

# INTRODUCTION TO SNAPS LABS

A SNAPS laboratory includes station activities designed to develop students' science skills with hands-on activities and thought-proving exercises. The labs require students to use science, math, literacy, problem-solving and engineering skills so to expand their understanding scientific ideas and apply scientific concepts to the real world.

## Science Skills Station

Students explore a concept using science and math skills. The skills may be procedural that a student must physically do. The skills may be mathematical or require scientific thinking and reasoning.

## Narrative Station

Students employ literacy skills important to understanding scientific text as well as illustrations, tables and graphs. In many labs, students will explore multimedia sources, such as videos, audio files or animations.

## Assessment Station

Students answer multiple choice questions, short answer questions and/or open-ended, thought-provoking questions. The questions progressively get "harder" and require students to employ lower, mid and higher order thinking.

## Problem-Solving Station

Students utilize the engineering design process and problem-solving skills so to identify problems, test solutions and/or make improvements to solutions.

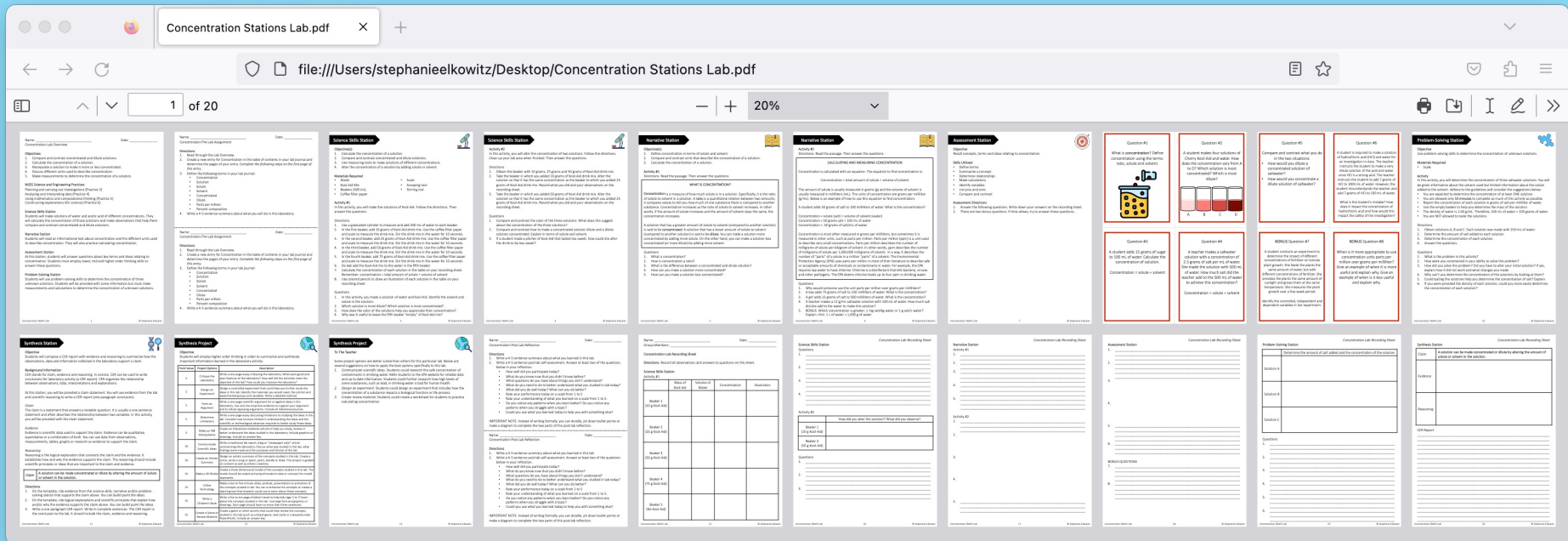
## Synthesis Station

Students compose a CER report as a lab conclusion so to relate the observations, data and other information gathered in the lab to the objective(s) of the lab.

## Synthesis Project

Students complete an activity or project that helps summarize information studied and learned in the lab. This facilitates "bringing it all together" while getting students to think harder and deeper about a concept.

