

Nature of Science

Nature of Science Unit includes:

- Print and digital Interactive Notebooks
- Editable Resources, including notes, PowerPoints, and test
- Instructional Videos
- Teacher-led Demos & Guided Inquiry Labs
- Task Cards & Digital Task Cards
- Study Guides





Suggested Pacing Guide

The following is a **suggested pacing guide** for my COMPLETE COURSES (Earth, Life or Physical Science) which are based on 50-minute class periods. There are three variations below. **Each variation is based on the number of sections in your SCIENCE INTERACTIVE NOTEBOOK chapter.**

Based on a **4-Section Chapter**

Day	Lesson/Activity	Engage	Explain	Explore	Elaborate	Evaluate
1	<ul style="list-style-type: none">• Teacher Demo• Section 1 Notes – INB input• INB Activity – INB output (homework if not completed in class)	x				
			x			
				x		
2	<ul style="list-style-type: none">• Mini-quiz• Section 2 Notes – use PowerPoint• INB Activity					x
			x			
				x		
3	<ul style="list-style-type: none">• Mini-quiz• Guided Inquiry Lab – Student Led					x
				x		
					x	
4	<ul style="list-style-type: none">• Section 3 Notes – use PowerPoint• INB Activity		x			
				x		
					x	
5	<ul style="list-style-type: none">• Mini-quiz• Section 4 Notes – use PowerPoint• INB Activity		x			
				x		
					x	
6	<ul style="list-style-type: none">• Mini quiz• Science Stations					x
				x		
					x	
7	<ul style="list-style-type: none">• Science Stations				x	
				x		
					x	x
8	<ul style="list-style-type: none">• Final draft and testing for Creation Station (STEM)				x	x
				x		
					x	
9	<ul style="list-style-type: none">• Task Card Review (game-style, full class, partner)				x	
				x		
					x	
10	<ul style="list-style-type: none">• Chapter Test• Have students complete notes for next chapter*					x
		x				

* **Note-taking option:** Once students are done with chapter test, they get the next set of notes and work quietly on completing them while other students finish up. All notes are to be completed when they return to class. Have students glue each page of notes into the next few pages of their INB (right side only). This way, when you go over the PowerPoint each day, they have already reviewed topic and are ready for class.

5 E Model

Engage – Teacher-led demos foster wonder and classroom discussion and serve as the hook for the lesson. Videos and images of natural phenomena also foster questioning and communication. NGSS phenomena are aligned to middle school NGSS standards.

Explain – PowerPoints, instructional videos, and guided notes (input side of interactive notebooks) provide definitions, explanations, and information through mini-lecture, text, internet, and other resources which encourages students to explain concepts and definitions in their own words.

Explore – Students investigate problems, events, or situations. As a result of their mental and physical involvement in these activities, students question events, observe patterns, identify and test variables, and communicate results.

Elaborate – It is important to involve students in further experiences that apply, extend, or elaborate the concepts, processes, or skill they are learning. Elaborate activities provide time for students to apply their understanding of concepts and skills. They might apply their understanding to similar phenomena or problems.

Evaluate – Use a variety of assessment to gather evidence of student's understanding and provide opportunities for them to assess their own progress.

Student Interactive Notebook

Each concept shares:

- Actual photos of both the INPUT and OUTPUT pages of Science Interactive Notebook
- Instructions on how to create/use/complete activity for OUTPUT side
- Mini-Quizzes for each concept to check students' understanding
- Answer Keys for all mini-quizzes
- Appendix with Teacher Notes for Interactive Notebook in LARGE print.

Section 1: The Method of Science

Section 2: Standards of Measurement

Section 3: Graphing

Layered Book

Step 1: Layer 5-sheets of colored paper about an inch apart vertically! Keep edges even

Scientific Method Labels for Layered Book

The Scientific Method	Ask a Question
Research	Form Hypothesis
Design	Gather & Analyze Data

Instructions:

For this section, students will be calculating density using the displacement method of marbles and pennies. Attached is the activity that you can print and students can paste it into their Science Interactive Notebook. And the best part – easy set-up, easy clean-up!

