

# 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

The screenshot displays a PDF viewer interface showing a grid of 20 lab station pages for 'Velocity and Acceleration Stations Lab.pdf'. The viewer's address bar shows the file path: file:///Users/stephanieelkowitz/Desktop/Velocity and Acceleration Stations Lab.pdf. The page number is 1 of 20, and the zoom level is 20%. The grid contains the following stations:

- Science Skills Station:** Includes sections for Objectives, Materials, Procedure, and a graph of velocity vs. time.
- Narrative Station:** Includes sections for Objectives, Materials, Procedure, and a graph of velocity vs. time.
- Assessment Station:** Includes sections for Objectives, Materials, Procedure, and a graph of velocity vs. time.
- Problem Solving Station:** Includes sections for Objectives, Materials, Procedure, and a graph of velocity vs. time.
- Synthesis Station:** Includes sections for Objectives, Materials, Procedure, and a graph of velocity vs. time.
- Synthesis Project:** Includes sections for Objectives, Materials, Procedure, and a graph of velocity vs. time.

## 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

The screenshot displays a digital lab interface titled "Velocity and Acceleration Digital Lab - Saved to my Mac". The interface includes a top navigation bar with icons for Home, Insert, Draw, Design, Transitions, Animations, Slide Show, Review, View, Recording, Acrobat, and Tell me. Below the navigation bar, there are 16 numbered stations, each with a title and content. The stations are:

- 1. Velocity and Acceleration Lab Overview
- 2. Velocity and Acceleration Lab Assignment
- 3. Science Skills Station: Materials Required, Activity #1, Activity #2
- 4. Science Skills Station: Activity #1, Activity #2
- 5. Science Skills Station: Activity #1, Activity #2
- 6. Science Skills Station: Activity #1, Activity #2
- 7. Narrative Station: Activity #1
- 8. Narrative Station: Activity #1
- 9. Narrative Station: Velocity of Object #1, Velocity of Object #2
- 10. Assessment Station: Questions 1-4
- 11. Assessment Station: Questions 1-4
- 12. Problem-Solving Station: Questions 1-4
- 13. Problem-Solving Station: Questions 1-4
- 14. Synthesis Station: Questions 1-4
- 15. Synthesis Station: Questions 1-4
- 16. Velocity and Acceleration Lab Reflection

The interface also shows a bottom navigation bar with "Slide 16 of 16", "English (United States)", "Accessibility: Investigate", and a zoom level of "66%".

## 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

AutoSave OFF Home Insert Draw Design Layout References Mailings Review View Grammarly Acrobat Tell me Comments Editing Share

Velocity and Acceleration Editable Lab Stations — Saved to my Mac

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

Velocity and Acceleration Lab Overview

**Objectives**

- Use mathematical equations to calculate velocity and acceleration.
- Determine the relationship between velocity and acceleration.
- Analyze data in a graph to determine how an object's position changes according to its velocity and acceleration.

**Mini Science and Engineering Practice**

Planning and carrying out investigations (Practice 3)  
Analyzing and interpreting data (Practice 4)  
Using mathematics and computational thinking (Practice 5)  
Obtaining, evaluating, and communicating information (Practice 8)

**Science Skills Station**

Students will conduct investigations to determine an object's velocity and acceleration. Students will measure the object's distance and time traveled. With these measurements, they will calculate the object's velocity and acceleration.

**Formulas**

$$v = \frac{d}{t}$$
$$a = \frac{v}{t}$$

Velocity (v) is measured in meters per second (m/s)  
Distance (d) is measured in meters (m)  
Time (t) is measured in seconds (s)  
Acceleration (a) is measured in meters per second squared (m/s<sup>2</sup>)  
Change in velocity ( $\Delta v$ ) is measured by final velocity (v<sub>f</sub>) and initial velocity (v<sub>i</sub>)

**Questions**

- An object travels 3 meters in 1.5 seconds. What is its velocity?
- An object travels 6 m/s. How far does the object travel in 3 seconds?
- An object at rest increases its speed to 12 m/s in 30 seconds. What is its acceleration?
- An object traveling 15 m/s comes to a stop in 5 seconds. What is its acceleration (or deceleration)?
- An object has an acceleration of 10 m/s<sup>2</sup>. How long does it take the object to change its velocity from 0 m/s to 20 m/s?

Velocity and Acceleration SNAP Lab © Stephanie Elkowitz

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

Velocity and Acceleration The Lab Assignment

**Directions**

- Read through the Lab Overview.
- Create a new entry for Velocity and Acceleration in the table of contents in your lab journal and determine the page of your lab entry. Complete the following steps on the first page of this entry.
  - Define following terms in your lab journal:
    - Velocity
    - Acceleration
  - Write a 4-5 sentence summary about what you will do in this laboratory.