# SNAPs LAB STATIONS ACTIVITY



## Features:

- ✓ Connects Science, Math, ELA & Engineering (Problem-Solving) Skills
  - ✓ Requires easy-to-get and inexpensive materials
  - ✓ **Printable lab** for traditional classrooms included
  - ✓ Student Recording Sheets, Teacher Guide and Answer Key included
- Printable Lab downloaded as a PDF file. Teacher Guide and Key not shown.*

# DIGITAL SNAPs LAB STATIONS ACTIVITY

## Features:

- ✓ **Digital lab** for distance learning and paper-free classrooms included
- ✓ Fillable slides (pptx file) compatible with both Microsoft PP and Google Slides
- ✓ Assessment station available as self-grading Google Form (via force copy link)

# EDITABLE SNAPs LAB STATIONS ACTIVITY

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Concentration Editable Lab Stations

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Concentration Lab Overview

**Objectives**

- Compare and contrast concentrated and dilute solutions.
- Calculate the concentration of a solution.
- Manipulate solutions to make a more or less concentrated solution.
- Discuss different units used to describe concentration.
- Make measurements to determine the concentration of a solution.

**MS Science and Engineering Practices**

Planning and carrying out investigations (Practice 3)  
Analyzing and interpreting data (Practice 4)  
Using mathematics and computational thinking (Practice 5)  
Constructing explanations for observed phenomena (Practice 6)

**Science Skills Station**

Students will make solutions of water and acids at different concentrations. They will calculate the concentrations of those solutions and make observations that help them compare and contrast concentrated and dilute solutions.

**Assessment Station**

Students will read an informational text about concentration and the different units used to describe concentration. They will also practice calculating concentration.

**Assessment Station**

At this station, students will answer questions about key terms and ideas relating to concentration. Students must employ their **grip** and higher-order thinking skills to answer these questions.

**Problem-Solving Station**

Students will use problem-solving skills to determine the concentration of three unknown solutions. Students will be provided with some information but must make measurements and calculations to determine the concentration of unknown solutions.

Concentration © Stephanie Elowitz

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Concentration Pre Lab Assignment

**Directions**

- Read through the Lab Overview.
- Create a new entry for Concentration in the table of contents in your lab journal and determine the page of your entry. Complete the following steps on the first page of the entry.
- Define the following terms in your lab journal:
  - Concentration
  - Solute
  - Solvent
  - Concentrated
  - Dilute
  - Parts per million
  - Percent composition
- Write a 4-5 sentence summary about what you will do in this laboratory.

**Science Skills Station**

Directions

- Prepare a graduated cylinder to measure and add 200 mL of water to each beaker.
- In the first beaker, add 10 grams of Kool-Aid mix. Use the coffee filter paper and scale to measure the drink mix. Add the drink mix to the water for 10 seconds.
- In the second beaker, add 20 grams of Kool-Aid mix. Use the coffee filter paper and scale to measure the drink mix. Add the drink mix to the water for 10 seconds.
- In the third beaker, add 30 grams of Kool-Aid mix. Use the coffee filter paper and scale to measure the drink mix. Add the drink mix to the water for 10 seconds.
- In the fourth beaker, add 40 grams of Kool-Aid mix. Use the coffee filter paper and scale to measure the drink mix. Add the drink mix to the water for 10 seconds.
- DO NOT** add the Kool-Aid mix to the water in the fifth beaker.
- Calculate the concentration of each solution in the table on your recording sheet. Remember: concentration = total amount of solute ÷ volume of solvent
- Use colored drops to show an indication of each solution in the table on your recording sheet.

**Questions**

- In this activity, you make a solution of water and Kool-Aid. Identify the solvent and solute in the solution.
- Which solution is most dilute? Which solution is most concentrated?
- How does the color of the solutions help you appreciate their concentration?
- Why was it hard to have the fifth beaker "empty" of Kool-Aid mix?

Concentration © Stephanie Elowitz

**Science Skills Station**

**Objectives**

- Calculate the concentration of a solution.
- Compare and contrast concentrated and dilute solutions.
- Use measuring tools to make solutions of different concentrations.
- Calculate the concentration of a solution by adding solute to solvent.

**Materials Required**

- Scale
- Measuring tool
- Beakers (500 mL)
- Coffee filter paper
- Solute
- Solvent
- String

**Activity #1**

In this activity, you will make the solutions of Kool-Aid. Follow the directions. Then answer the questions.