Determining Density

Volume is the amount of space taken up by something. Water displacement is one way to determine the volume of a solid. When an object is placed in water, the amount of water it displaces is the volume of the object. From the mass and volume of the object, its density can then be calculated. Density is a measure of how much mass fits in a given amount of space. Note: 1 mL = 1 mL

Materials:

Marbles	5 marbles
Water	20 pennies
100 mL graduated cylinder	

Part 1:

1. Determine the mass of 5 marbles on the balance. Mass = _____
2. Fill the graduated cylinder to the 50 mL mark with water. **Caution:** This is a sharp object. Do not allow any water to splash out.
3. Gently place the 5 marbles in the water:
 - a. Initial level of water = _____
 - b. Final level of water = _____
 - c. Volume of the 5 marbles = _____ mL
4. Density = $\frac{\text{Mass}}{\text{Volume}} = \frac{50 \text{ g}}{20 \text{ mL}} = 2.5 \text{ g/mL}$

Part 2:

1. Repeat all steps in Part 1 with the 20 pennies:
 - a. Mass of 20 pennies = _____
 - b. Initial level of water = _____
 - c. Final level of water = _____
 - d. Volume of the 20 pennies = _____ mL
2. Density = $\frac{\text{Mass}}{\text{Volume}} = \frac{20 \text{ g}}{20 \text{ mL}} = 1 \text{ g/mL}$

Independent Variable

Independent variable = Factor whose value is proposed only

Dependent Variable

Dependent variable = Factor that is measured

Control

Control = Factor that is held constant

Hypothesis

Hypothesis = A statement that can be tested

Experimental

Experimental = A procedure that is used to test a hypothesis

Procedure

Procedure = A series of steps followed to complete an experiment

Conclusion

Conclusion = A statement of the results of an experiment

Share Results

Share Results = A statement of the results of an experiment

Section 3: Graphing

Instructions:

For this page in the Science Interactive Notebook, students will compare and contrast the three different types of graphs and how they are used. Students will be given three different sets of data and will need to determine what type of graph would best represent that data. Students will then need to graph the data for each table in their Science Interactive Notebook. I always make students use a minimum of three colors when doing an activity like this – neatness counts! This following is the student handout for Graphing along with a mini-quiz.

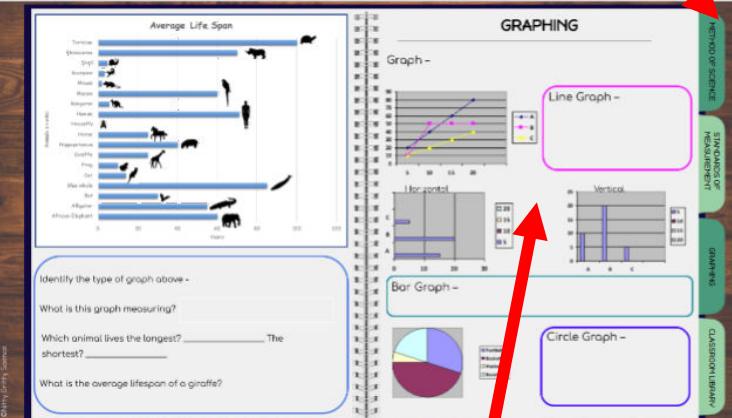
Student Digital Notebook

The student notebook is on Google Drive and ready for you to share with your students. Here's a quick overview of the features:

Set up like a traditional interactive notebook with input and output sides.

Directions: Use the information from the graph to answer the question.

Identify the type of graph above -



Encouraging independent learners. Directions for output side are here along with what they need to complete the activity.

Hyperlinked tabs so student can easily move through chapter for review

Students watch video < 6 min to complete notes.

Digital Textbook

For further exploration, click button(s) below:

- Graph of the Week
- Types of Graphs

Notes are chunked into manageable sections with large spaces for textboxes

Some pages have links so students can go deeper into the topic if they need.

