

Science Inquiry - Grade 4

OBSERVING/QUESTIONING

Make and describe observations in order to ask questions, and/or make predictions related to the science investigation.

Key concepts for this Inquiry Construct

- 1- making observations to prepare for making the prediction and describing what is observed
- 2- making a prediction/asking a research question

Within Life Science AAGSE: LS 1.1.2a: Given an external feature of an organism, match organisms with the same feature.

Students select the feature of hair. The students make observations of the colors of student hair within the class; describe the observations in categories of hair (blond, brown, white, black, red) to make the prediction of "Most students have _____ hair." After their prediction is made, the students collect data on student hair in each of four science classes.

To assess this Inquiry Construct for students at different levels of understanding:

Give each student four opportunities to observe and describe hair color.

Susie: Take data on Susie's ability to complete following sequence for each of the four hair subjects:

- 1- identify a hair subject
- 2- describe the hair in terms of color, length, and curl
(Repeat steps one and two for each of the four students.)
- 3- make a prediction that includes the hair features (color, length, and curl) such as "most students have long brown straight hair."

Evaluate accuracy, independence + level of prompting (I=independent, GVP=general verbal prompt, SVP=specific verbal prompt) *Remember we are evaluating Susie's accuracy in completing each of the steps. She will repeat steps one and two for each student and make one prediction. Accuracy for the prediction means that she made a reasonable prediction.*

Stanley: Take data on his ability to complete the following sequence for each of the four hair subjects:

- 1- look in the direction of each hair subject
- 2- describe the hair in terms of color
(Repeat steps one and two for each of the four students.)
- 3- make a prediction that includes the hair feature of color

Evaluate accuracy, independence + level of prompting (I=independent, V=verbal prompt, T=tap prompt) *Remember we are evaluating Stanley's accuracy in completing each of the steps. He will repeat steps one and two for each student and make one prediction. Accuracy for the prediction means that he made a reasonable prediction.*

Devon: Take data on her ability to complete the following sequence for each of the four hair subjects:

- 1- look in the direction of each hair subject
- 2- reach to touch the object* that represents one hair feature (curly, brown, black, or blonde)
- 3- eye gaze/reach to locate a friend with the appropriate hair feature
- 4- select the object to describe the selected hair feature

Evaluate accuracy, independence + level of prompting (I=independent, E=elbow prompt, W=wrist prompt, H=hand over hand prompt) *Remember we are evaluating Devon's accuracy in completing each of the steps. She will repeat the steps for each student.*

* Local hair salon might have samples of hair to use for representational hair feature objects

Science Inquiry-Grade 4

CONDUCTING

Follow procedures, using equipment or measurement devices accurately as appropriate, for collecting and/or recording qualitative or quantitative data.

Key concepts for this Inquiry Construct

- 1- following procedure and collecting/recording data
- 2- using equipment/measurement devices and collecting/recording data

Within Earth and Space Science AAGSE: ESS1.2.1 Identify the forms of water in the water cycle.

Students use thermometer (equipment) to collect quantitative data on the temperatures of forms of water to describe/identify the forms in the water cycle (ice, liquid, steam).

To assess this Inquiry Construct for students at different levels of understanding:

Give each student the opportunity to use the thermometer by collecting the temperature of each sample.

1. ice cubes using a thermometer
2. water at room temperature
3. steam (over a boiling pot of water with careful supervision)

Susie: Take data on her ability to complete following sequence to use the equipment (thermometer):

1. use the equipment correctly (places sensor on sample, allows 1 minute to capture temperature)
2. collect the data (reads the thermometer accurately within 1 degree)

Evaluate accuracy, independence + level of prompting (I=independent, GVP=general verbal prompt, SVP=specific verbal prompt) Susie will follow this two step process each time she takes the temperature of a sample giving her a total of 6 opportunities for accuracy and independence data to be collected.

Stanley: Stanley will participate in a four step process, but data is to be taken only on the aspects of conducting, steps 2 and 3. If the samples are set in stations at different tables, the students have the opportunity to "locate" the correct equipment each time they move to a new table (allows for repeated trials).

1. get the equipment (selects the thermometer from a field of three different pieces of equipment)
2. use the equipment correctly (places sensor on sample, counts to 10)
3. collects the data (reads the thermometer within 1 degree)
4. replaces the equipment (puts it in the case/bin)

Evaluate accuracy, independence + level of prompting (I=independent, V=verbal prompt, T=tap prompt) Stanley will follow this four step process each time he takes the temperature of a sample, but data is to be taken only on steps 2 and 3, giving him a total of 6 opportunities for accuracy and independence data to be collected.

Devon: Devon will participate in a three step process, but data is to be taken only on the aspects of conducting, steps 2 and 3 (equipment: thermometer with beeping feature):

1. get the equipment (eye gazes to select the correct equipment (thermometer))
2. uses the equipment correctly (place the thermometer on the sample)
3. collects the data (respond when the beeper rings)

Evaluate accuracy, independence + level of prompting (I=independent, E=elbow prompt, W=wrist prompt, H=hand over hand prompt) Devon will follow this three step process each time she takes the temperature of a sample, but data is to be taken only on steps 2 and 3, giving her a total of 6 opportunities for accuracy and independence data to be collected.