**Directions**

- Prepare a graduated cylinder to measure and add 200 mL of water to each beaker.
- In the first beaker, add 10 grams of Kool-Aid mix. Use the coffee filter paper and scale to measure the drink mix. Add the drink mix to the water for 10 seconds.
- In the second beaker, add 20 grams of Kool-Aid mix. Use the coffee filter paper and scale to measure the drink mix. Add the drink mix to the water for 10 seconds.
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**Questions**

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- Why was it hard to have the fifth beaker "empty" of Kool-Aid mix?

Concentration © Stephanie Elowitz

**Activity #2**

In this activity, you will alter the concentration of two solutions. Follow the directions. Clean up your lab area when finished. Then answer the questions.

**Directions**

- Obtain the beaker with 10 grams, 20 grams and 30 grams of Kool-Aid mix.
- Take the beaker in which you added 10 grams of Kool-Aid mix. Alter the solution so that it has the same concentration as the beaker to which you added 20 grams of Kool-Aid mix. Record what you did and your observations on the recording sheet.
- Take the beaker in which you added 10 grams of Kool-Aid mix. Alter the solution so that it has the same concentration as the beaker in which you added 20 grams of Kool-Aid mix. Record what you did and your observations on the recording sheet.

**Questions**

- Compare and contrast the color of the three solutions. What does this suggest about the concentration of the three solutions?
- Compare and contrast how to make a concentrated solution dilute and a dilute solution concentrated. Explain in terms of solute and solvent.
- If a student made a poster of Kool-Aid that looked too sweet, how could she alter the drink to be less sweet?

Concentration © Stephanie Elowitz

**Narrative Station**

**Objectives**

- Define concentration in terms of solute and solvent.
- Compare and contrast units that describe the concentration of a solution.
- Calculate the concentration of a solution.

**Activity #3**

Directions: Read the passage. Then answer the questions.

**WHAT IS CONCENTRATION?**

Concentration is a measure of how much solute is in a solution. Specifically, it is the ratio of solute to solvent in a solution. It **differs** a quantitative relation between two amounts. It compares volume to tell you how much of one substance there is compared to another substance. Concentration increases as the ratio of solute to solvent increases. In other words, if the **amount** of solute increases and the amount of solvent stays the same, the concentration increases.

A solution that has a greater amount of solute to solvent (compared to another solution) is said to be **more concentrated**. A solution that has a lesser amount of solute to solvent (compared to another solution) is said to be **less concentrated**. You can make a solution more concentrated by adding more solute. On the other hand, you can make a solution less concentrated (or more dilute) by adding more solvent.

**Questions**

- What is concentration?
- How can concentration change?
- What's the difference between a concentrated and dilute solution?
- How can you make a solution more concentrated?
- How can you make a solution less concentrated?

Concentration © Stephanie Elowitz

**Activity #3**

Directions: Read the passage. Then answer the questions.

Concentration is calculated with an equation. The equation to find concentration is:

$$\text{Concentration} = \frac{\text{total amount of solute}}{\text{total amount of solvent}}$$

The amount of solute is usually measured in grams (g) and the volume of solvent is usually measured in milliliters (mL). The units of concentration are grams per milliliter (g/mL). Here's an example of how to use this equation to find concentration:

A student adds 10 grams of salt to 100 milliliters of water. What is the concentration?

Concentration = volume of solute ÷ volume of solvent (water)  
Concentration = 10 grams salt ÷ 100 mL of water  
Concentration = 10 grams of salt/mL of water

Concentration is most often measured in grams per milliliter, but sometimes it is measured in other units, such as parts per million. Parts per million (ppm) is a unit used to describe very small concentrations. Parts per million includes the number of grams of solute per kilogram of solvent. In other words, ppm describes the number of milligrams of solute per 1,000,000 milligrams of solvent. In a way, it describes the number of "parts" of a solute in a million "parts" of a solvent. The Environmental Protection Agency (EPA) uses parts per million in most of its tests to describe the safe or acceptable amounts of chemicals or contaminants in water. For example, the EPA requires tap water to have chlorine. Chlorine is a disinfectant that kills bacteria. **g/g** and **g/L** are other units that can be used to describe concentration in drinking water.