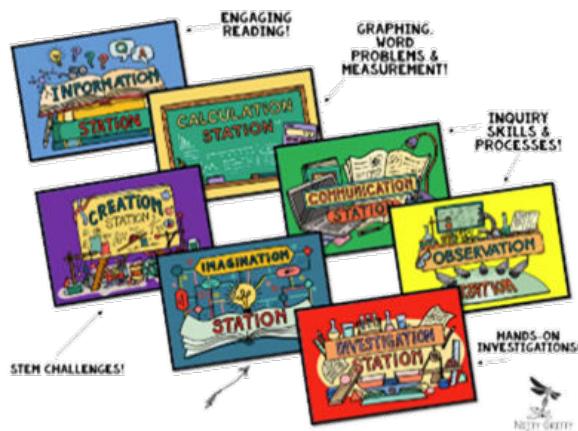
Demos, labs, & Science Stations

Working in the lab and being engaged in science experiments is the most exciting part of science.

Demo, Labs, and Science Stations Includes:

1. **SCIENCE STATION SIGNAGE** for all 7 stations is provided in color and in black and white (see preview) and all student answer sheets have icons that correspond with each station for ease of use.
2. **DEMONSTRATION** (teacher-led) allows teachers to invite scientific discussions and can help uncover misconceptions and, most importantly, lead to heightened curiosity and interest in the topic being studied.
3. **GUIDED INQUIRY LAB** which is a traditional lab that allows students to perform an investigation in order to solve a problem. Students will hypothesize, collect and analyze data and communicate their results.
4. **TEACHER GUIDES to DEMOS & SCIENCE STATIONS** help get you started and give you background information to make your science lessons engaging.
5. **7 SCIENCE STATIONS** which are designated locations in the classroom with activities that challenge students to extend their knowledge and elaborate on their science skills by working independently of the teacher in small groups or pairs. Stations included are:
 - INFORMATION STATION – Group members will read an interesting and relevant science passage then complete a task to help increase science literacy and deepen their understanding of the science concept.
 - OBSERVATION STATION – Group members will have images, illustrations, or actual samples at this station that show applications or processes of the science topic. Using what they've learned, they will need to apply their observation skills to complete the questions attached to each.
 - CALCULATION STATION – Group members use their math skills to complete the station challenge. Skills may include graphing, analyzing data, using models, measurement, and calculating formulas or word problems.
 - INVESTIGATION STATION – Group members will work with one another to explore the concept through hands-on activities so they may practice specific inquiry process skills as they learn.
 - COMMUNICATION STATION – There are three different options for this station: interviews, video, group essay. Depending on the option you choose, group members will communicate what they know by answering questions in creative ways.
 - CREATION STATION – Group members will work together to solve a STEM (Science, Technology, Engineering, Math) challenge by creating models or designs that demonstrate their understanding of the science topic being taught.
 - IMAGINATION STATION – This station makes science concepts relevant for students by asking them to imagine scenarios that will bring about discussion and critical thinking.
6. **INQUIRY PROCESS SKILLS CHECKLIST** is provided with each set to show teachers and administrators the inquiry skills used by students in each activity. These skills include, but are not limited to, communicating, creating models, inferring, classifying, identifying variables, measuring, observing, predicting, gathering and organizing data, comparing and contrasting, interpreting data, and manipulating materials.

SCIENCE STATIONS



Eye Safety

SCIENCE SKILLS AND LAB SAFETY

Procedure

1. Blow an eye on the underside of the Petri dish and display for class using the projector.
2. Crack open the egg and place the egg white only in the Petri dish.
3. Explain that the proteins in egg whites are similar to those found in the protein layer of the eye.
4. Tell them that acetone was being cautious and has splashed acid into their eye. cold drops of acid to the eye whites.
5. Ask students to make observations of what is happening to the egg whites.
6. Try adding water to reverse the effects. Ask students make observations.

Discussion

Q: What happened to the egg?

A: The protective layer became cloudy and damaged the eye.

Q: What type of safety equipment must be worn when doing lab?