Science Inquiry - Grade 8

PLANNING

Identify information/ evidence that needs to be collected and/or tool to be used in order to answer a question and/or check a prediction.

Key concepts for this Inquiry Construct

- 1- identifying information/evidence needed to be collect to answer a question/checking a prediction or
- 2- Identifying tools to be used to collect information to answer a question/checking a prediction

Within Physical Science AAGSE: PS1.4.1d Identify one or more physical changes

Students make the prediction about the physical change evaporation. They predict “The substance will melt at ___ degrees Fahrenheit and boil at ___ degrees Fahrenheit.” The students identify the tools needed to collect the information they need.

To assess this Inquiry Construct for students at different levels of understanding:

Give each student two opportunities to use or identify the tools needed to collect the information to check his/her prediction for each of the following substances

- ice cubes of pure water
- ice cubes of water/salt mixture
- ice cubes of water/sugar mixture

Susie: Susie will participate in a three step process, but data is to be taken only on the aspects of planning, steps 1 and 2. Take data on her ability to identify the tools and information needed to check her prediction “The water/salt mixture will melt at 25 degrees and boil at 50 degrees”

1. identify the equipment (tool = thermometer) needed for the experiment
2. identify the information needed (melt and boil) to collect temperature information
3. puts the information on her recording sheet

Evaluate accuracy, independence + level of prompting (I=independent, GVP=general verbal prompt, SVP=specific verbal prompt) Susie will follow this three step process for each sample, but data for the RIAA is to be taken only on steps 1 and 2, giving her a total of 6 opportunities for accuracy and independence data to be collected.

Stanley: Stanley will participate in a three step process, but data is to be taken only on the aspects of planning, steps 1 and 2. Take data on his ability to identify the tools and the points at which temperature will be checked. His prediction was “The water/salt mixture will melt at 50 degrees and boil at 60 degrees”

1. identify and locate the equipment (selects the thermometer from a field of three different equipment and labels it “thermometer”)
2. identify the information needed (identifies the points at which temperature will be checked by selecting the symbols “melt” and “boil” from a field of 4 symbols)
3. places the information on his recording sheet (melt and boil)

Evaluate accuracy, independence + level of prompting (I=independent, V=verbal, T=tap prompt) Stanley will follow this three step process for each sample, but data for the RIAA is to be taken only on steps 1 and 2, giving him a total of 6 opportunities for accuracy and independence data to be collected.

Devon: Devon will participate in a three step process, but data is to be taken only on the aspects of planning, steps 1 and 2. Take data on her ability to identify the tools to be used to check her prediction “The water/salt mixture will melt.” This prediction was conveyed through a “melt” symbol (an object symbol with a gel-filled container marked with the Mayer Johnson symbol “melt”).

1. identify and locate the equipment (selects the thermometer from a field of two: a thermometer and a “nothing” symbol)
2. identify the points at which temperature will be checked (selects the object symbols “melt” from a field of 2 symbols)
3. places the symbol (melt and boil) on her recording sheet

Evaluate accuracy, independence + level of prompting (I=independent, E=elbow prompt, W=wrists prompt, H=hand over hand prompt) Devon will follow this three step process for each sample, but data for the RIAA is to be taken only on steps 1 and 2, giving her a total of 6 opportunities for accuracy and independence data to be collected.

Science Inquiry - Grade 8

CONDUCTING

Use data to summarize results

Key concepts for this Inquiry Construct

This construct involves using data in some way that concludes or ends in summarizing results.

Within Life Science LS3.1.2a: Match animals to their environment.

After reading about different environments and seeing different video clips available on-line, students make predictions on where they believe different animals live. Each student selects a different animal and creates a prediction such as:

I predict that most _____ (animal) lives in _____ (environment).

Students do research (books, videos, actual observations) and chart their findings on the class's data table.

To assess this Inquiry Construct for students at different levels of understanding:

Give each student an opportunity to use assigned animal data to summarize the data for the class.

Susie: Take data on her ability to summarize the class's data for 4 animals that live in different environments (polar bear, otter, snake, and iguana)

1. locate the data (find the correct column on the table for the assigned animal)
2. read the data (identify the # environments and the frequency count)
3. summarize the data (complete summary statement):
Most _____ (animals) live in _____ (environment).

Evaluate accuracy, independence + level of prompting (I=independent, GVP=general verbal prompt, SVP=specific verbal prompt) for each of the three steps

Stanley: Take data on his ability to summarize the class's data for 2 animals with somewhat defined environments (butterflies, whales)

1. locate the data (find the correct column on the table for the assigned animal)
2. read the data (identify the # environments and the frequency count)
3. summarize the data (complete summary statement):
Most _____ (animals) live in _____ (environment).

Evaluate accuracy, independence + level of prompting (I=independent, V=verbal, T=tap prompt)

Devon: Take data on her ability to summarize the class's data for 1 animal (snail or fish) with a very defined environment (water represented by a "water" symbol)

1. locate the data (find the correct column on the table for the assigned animal. Devon uses a tactile graph with actual objects in each "box" of the table.)
2. read the data (identify the # of animals in the boxes)
3. summarize the data (complete summary statement by counting the animals and placing them in a tactile summary strip):
Most _____ (snails) live in _____ (water symbol).

