MINI SET

NATURE OF SCIENCE

Science Practices & Scientific Method

TASK CARDS

- ☑ Tiered questions that probe lower and higher-order thinking
- ☑ Differentiated for upper elementary and intermediate students
- ☑ Skills and processes aligned to NGSS and many state standards

By Stephanie Elkowitz

ABOUT THIS PRODUCT

Task cards are an important tool to use in your classroom. They can be used to assess your students or for students to self-assess themselves. Task cards can be used at science centers, set up in a room-circuit format and/or given to students for independent study or review. These task cards cover concepts that should be understood by upper elementary and/or middle school students according to most state science standards as well as Next Generation Science Standards (NGSS).

These task cards are **differentiated** and **tiered**. A colored shape code is denoted on each task card to help you differentiate the concepts. A "signal strength" is also denoted on each task card to help you probe lower, mid and higher order thinking.

Concepts are **differentiated** by a colored shape code:

Cards with a green circle deal with basic key ideas and understandings meant for upper elementary (grade 3-5) students. These concepts can or should be reviewed with intermediate/middle school (grade 6-8) students.

Cards with a blue square deal with intermediate key ideas and understandings meant for middle school students. These concepts may be appropriate for high-achieving upper elementary students

Cards with a black diamond cover advanced, traditionally high school, concepts. Some of these concepts may be appropriate for your intermediate students.

Questions are **tiered** by a "signal strength" code:

Cards with a "low" signal strength assess students on the 1st and 2nd level of Bloom's taxonomy (knowledge and comprehension). These questions assess whether students can remember, recall and understand facts.

Cards with a "medium" signal strength asses students on the 3rd and 4th level of Bloom's taxonomy (application and analysis). These questions assess whether students can apply information to new situations and examine information in detail.

Cards with a "high" signal strength assess students on the 5th and 6th level of Bloom's taxonomy (synthesis and evaluation). These questions assess *how* students use information. They assess whether students can make predictions using their knowledge and whether students can evaluate, judge or interpret new information using their knowledge.

Science Practices & Scientific Method Question Breakdown

Q	Level	Tier	Answer
1	●		Observations
2	●		Observations
3	●		Inference
4	●		Scientific Method
5	●		Scientific Method
6	●		Testable Question
7	●		Hypothesis
8	●		Variables
9	●		Controlled Experiment
10	●		Collecting and Analyzing Data
11	●		Collecting and Analyzing Data
12	●		Conclusion
13	●		Observations
14	●		Scientific Method
15	●		Collecting and Analyzing Data
16	●		Collecting and Analyzing Data
17	●		Observations
18	●		Inference
19	●		Controlled Experiment
20	●		Conclusion

Q	Level	Tier	Answer
21	■		Types of Variables
22	■		Setting up a good experiment
23	■		Setting up a good experiment
24	■		Experimental Method
25	■		Analyzing Data
26	■		Recognizing Bias
27	■		Communicating/Arguing Scientific Ideas
28	■		Communicating/Arguing Scientific Ideas
29	■		Setting up a good experiment
30	■		Types of Variables
31	■		Recognizing Errors
32	■		Recognizing Bias
33	■		Setting up a good experiment
34	■		Experimental Method
35	■		Recognizing Errors
36	■		Critiquing Scientific Ideas

SCIENCE PRACTICES

1

What is an observation?

A. An explanation for something you see in the natural world
B. A description of a natural cycle or scientific ideas
C. Something you notice, measure or detect
D. Something you have a strong like or dislike for

SCIENCE PRACTICES

2

Which of the following is NOT a scientific observation?

A. The tree has green leaves.
B. The dog has a mass of 70 kilograms.
C. Chocolate milk is brown.
D. A tree with colorful leaves is beautiful.

SCIENCE PRACTICES

3

What is an inference?

A. An opinion about a scientific idea
B. An argument that supports a a scientific idea
C. An idea or prediction formed from facts or evidence
D. A qualitative observation that describes the behavior or a living thing

SCIENCE PRACTICES

4

What is the scientific method?

A. A way to make quantitative and qualitative observations about a living thing
B. A procedure that directs how to conduct a scientific experiment
C. The process of solving a problem
D. The process of making inferences based on non-scientific observations

SCIENCE PRACTICES

5

Scientists perform experiments using the scientific method in order to:

A. Answer questions about the natural world
B. Determine if their predictions about the natural world are correct
C. Generate evidence upon which we can build scientific knowledge
D. All of the above

SCIENCE PRACTICES

6

Which of the following is NOT a testable question?