**Science Skills Station**

**Objectives**

- Use mathematical equations to calculate velocity and acceleration.
- Calculate Earth's gravitational acceleration by using measurements of a falling object.

**Materials Required**

- Basketball (or same size ball)
- Meter stick or tape measure
- Stopwatch

**Activity #1**

In this activity, you will use the equations for velocity and acceleration to calculate the velocity, acceleration, distance traveled or time traveled for an object. The equations for velocity and acceleration are:

$$v = \frac{d}{t}$$
$$a = \frac{v}{t}$$

Velocity (v) is measured in meters per second (m/s)  
Distance (d) is measured in meters (m)  
Time (t) is measured in seconds (s)  
Acceleration (a) is measured in meters per second squared (m/s<sup>2</sup>)  
Change in velocity ( $\Delta v$ ) is measured by final velocity (v<sub>f</sub>) and initial velocity (v<sub>i</sub>)

**Questions**

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Velocity and Acceleration SNAP Lab © Stephanie Elkowitz

**Activity #2**

Earth's gravity is the force that causes objects to move or accelerate toward its center. Earth's gravitational acceleration is the rate at which Earth's gravity pulls objects toward it. In this activity, you make measurements of a falling object to determine Earth's gravitational acceleration. Record all measurements on your recording sheet.

**Directions**

- Using the meter stick or tape measure, mark two meters above the floor on a wall with Scotch tape. This marking will help you consistently drop an object from the same height (2 meters).
- Hold the basketball level with the two-meter marking. Use the stopwatch to measure how long it takes the ball to fall two meters. Start the stopwatch when you release the ball from the stopwatch when the ball hits the ground. **Caution: Be careful!** Record how long it takes the ball to fall.

**Calculations**

- Find the average of your three trials. To find average:  
Divide the sum of the three trials (Final 1 + Trial 2 + Trial 3)
- Divide the sum by the number of **trials**.

Calculate the ball's acceleration. To calculate acceleration, use the equation:  
$$a = \frac{\Delta v}{t}$$

a = acceleration  
 $\Delta v$  = change in velocity  
t = time it took the ball to fall

When you substitute for  $\Delta v$  and  $t$  and solve the variables, you get  $a = 9.8$

Earth's known gravitational acceleration is 9.81 m/s<sup>2</sup>. Show your calculation **percentage** the accepted value? To consider percent error, use the equation:  
$$\text{Percent error} = \frac{\text{Accepted value} - \text{Measured value}}{\text{Accepted value}} \times 100$$

**Questions**

- What happens to the object's velocity as it falls to the ground?
- Do you think measurements would be good for a larger object, like a bowling ball?
- How could you use the equation for acceleration to calculate the final velocity of the baseball right before it hits the ground?

Velocity and Acceleration SNAP Lab © Stephanie Elkowitz

**Activity #3**

Complete and contrast velocity and acceleration.  
Analyze data in a graph to determine how an object's position changes according to its velocity and acceleration.

**Activity #4**

Read the passage. Then answer the questions.

**VELOCITY AND ACCELERATION**

Velocity and acceleration are measurements that describe the motion of an object. **Velocity** measures the speed and direction of an object. It represents the distance an object travels in a certain amount of time traveled and the direction the object travels. We measure velocity in meters per second (m/s). **Acceleration** measures how the velocity of an object changes. It represents how an object's velocity is measured over time. We measure acceleration in meters per second squared (m/s<sup>2</sup>).

The direction of an object's velocity can be described by assigning a positive or negative sign to the value of velocity. Velocities that act in opposite directions have opposite signs. Let's use our positive velocity to the right with a positive direction. This means that distance traveled to the right is "positive distance." Therefore, velocity to the left is represented by a negative number. This means that distance traveled to the left is "negative distance."

Acceleration also has direction. The direction of an object's acceleration is determined by calculating the change in velocity. If the final velocity is greater than the initial velocity, the change in velocity is positive, which leads to a positive acceleration. This means the object is speeding up or accelerating in the same direction it is moving. If the final velocity is less than the initial velocity, the change in velocity will be negative, which leads to a negative acceleration or deceleration. This means the object is slowing down or accelerating in the opposite direction it is moving.

**Questions**

- What happens to the velocity of object #1 over time?
- What happens to the velocity of object #2 over time?
- How do the velocities of object #1 and object #2 compare?
- Which object travels a greater distance over time? Explain.

Velocity and Acceleration SNAP Lab © Stephanie Elkowitz

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

Velocity and Acceleration Past 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 two 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 did you do well today that you do best at?
  - 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 when you learn better? Do you notice any patterns when you struggle with a topic?
  - Could you use what you learned today to help you with something else?

**IMPORTANT NOTE:** In order of writing format, you can double, (on down bullet points or make a change) to complete the two parts of the post-lab reflection.