A: goggles, aprons, hair ties, gloves

Teacher

Materials

- eye dropper
- vinegar
- Petri dish
- acetone
- water
- goggles
- apron
- hair ties
- gloves

Teacher guide and answer key offered for every lab!

Easy-to-get materials!

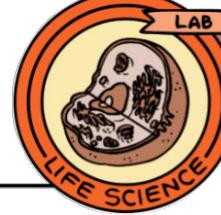


Common SI Prefix	Symbol	Amount
kilo	k	1,000
centi	c	1/100
milli	m	1/1,000
deci	d	1/10
deka	d	10
micro	μ	1/1,000,000
nano	n	1/1,000,000,000

Materials

- graduated cylinder
- tape
- balance
- metric ruler
- empty small containers
- fertilizer solution
- water
- 20 ml. graduated cylinder
- colored pencils

Safety:



Drip, Drop, Splat!

How does the density of a liquid will affect the height of the liquid and shape of droplet splatters?

Materials:

- colored water (graduated cylinder A)
- colored syrup (graduated cylinder B)
- eye dropper
- paper
- metric ruler
- meter stick

Procedure:

1. Make a hypothesis of how density of a liquid will affect splatter size on your lab sheet.
2. Place the piece of paper down on the lab table in order to catch droplets.
3. Measure the heights listed in the data table using a meter stick. Place meter stick with end starting at zero on paper and move up stick when measuring height of drops.
4. Use the eye dropper to drip ONE drop of colored water and ONE drop of colored syrup. Make sure to drop on different places on paper.
5. Measure the size of the splatter in MILLIMETERS. Record in data table on answer sheet.
6. Repeat for each height.
7. Use the collected data to graph the splatter size versus drop height for each liquid.

Analyze and Conclude

1. Was your hypothesis correct? Explain.
2. What two controls in your experiment that helped you collect the most accurate data possible?

USER-FRIENDLY PAGES:

Students easily recognize which answer sheet to use at each station by matching station icons located on each page!!

Name _____ Date _____

Hypothesis

Procedure

Drop Height (cm)	Colored Water	Colored Syrup
5		
25		
50		
75		
100		

Height of Drop vs. Splatter Size

Legend

- Water
- Syrup

Analyze and Conclude:

1. _____

2. _____

TEACHERS SAVE TIME:
Laminate station pages and reuse for each class and for years to follow!
Inquiry skills used are timeless!

Instructional Videos

The Nature of Science Instructional Videos and Digital Assessments are designed to help teachers move instruction from the group learning space to the individual learning space. Not only does this give students independence in their learning, but it also allows more time for dynamic and interactive learning when teachers meet with students in a group setting.

This resource is perfect for:

- Flipped Classroom
- Absent students
- 1:1 Classrooms
- Sub Plans
- Hybrid Schedules
- Teachers who want more time to guide students as they apply concepts and engage creatively in the subject matter

Features of this resource include:

- Instructional videos which are six minutes or less to keep students focused
- Videos and assessments can be completed independently
- Auto grading and reporting in Google Forms
- Share link with students through educational platforms or email
- Quizzes are editable with 5 - 8 questions per quiz
- Information in video pairs with Nitty Gritty Science Interactive Notebooks

Task Cards & Digital Task Cards

Task cards are a great tool for concept review that can be used in a variety of ways – pairs, small groups, team games, or individually. The reason they are so effective is there is only ONE task per card, allowing students to focus on that single task until they have successfully completed it. Answers sheet and answer key for teachers are included.

The digital, self-checking task cards are hosted at Boom Learning™ and are compatible with Google Classroom. These are perfect for displaying on your interactive whiteboard and leading class games or review sessions.

Print Task Cards

DECIDE
A testable prediction is a _____
a. experiment
b. variable
c. hypothesis
d. constant

DETERMINE
Determine the SI base unit for _____
a. Celsius
b. Fahrenheit
c. Kelvin
d. Supernova

COMPLETE
An organized set of investigation procedures is called the _____
a. line
b. circle
c. bar
d. independent

DETERMINE
A _____ graph shows how a relationship between two variables changes over time.
a. line
b. circle
c. bar
d. independent

CONVERT
Convert the following
 $4.6 \text{ L} = \text{ mL}$

IDENTITY
Identify three types of graphs.