A. What is the life cycle of a butterfly?
B. Does fertilizer help plants grow faster?
C. Do fish prefer living in water at a certain temperature?
D. What are students' favorite dinner meals?

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7

What is a hypothesis?

A. A random guess that turns out to be correct
B. A thoughtful to prediction to what you think will happen in an experiment
C. A qualitative observation made during an experiment
D. A quantitative observation made during an experiment

SCIENCE PRACTICES

8

What is a variable?

A. A prediction about what you think will happen in an experiment
B. A quantitative observation of something in the natural world
C. The time it takes to complete an experiment
D. A factor or condition in an experiment

SCIENCE PRACTICES

9

What is a controlled experiment?

A. An experiment in which only only variable is changed
B. An experiment in which you measure at least two different things
C. An experiment in which you change or manipulate at least two different variables
D. An experiment that does not involve making qualitative observations

SCIENCE PRACTICES

10

What is data?

A. Information collected during an experiment
B. A conclusion based on measurements made during an experiment
C. An analysis of measurements made during an experiment
D. An educated guess or prediction

SCIENCE PRACTICES

11

What is analyzing data?

A. Looking for relationships, patterns and solutions in things tests in an experiment
B. Forming a hypothesis based on data collected during an experiment
C. Getting rid of “bad” data in an experiment
D. Making observations that lead to collection of data in an experiment

SCIENCE PRACTICES

12

Which of the following is NOT discussed in a conclusion:

A. A summary of the results
B. Sources of error or mistakes
C. How someone could perform the experiment better
D. The materials used in the experiment

SCIENCE PRACTICES

13

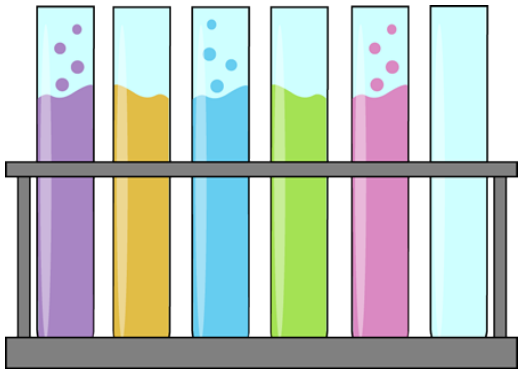
Categorize the following observations as quantitative or qualitative observations.

- Mass
- Texture of an object
- Color of an object
- Volume
- Size
- Age
- Taste of a substance
- Odor of a substance

SCIENCE PRACTICES

14

Summarize the five steps of the scientific method.



SCIENCE PRACTICES

15

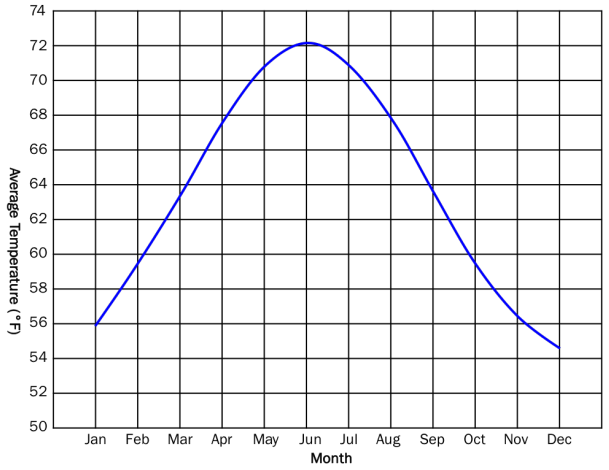
Why is it important to collect data in a data table?

Time (days)	Height of Plant A (cm)	Height of Plant B (cm)
1	5.0 cm	5.0 cm
2	5.5 cm	5.2 cm
3	6.0 cm	5.3 cm
4	6.4 cm	5.5 cm
5	6.9 cm	5.9 cm
6	7.6 cm	6.2 cm

SCIENCE PRACTICES

16

Analyze and interpret the graph, which shows average monthly temperature for a location throughout the year.



SCIENCE PRACTICES

17

Make at least 3 qualitative and quantitative observations about the frog below.

Info:
Age: 2 years
Size: 65 mm

SCIENCE PRACTICES

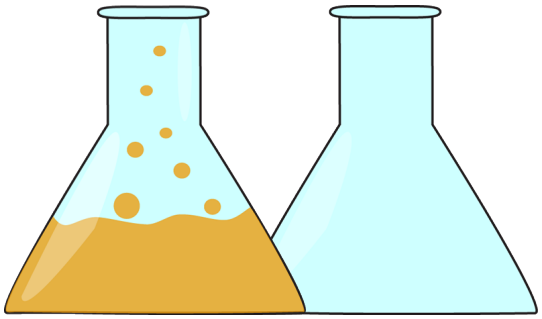
18

Make an inference about what you think is happening in the image below.