**Questions**

- Why would someone use parts per million instead of grams per milliliter?
- A boy adds 70 grams of salt to 100 milliliters of water. What is the concentration?
- A girl adds 20 grams of salt to 100 milliliters of water. What is the concentration?
- A teacher makes a 12 g/L saltwater solution with 100 mL of water. How much salt did she use to make this solution?
- SOBOL, which is concentrated greater: 1 mg salt/kg water or 1 g salt/L water? Explain. (1 L of water = 1,000 g of water)

Concentration © Stephanie Elowitz

**Assessment Station**

**Objectives**

Use key terms, terms and ideas relating to concentration.

**Skills Station**

- Define **concentration**.
- Calculate **concentration**.
- Manipulate **solutions**.
- Compare and contrast **concentrated** and **dilute**.

**Assessment Station**

- Answer the following questions. Write down your answers on the recording sheet.
- There are two bonus questions. If time allows, try to answer these questions.

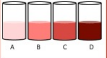
Concentration © Stephanie Elowitz

**Question #1**

What **concentration**? Define concentration using the terms: ratio, solute and solvent.

**Question #2**

A student makes four solutions of Cherry Kool-Aid and water. How does the concentration vary from A to D? Which solution is most concentrated? Which is most dilute?



**Question #3**

A student adds 15 grams of sugar to 100 mL of water. Calculate the concentration of solution.

Concentration = solute ÷ solvent

**Question #4**

A teacher makes a saltwater solution with a concentration of 2.5 grams of salt per mL of water. She made the solution with 100 mL of water. How much salt did the teacher add to the 100 mL of water to achieve the concentration? Concentration = solute ÷ solvent

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**Question #5**

Compare and contrast what you do in the two stations.

- How would you dilute a concentrated solution?
- How would you concentrate a dilute solution of solute?

**Question #6**

A student is required to make a solution of Kool-Aid and water for an investigation in class. The teacher instructs the student to make a more concentrated solution. The teacher instructs the student to add 7 grams of mix to 100 mL of water. However, the student misunderstands the teacher and adds 7 grams of mix to 200 mL of water. What the student's mistake? How does it impact the concentration of the resulting solution?

**BONUS Question #7**

A student conducts an experiment to determine the effect of different concentrations of fertilizer on tomato plant growth. She tests the plants the same amount of water but with each different concentration of fertilizer. She provides the plants the same amount of sunlight and grows them at the same temperature. She measures the plant growth over a five-week period.

Identify the controlled, **variables**, and dependent **variables** in that experiment.

**BONUS Question #8**

When is it more appropriate to use concentration **parts per million** over **grams per milliliter**? Give an example of when it is more useful and explain why. Give an example of when it is less useful and explain why.

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**Problem-Solving Station**

**Objectives**

Use problem-solving skills to determine the concentration of unknown solutions.

**Materials Required**

- Scale

**Activity**

In this activity, you will determine the concentration of three unknown solutions. You will be given information about the solute used and limited information about the volume added to the solvent. Answer the questions and compare your solutions below.

- You are expected to determine the concentration of at least ONE solution.
- If you are allowed to use **g/g**, determine as much of the activity as possible.
- Report the concentration of each solution in grams of solute per milliliter of water.
- Use the empty beaker to help you determine the mass of the solution.
- The density of water is 1.00 g/mL. Therefore, 100 mL of water = 100 grams of water.
- You are NOT allowed to taste the solutions.

**Directions**

- Obtain solutions A, B, and C. Each solution was made with 250 mL of water.
- Determine the amount of solute added to each solution.
- Determine the concentration of each solution.
- Answer the questions.

**Questions**

- What is the problem in this activity?
- How were you constrained in your ability to solve this problem?
- How did you solve the problem? Did you try to alter the unknown solution? If yes, explain how it did not work and what it changed you made.
- Why can't you determine the concentration of the masses by looking at them?
- Could tasting the solutions help you determine the concentration of each? Explain.
- If you were provided the density of each solution, could you more easily determine the concentration of each solution?

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**Station Station**

**Objectives**

Students will compare a CER report with evidence and reasoning to determine how the observations, data and information collected in the laboratory support a claim.

**Background Information**

CER stands for **claim**, **evidence** and **reasoning**. In science, CER can be used to write conclusions for laboratory activity (in CER reports). CER organizes the relationship between observations, data, background and explanation.

At this station, you will be provided a claim statement. You will have evidence from the lab and scientific reasoning to write a CER (one paragraph conclusion).