COMPLETE
A factor that does not change in an experiment is the _____

DECIDE
An idea, event, or object that can be used to represent something you are trying to explain is a _____
a. hypothesis
b. model
c. variable
d. control

DETERMINE
In an investigation you put a beaker of water in the sun and measure the temperature every 10 minutes for 1 hour. What is the dependent variable?

IDENTITY
Identify the piece of lab equipment you would use to measure 15 mL of water.

Digital Task Cards

Nature of Science

In a bar graph, the _____ variable is plotted on the x-axis.

independent

Nature of Science

A statement that describes what scientists expect to happen every time under a particular set of conditions is a _____

Scientific theory
Scientific inquiry
Scientific hypothesis

Nature of Science

On what day of the week did most kids go swimming?

Days of the Week	# of kids that went swimming
M	32
T	28
W	22
Th	25
F	35

Study Guides: Includes print or digital options

NGS Magnified Study Guides are directly aligned to the notes and assessments offered by NGS Magnified and include a variety of review strategies that meet the needs of your learners for independent study and indirect instruction.

Each study guide provides a combination of strategies which may include:

- Graphic organizers
- Vocabulary building
- Compare and contrast
- Problem-solving
- Concept mapping
- Interpreting data
- Critical thinking
- Theme connection
- Matching
- Fill-in-the-blank
- Short answer
- Real-world application
- QR videos with accompanying questions

STUDY GUIDE

NATURE OF SCIENCE

Name: _____ Date: _____

SECTION 1
Directions: Describe how science each of the pictures below.
Hot air balloon _____

SECTION 2
Directions: Define each of the factors of the scientific investigation.
Hypothesis _____
Experiment _____

SECTION 3
Directions: Using your knowledge of measurement, determine the unit you would use to measure each of the following items.
Carton of milk _____
Bathtub _____
Test tube _____
Other _____

SECTION 4
Directions: Fill in the circle graph to best present the popularity of the type of chocolate listed.
Reese's Peanut Butter Cups 40 %
M&Ms 33 %
Snickers 20 %
Butterfinger 7 %

SECTION 5
Directions: Use the data below to create the type of graph that best present the information.
Temperature in Kansas City | Favorite Type of Movie

Degrees	Days
0	1
20	2
40	3
60	4
80	5
100	6

People	Type of Movie
20	Thriller
12	Pop
13	Classic
8	Alternative

SECTION 6
Directions: Fill in the blank with the best term from the word bank. Not all words will be used.

independent variable	dependent variable	control variable
x-axis	y-axis	bar graph
vertical	information	circle graph

1. Graphs are a way of communicating a lot of _____.
2. A variable that changes and affects another variable is called _____.
3. In a line graph, the horizontal axis can also be referred to as the _____.
4. The type of graph that shows information as bars of a circle is called _____.
5. A variable that changes as a result of another variable is called _____.
6. In a line graph, the _____ axis is referred to as the y-axis.

Assessments:

Teachers can use a variety of assessments to evaluate student progress throughout the unit. The curriculum provides mini-quizzes for each Interactive Notebook chapter and an online assessments that goes with the instructional videos. The chapter test includes multiple choice, short answer, interpreting diagrams, and an essay.

Name _____ Date _____

Quiz: The Method of Science

Matching

_____ 1. Hypothesis	a. standard for comparison
_____ 2. Control	b. testable prediction
_____ 3. Dependent variable	c. factor that is adjusted by the experimenter
_____ 4. Experiment	d. factor that doesn't vary in experiment
_____ 5. Constant	e. organized procedure for testing hypothesis
_____ 6. Independent variable	f. factor whose value is graphed on y-axis

7. Put the steps of the Scientific Method in correct order using numbers 1-7

Gather and Analyze Data _____ Ask a Question _____ Research _____
Form Hypothesis _____ Design Experiment _____ Share Results _____