Velocity and Acceleration SNAP Lab © Stephanie Elkowitz

**Assessment Station**

**Objective**

Relate concepts, terms and ideas relating to acceleration and velocity.

**Skills Utilized**

- Define **velocity**
- Define **acceleration**
- Complete an **acceleration**
- Use **graphs and axes**
- Answer **EQs**

**Assessment Directions**

- 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.

**Question #1**

What is **velocity**? What are the units for velocity?

**Question #2**

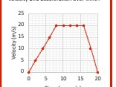
What is **acceleration**? What are the units for acceleration?

**Question #3**

What is the difference between positive acceleration and negative acceleration?

**Question #4**

Below is a graph that displays the velocity of an object over 20 seconds. What is happening to the object's velocity and acceleration over time?



**Question #5**

A car travels ten meters in 2.5 seconds. Using the equation below, calculate the car's velocity.

$$\text{velocity} = \frac{\text{distance}}{\text{time}}$$

**Question #6**

A car traveling 15 meters per second comes to a stop in 3 seconds when a stoplight turns red. Using the equation below, calculate the car's acceleration.

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

**BONUS Question #7**

Which statement below is correct? Explain your answer.

A. An object can have velocity without having acceleration.

B. An object can have acceleration without having velocity.

**BONUS Question #8**

Velocity has direction. In order to determine the direction of velocity, we often use positive and negative numbers. We could also describe the direction of velocity using descriptive terms like east and west or up and down.

What are the benefits and limitations to describing velocity with positive and negative numbers? What are the benefits and limitations to describing velocity with descriptive terms?

Velocity and Acceleration SNAP Lab © Stephanie Elkowitz

**Problem-Solving Station**

**Objective**

The design of a racecar to determine the features that help it achieve high acceleration and velocity.

**Background**

Racecars are vehicles that achieve very fast speeds. There are many factors that racecar engineers consider when designing a racecar to increase the car's acceleration and velocity, not using other vehicles. Drivers also rely on science and math to help them manipulate their car's track, making them go faster.

Discussed Watch a 3:16 minute video about racecars. Then answer the questions.

**Video Links**

SciShow TV: <https://www.youtube.com/watch?v=Ugk1Ugk1Ugk>  
Original YouTube Video: <https://www.youtube.com/watch?v=Ugk1Ugk1Ugk>

**Questions**

- What **three** scientific principles do engineers and drivers consider when designing and driving racecars? Define or explain each principle.
- Apply the engineers and driver's manipulative these principles to increase a racecar's acceleration.
- What are the three most discussed in the video, what other factors play a role in the ability of a racecar to accelerate quickly and travel farther at a high velocity?
- Apply, such as those seen in the video, what other factors play a role in the ability of a racecar to accelerate quickly and travel farther at a high velocity?
- What are the benefits and limitations to describing velocity with positive and negative numbers? What are the benefits and limitations to describing velocity with descriptive terms?

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**Synthesis Station**

Students will compose a claim statement with evidence and reasoning to substantiate how the observations, data and information collected in the laboratory support a claim.

**Background Information**

Claims stand for claim, evidence and reasoning. In science, a claim can be used to write conclusions for laboratory activities or CER reports. CER explains the relationship between observations, data, interpretations and explanations.

At this station, you will be provided a claim statement. You will use evidence from the lab and scientific reasoning to write a CER report from paragraph conclusions.

**Claim**

The claim is a statement that answers a testable question. It is usually a 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 scientific data used to support the claim. Evidence can be qualitative, quantitative or a combination of both. You can use data from observations, measurements, tables, graphs or research in evidence to support the claim.

**Reasoning**

Reasoning is the logical explanation that connects the claim and the evidence. It relates how and why the evidence supports the claim. The reasoning should include scientific principles and include any response to the claim and evidence.

**Claim**

**Velocity and acceleration quantitatively describe how an object's position changes.**

**Directions**

- Do the template, cite evidence from the science skills, narrative and/or problem solving station that supports the claim above. You can double check the above.
- Do the template, cite logical explanations and scientific principles that explain how and why the evidence supports the claim above. You can double check the above.
- Write a one paragraph CER report. Write a complete sentence. The CER report is the conclusion to the lab. It should include the claim, evidence and reasoning.

Velocity and Acceleration SNAP Lab © Stephanie Elkowitz



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

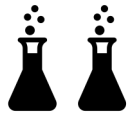
## DISTANCE – INDEPENDENT LEARNING COMPATIBILITY

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 a hands on activity at the science skills station which could easily be completed independently. The activity requires a baseball (but any ball that can bounce will work) and a meter stick or tape measurer. A digital stopwatch is included with the digital version of the science skills station activity.



# 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>)**