**Claim**

The claim is a statement that answers a testable question. It is usually one sentence statement and often describes the relationship between two variables. In this activity, you will be provided with the claim statement.

**Evidence**

Evidence is specific data used to support the claim. Evidence can be qualitative, quantitative or a combination of both. You can use data from observations, measurements, tables, **g/g** or **research** to evidence to support the claim.

**Reasoning**

Reasoning is the logical explanation that connects the claim and the evidence. It establishes how and why the evidence supports the claim. The reasoning should include scientific principles or ideas that are important to the claim and evidence.

**Skills**

**A claim can be both constructed or data by altering the amount of solute or solvent in the solution.**

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

Concentration Post Lab Reflection

**Directions**

- Write a 4-5 sentence summary about what you learned in this lab.
- Write a 4-5 sentence post lab self assessment. Answer at least 6 of the questions below in your reflection.
  - How well did you participate today?
  - What do you know now that you didn't know before?
  - What questions do you have about things you don't understand?
  - What do you need to do to better understand what you studied in lab today?
  - What concepts do you understand today that you do not?
  - Rate your performance today on a scale from 1 to 5.
  - Rate your understanding of what you learned on a scale from 1 to 5.
  - Do you notice any patterns you are better at? Do you notice any patterns when you struggle with a topic?
  - Could you use what you learned today to help you with something you do?

**APPOINTMENT** (NOT a student of writing format). You can double, get down below parts to make a diagram to complete the last parts of the post lab reflection.

Concentration © Stephanie Elowitz

## Features:

- ✓ **100% Editable** stations downloaded as a docx file
- ✓ Necessary diagrams, tables and graphs included
- ✓ Illustrative graphics and clipart NOT included

# TEACHER GUIDE

## PRINTABLE LAB SETUP AND PREPARATION

Each “traditional PDF file” includes directions and questions for each station. Print one copy of these materials for each station. Place copies of the letter-sized directions questions in sheet protectors or use self-laminating sheets to protect the documents. Position the materials at each station with the general supplies of that station.

## TEACHING DURATION

Most SNAPS lab activities require **two class periods** or **90 to 120 minutes**. However, the time needed to require one lab can vary with grade level, student autonomy and difficulty of content. Allowing two class periods allows ample time – regardless of these factors – for students to finish the four in-class stations.

Suggestions for shortening the lab:

1. Assign the Narrative Station as pre-lab work. By doing this, you ensure your students have first-order knowledge of the concepts and ideas explored in the lab. If you are using this lab to introduce new concepts, using the narrative station as a pre-lab will increase student success at the other lab stations.
2. Assign the Assessment Station as post-lab work. By doing this, you ensure your students are evaluated on the concepts and ideas in this lab after completing ALL stations.

## DOCUMENT DISTRIBUTION

1. Distribute student copies of the lab overview and pre-lab assignment the night before the laboratory. The pre-lab is a ½ page assignment. Staple the pre-lab to the lab overview before distributing these documents.
2. Distribute student copies of the recording sheet at the beginning of the laboratory.
3. Distribute copies of the post-lab, synthesis station and synthesis project at the end of the lab. The post-lab is a ½ page assignment. Staple the post-lab to the synthesis station and project before distributing these documents.
4. Assign a due date for the synthesis project. The post-lab reflection is a formative assessment and should not require a formal “due date.”

# TEACHER GUIDE

## DIGITAL VERSION OF SNAPs LAB ACTIVITIES

This download includes a digital lab/fillable slides that allow students to complete the laboratory on a computer or tablet. This file was created to work with a variety of online platforms and secure file-sharing platforms. The digital lab has been modified so students record answers directly following questions rather than in a student packet.

### Important Notes

- The answer key is removed from the digital lab.
- The answer key is included in the traditional PDF file.
- The digital laboratory CANNOT be edited; only fillable areas can be manipulated.
- When applicable, videos are included to help students create digital graphs.

The digital laboratory can be used a variety of ways:

- Distribute paper-free laboratories as part of regular instruction
- Use to assign at-home work as part of a remote or distance learning plan
- Send work to acutely or chronically absent students
- Support tutoring or at-home instruction for homebound students

How can you distribute and share the digital laboratory with your students?