Name _____ Date _____

Quiz: The Method of Science

Matching

_____ 1. Hypothesis	a. standard for comparison
_____ 2. Control	b. testable prediction
_____ 3. Dependent variable	c. factor that is adjusted by the experimenter
_____ 4. Experiment	d. factor that doesn't vary in experiment
_____ 5. Constant	e. organized procedure for testing hypothesis
_____ 6. Independent variable	f. factor whose value is graphed on y-axis

7. Put the steps of the Scientific Method in correct order using numbers 1-7

Gather and Analyze Data _____ Ask a Question _____ Research _____
Form Hypothesis _____ Design Experiment _____ Share Results _____

Name _____ CHAPTER TEST: DATES TO: _____ Multiple Choice

Choose the answer that best completes each statement.

1. The theory that reflects the idea that there is a limited number of species ever to live is _____
a. evolution
b. biodiversity
c. extinction
d. speciation

2. Below are the facts and concepts about biology are _____
a. hypothesis
b. predictions
c. theories
d. principles

3. Using the _____, _____ is made more using Biosis.
a. abiotic
b. biotic
c. environment
d. climate

4. The part of _____ is learning about the _____
a. science
b. environment
c. biology
d. society

5. Most _____ are _____
a. individuals
b. individuals
c. individuals
d. individuals

6. A group of _____ are _____
a. individuals
b. individuals
c. individuals
d. individuals

7. Using _____, _____ is made more using Biosis.
a. abiotic
b. biotic
c. environment
d. climate

8. All living things _____ to make more living things.
a. individual
b. individual
c. drive
d. drive

9. The study of biology is learning about the _____
a. society
b. the environment
c. the environment
d. all of the above

10. The information gathered from experiments is called _____
a. data
b. data
c. hypothesis
d. conclusion

11. The three common types of logic problems are _____
a. pure induction
b. pure deduction
c. mixed induction
d. mixed deduction

12. Quantitative research is the _____
a. graphs or charts
b. description of behavior
c. description of behavior
d. all of the above

13. What is the first thing you do?
a. Form a hypothesis
b. Do the experiment
c. Start first set of hypotheses
d. Ask a question

14. Using one or more of your _____, _____
a. observing
b. observing
c. observing
d. observing

15. When classifying your things into categories or groups together items that are alike in some way, they are _____
a. identical
b. identical
c. identical
d. making models

16. If a habitat becomes _____, the first thing you should do is _____
a. eat a donut
b. eat a donut
c. eat a donut
d. eat a donut

17. A habitat becomes _____, the first thing you should do is _____
a. eat a donut
b. eat a donut
c. eat a donut
d. eat a donut

18. _____ is used to make small details of an object visible to a scientist.
a. A _____ is used to make small details of an object visible to a scientist.
b. A _____ is used to make small details of an object visible to a scientist.

19. The simulation _____ and of life is _____
a. The study of life is _____

20. The study of life is _____

EDITABLE CHAPTER TEST INCLUDES MULTIPLE CHOICE, FILL IN THE BLANK, INTERPRETING DIAGRAMS, & SHORT ANSWERS QUESTIONS

ANSWER KEY INCLUDED — IMAGES ARE BLURRED FOR COPYRIGHT REASONS

Terms of Use



Thank you for sharing NGS Magnified with your students!

Terms of Use

Copyright © NGS Magnified, LLC (formerly Nitty Gritty Science, LLC.) All rights reserved by author Dr. Erica Colón. This product is to be used by the original downloader only. Copying for more than one teacher, classroom, department, school, or school system is prohibited. This product may not be distributed or displayed digitally for public view. Failure to comply is a copyright infringement and a violation of the Digital Millennium Copyright Act (DMCA). Clipart and elements found in this PDF are copyrighted and cannot be extracted and used outside of this file without permission or license. Intended for classroom and personal use ONLY.

Contact Information:

Email: admin@nittygrittyscience.com

Website: www.NGSmagnified.com

TPT: <https://www.teacherspayteachers.com/Store/Nitty-Gritty-Science>