Evaluate accuracy, independence + level of prompting (I=independent, E=elbow prompt, W=wrists prompt, H=hand over hand prompt)

Science Inquiry Grade 11

CONDUCTING

Use accepted methods for organizing, representing and/or manipulating data

Key concepts for this Inquiry Construct

This inquiry construct involves using data in one or more of the following ways

1. Organizing data
2. Representing data
3. Manipulating data

Within Earth and Space Science: ESS1.1.6 Identify the four basic materials of the earth (i.e., water, soil, rocks and air.)

After reading about different material of the earth, the students are each given a packet of information. Students will make predictions of the materials found most frequently in their information. As the student reviews each piece of information, they need to record the basic materials they identify in each packet.

To assess this Inquiry Construct for students at different levels of understanding:

Each student will receive a collection of information that matches their abilities/strengths:

- actual water, soil, rocks, air
- photos of earth within the school grounds with easily identifiable earth materials
- photos of nearby earth that take keen observations to locate the materials of the earth

Susie: Susie uses photos that take keen observation to locate the materials of the earth. To assess this inquiry construct, data should be taken on her ability to organize and represent the data by assessing Susie's skills at

- organize her "data" from each photograph by placing the data on the correct place of the graph

Evaluate accuracy, independence + level of prompting (I=independent, GVP=general verbal prompt, SVP=specific verbal prompt). Susie will be evaluated on her ability to correctly use the graph to organize each piece of data. The number of opportunities to evaluate accuracy and independence is the number of pieces of data (photos).

Stanley: Stanley uses photos of earth within the school grounds with easily identifiable earth materials. To assist Stanley in identifying the earth materials, he might walk to the school area in the photograph. To assess this inquiry construct, data should be taken on his ability:

- Organize the data by placing the "data" from each photograph/area on the correct place of the graph

Evaluate accuracy, independence + level of prompting (I=independent, V=verbal, T=tap prompt) Stanley will be evaluated on his ability to correctly use the graph to organize each piece of data. The number of opportunities to evaluate accuracy and independence is the number of pieces of data (photos).

Devon: Devon learns best when she has direct touch contact with materials. Her information was e.g., presented in bags. Identical bags might be found in areas within the classroom, or nearby her classroom (soil outside the door, water in a hole in the soil, a rock in the soil, air). Take data on her ability to organize her materials into three tactile graphs, marked with actual objects. Evaluate Devon's abilities to place the actual objects in the correct place of the graph for each of her objects by

- placing the earth material in the correct place of the graph

Evaluate accuracy, independence + level of prompting (I=independent, E=elbow prompt, W=wrist prompt, H=hand over hand prompt). Devon will be evaluated on her ability to correctly use the graph to organize each piece of data. The number of opportunities to evaluate accuracy and independence is the number of pieces of data (objects).

Science Inquiry - Grade 11

ANALYZING

Use evidence to support and/or justify interpretations and/or conclusions or explain how the evidence refutes the hypothesis.

Key concepts for this Inquiry Construct

This inquiry construct involves

1. using data evidence for evidence to support an interpretation and/or conclusion or
2. using data evidence for evidence to justify an interpretation and/or conclusion or
3. communicating how the evidence supports/refutes the hypothesis/conclusion

Within Physical Science: PS3.1.1 Identify the relationship between force and motion

Students will use a ramp, different weight balls as a “striker” and a block to explore the relationship between force and motion. Different weight “striker” balls will be used and the students will make a hypothesis about which ball will create the greatest force. The force will be evaluated by the resulting motion (the length of the “push”) and will be measured and organized on a table.

To assess this Inquiry Construct for students at different levels of understanding

Susie: To assess this inquiry construct, data should be taken on her ability to use her evidence to refute/support her hypothesis. Data should be taken on Susie’s skills to

1. state her hypothesis
2. identify whether her hypothesis was correct/incorrect
3. identify the data that supports her conclusion

Evaluate accuracy, independence + level of prompting (I=independent, GVP=general verbal prompt, SVP=specific verbal prompt) for each of the three steps

Stanley: To assess this inquiry construct, data should be taken on his ability to use the evidence to refute/support his hypothesis. Data should be taken on Stanley’s skills to

1. identify whether his hypothesis was correct/incorrect (by marking “x” or “✓”)
2. identify the data that supports his conclusion (circle the data in the table)

Evaluate accuracy, independence + level of prompting (I=independent, V=verbal, T=tap prompt)

Devon: This inquiry construct is not a good match for Devon’s skills. A better choice would be the **Conducting Inquiry Construct**

Qualitative data deal with descriptions. It is data that can be observed but not measured (e.g. colors, textures, smells, tastes, appearance, beauty, etc).

Quantitative data deals with numbers. It is data which can be measured (e.g. Length, height, area, volume, weight, speed, time, temperature, humidity, sound levels, cost, members, ages, etc).