SCIENCE PRACTICES

19

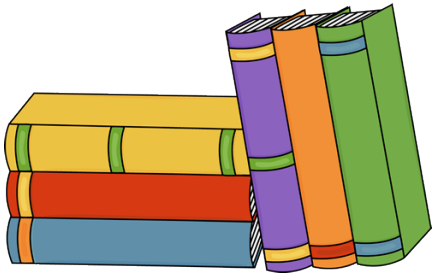
What could happen if you do not control variables in an experiment (besides the one factor you are intentionally changing)?



SCIENCE PRACTICES

20

What could happen if a scientist did not discuss mistakes (sources of error) in his or her experiment in the conclusion?



SCIENCE PRACTICES

21

What do you call the variable you change or manipulate in an experiment?

A. The dependent variable
B. The independent variable
C. The controlled variable
D. The scientific variable

SCIENCE PRACTICES

22

A good controlled experiment has:

A. One experimental group and one control
B. One experimental group and more than one control
C. Multiple experimental groups and more than one control
D. Multiple experimental groups and one control

SCIENCE PRACTICES

23

How should you manipulate the sample size and number of trials in order to reduce error in an experiment?

A. Have a large sample size and only one trial
B. Have a large sample size and multiple trials
C. Have a small sample size and only one trial
D. Have a small sample size and multiple trials

SCIENCE PRACTICES

24

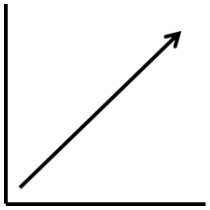
A good experimental method is:

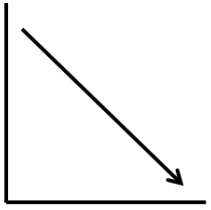
A. Written in a step-by-step fashion
B. Lists all the materials you need for an experiment
C. States the specific measurements and observations you need to make in an experiment
D. All of the above

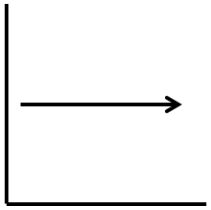
SCIENCE PRACTICES

25

Identify the types of relationships in the three graphs below:

A. 

B. 

C. 

SCIENCE PRACTICES

26

What is a bias?

A. A judgement based on scientific facts
B. A judgment based on an opinion
C. A scientific observation of a natural process that occurs on Earth
D. A non-scientific prediction about how things work in the natural world

SCIENCE PRACTICES

27

Which form of communication would be best to provide a "snapshot" or summary of your findings in an experiment?

A. A report
B. An oral presentation
C. A poster
D. A poem

SCIENCE PRACTICES

28

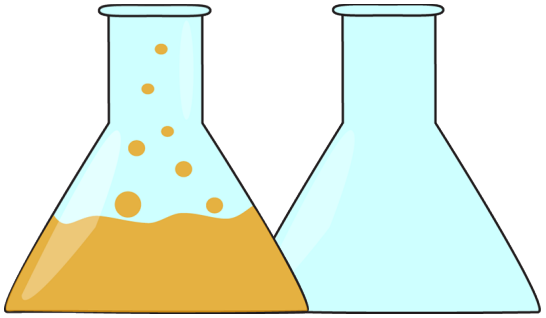
What should you NOT do when communicating or arguing scientific ideas?

A. Back up your ideas with reliable pieces of evidence
B. Credit others' ideas by citing where you obtained those ideas
C. Consider and discuss alternative viewpoints – provide evidence that refutes those ideas
D. Use feelings and emotion to make a case for your argument

SCIENCE PRACTICES

29

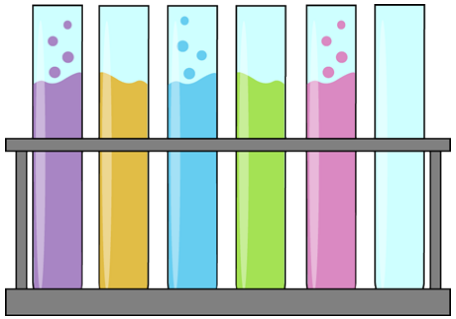
How is a control important to a controlled experiment?



SCIENCE PRACTICES

30

What is the difference between an independent, dependent and controlled variable?



SCIENCE PRACTICES

31

What are four ways you can reduce error in an experiment?

SCIENCE PRACTICES

32

Why is it important to be able to recognize bias in an investigation? How can you look for sources of bias in an investigation?

