yxiQQn
- Students can investigate how many marbles would be needed to raise the water level of ½-cup of water to 1-cup.

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SEPs in K-2
Let's Try It!

Can you determine which line is made by a pencil and which is made in ink?	How many drops of water from an eye-dropper will fit on a penny? Will the same number of drops from a pipette fit on a penny?
How long will it take a sugar cube to dissolve in water if we stir? What if we don't stir?	Can we raise the temperature of cold water?
What is the mass of 25-cents?	Can we use marbles to raise ½ cup of water to 1 cup?

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