- The laboratory CAN be distributed directly to students through email.
- The laboratory CAN be distributed or assigned with Google Classrooms, Microsoft Teams, Blackboard, Canvas, Schoology and other like platforms that are password-protected or require a code to enroll.
- The laboratory CAN be distributed with secure file sharing platforms like Google Drive, OneDrive and DropBox that are password-protected or shared only with students with their email or student account.
- Printable SNAPs labs can be shared or distributed just like the digital labs.

# TEACHER GUIDE

To use the digital laboratory with Microsoft Teams:

1. Upload an assignment to your One Drive.
2. Create a new assignment. Add the file as a "resource."
3. Assign to the appropriate class or students.

To use the digital laboratory with Google Classrooms:

1. Upload the assignment to your Google Drive. Add the file using the upload tool in a web browser or drag and drop the file into your Drive. Watch a demonstration of the process: <https://safesha.re/3h6n>
2. Create a new assignment and add the digital lab to it. Make a copy for each student.
3. Assign to the appropriate class or students.

## GOOGLE FORM ASSESSMENT

To better support digital classrooms, I created a Google Form version of the assessment station. There are two ways the Google Form assessment station can be used:

1. If using the digital lab, you can remove slides for the assessment station and use the Google Form assessment station instead. This makes the assessment station "more formal" since it is separate from the rest of the lab station activities.
2. If looking for a way to shorten the in-class lab, remove the assessment station – including the assessment station student recording pages – and assign the Google Form assessment station as an at-home assessment. Alternatively, you can use the Google Form assessment station as an in-class quiz if students have their own digital personal learning device.

# TEACHER GUIDE

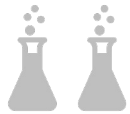
## DISTANCE – INDEPENDENT LEARNING COMPATIBILITY

SNAPs lab activities are rated for their ease with distance – independent learning. Some lab activities are very hands-on and require a lot of materials whereas other lab activities are more thought-provoking and require minimal – or no – additional materials.

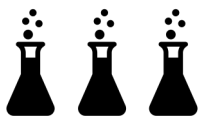
This lab has been rated the following:



The lab requires no modification to the required materials for distance – independent learning. All materials important to the lab are included in the digital lab. A calculator, colored pencils or a ruler may be needed.



The lab requires some modification to the required materials for distance – independent learning. Students can use household items, if needed, to complete hands-on activities.



The lab requires significant modification. Teacher should demonstrate or perform activities in a live session or prerecorded video and/or provide materials needed for the science skills or problem-solving station.

## Suggestions

- This lab includes hands-on activities so to make observations and measurements. For the best learning experience, students should complete this lab in a classroom.
- The activities at the science skills and problem-solving stations could be performed by the teacher in a pre-recorded video or in a live teaching session so to make this laboratory work in a distance learning setting.



# TEACHER GUIDE

## EDITABLE COMPONENTS OF SNAPs LAB ACTIVITIES

This download includes an editable word document of all lab components. The stations are available as fully editable DOCX files., Diagrams, illustrations, tables and/or graphs that are essential to lab activities are included in the editable document. Illustrative clipart is NOT included in the editable document.

Some labs have a directed synthesis project. When applicable, the directed synthesis project is available as an editable word document as well. Editable documents and rubrics important to standard synthesis projects are included in the [SNAPs Lab Stations Setup Guide](#).

There are three important reasons for creating editable versions of these stations:

1. Most lab station activities utilize five or more stations with relatively simple and short activities. However, my SNAPs lab activities include four comprehensive stations. The science skills station and problem-solving station could be used independently as single class period laboratories. To better allow for this option, I have made these stations editable. Teachers can use the narrative station as "pre-lab" work and the assessment station as "post-lab" work.
2. The science skills and problem-solving stations are the only stations that will require materials other than computers or calculators. By providing these stations in an editable format, you can manipulate the materials required and/or the directions so the activities work for your classroom.
3. By making the science and problem-solving station editable, you can alter the scope of the activities to suit your students' needs. You can also edit the questions so to evaluate your students in a manner that is best for you and your classroom.

**MAKE SURE YOU DOWNLOAD the FREE [SNAPs Lab Stations Setup Guide](#) for SIGNAGE, BEST PRACTICES & EDITABLE DOCUMENTS (<https://www.teacherspayteachers.com/Product/SNAPs-Lab-Stations-Guide-2953726>)**