SCIENCE PRACTICES

33

Your teacher asks you to design an experiment to tests the effects of fertilizer on plant growth. Design a controlled experiment that would answer this question. Be sure to identify:

- The independent & dependent variable
- The controlled variables
- The sample size and number of trials
- The experimental groups and control

SCIENCE PRACTICES

34

Write an "experimental" method for how to make a peanut butter and jelly sandwich. Make sure your directions have all the characteristics of a good experimental method.

SCIENCE PRACTICES

35

A scientist performs an experiment to determine the effects of exercise on heart rate. He uses two students in his experiment. He measures the heart rate of each student before exercising. Both students run one mile. The boy finishes 2 minutes faster than the girl. The girls says she has a cold and had trouble running. The scientist measures the heart rate of the students after exercising. He analyzes the data.

Identify sources of error in this experiment.

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36

A student writes a report on why he feels we shouldn't use genetic engineering to create seedless fruits. He explains how genetic engineering is used to make seedless fruits using information he read about in his textbook. He discusses the dangers of eating genetically engineered food using information he read about in a tabloid magazine. He calls people who eat genetically engineered food "stupid" because they don't understand the danger of eating seedless fruits.

Critique the students' report. What is one positive and one negative aspect of his report.

Name: _____ Date: _____

Level ● Questions Only

SCIENCE PRACTICES & SCIENTIFIC METHOD TASK CARDS ANSWER SHEET

1. _____
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3. _____
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Quantitative Observations	Qualitative Observations

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Name: _____ Date: _____

All Questions

SCIENCE PRACTICES & SCIENTIFIC METHOD TASK CARDS ANSWER SHEET

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Quantitative Observations	Qualitative Observations

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25. A. _____
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Name: _____ Date: _____

KEY

SCIENCE PRACTICES & SCIENTIFIC METHOD TASK CARDS ANSWER KEY

1. C
2. D
3. C
4. B
5. D
6. A
7. B
8. D
9. A
10. A
11. A
12. D

13.

Quantitative Observations	Qualitative Observations
Mass Volume Size Age	Texture of an object Color of an object Taste of a substance Odor of a substance

14. 1. Ask a question, 2. Forma hypothesis, 3. Perform a controlled experiment 4. Collect and analyze data, 5. Form a conclusion

15. Collecting data in a table helps prevent mistakes such as forgetting to make a measurement or mixing up measurements for different things.

16. Analysis: From months January to December, the temperature increases and then decreases. Interpretation: The temperature fluctuates this way because of the seasons. It is winter, spring, summer, fall and them winter again.

17. Qualitative: The eyes are red, the feet are orange, the body is slimy and green. Quantitative: The frog is 65 mm long, the frog has two eyes, the frog has 4 legs.

18. The girl is celebrating her birthday because she is blowing out candles on a cake.

19. You cannot be sure that the one variable you are changing is actually causing the effects in your experiment.

20. A reader could receive misinformation and develop a misunderstanding about scientific ideas because the results in the experiment could be flawed.

21. B
22. D
23. B
24. D

25. A. Direct
    B. Indirect
    C. Constant
26. B
27. C
28. D

29. A control provides a "baseline" to compare your experimental groups. It represents the most "normal" conditions.

30. An independent variable is the factor you change. The dependent variable is the factor you measure. The controlled variables are the factors you keep the same for all experimental groups.

31. 1. Use a large sample size and perform multiple trials of the experiment.
    2. Control all the variables.
    3. Follow the experimental method meticulously.
    4. Make sure tools are calibrated and working properly.

32. Bias can lead to erroneous or dishonest scientific ideas and can cause people to have an incorrect understanding about science. To ID bias, find out who is sponsoring the research, look to see if the sample size is large and diverse, look so see what evidence is provided and check to see who is sampled in a survey.

33. Independent variable: fertilizer, Dependent variable: plant height/growth, Controlled variables: type of plant and soil used, amount of water and sunlight; Set up 3 experimental groups with different types of fertilizer - each group has 10 plants; setup a control with 10 plants that do not receive fertilizer

34. *Answers will vary. Students should state the number of pieces of bread needed, how to spread the peanut butter and jelly, etc.*

35. The student only uses two test subjects, one test subject is sick, the students performed exercise with different intensities, we don't know if the age of the test subjects or the footwear worn by the test subjects were was controlled

36. Positive: the student uses a textbook to describe the process of genetic engineering. Negative: the student uses disrespectful language (stupid) and uses a tabloid (an unreliable source) for information about seedless fruits

THANK YOU!

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Graphics by Stephanie Elkowitz, www.mycutegraphics.com and www.sweetclipart.com

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