



**The Science Literacy Project  
Standards-Based Curriculum**

**2015-2016**

## More than a field trip

Nature's Academy does more than just provide a daylong field trip experience. In fact, we are **Partners in Education** committed to providing **yearlong** support to Manatee County educators. We are passionate about helping local students develop scientific literacy. So, we have provided tools that go **beyond** your field trip that supplement the curriculum you already have in place.

## How to use this resource

**Part One** of this packet details all of the **standards** addressed by your Nature's Academy trip and corresponding curriculum. We have included this list to help you think about the many different ways you can integrate your Nature's Academy trip into your yearlong classroom lessons.

**Part Two** of this packet provides information about all of the **activities** your students will participate in on their Nature's Academy field trip. Background information, activity objectives, vocabulary, and featured organisms are provided to help you prepare students prior to the day of their trip. Consider introducing some of these topics to students beforehand, or develop a lesson plan that helps students **engage** in the trip by brainstorming what they know or don't know about some sample topics.

**Part Three** of this packet is a series of comprehensive **lesson plans** that utilize the Nature's Academy Citizen Science Database to bring real-world data to your classroom, all of which align with Manatee County science standards. While students are on their field trip, they take data that is added to our database. Now, it is time to help them discover the value of this type of data! Lessons are arranged by quarter, so no matter what time of year you come on your field trip, there is a relevant lesson that connects it to your current curriculum.

## Provide Feedback

We want to hear from you! **Love** one of our lessons? Think that we could make some changes to make resources **easier** to implement? Contact our Education Coordinator and curriculum specialist Abigail Oakes at [Abigail@naturesacademy.org](mailto:Abigail@naturesacademy.org)



# Part One: Standards

This section is a guide to all of the standards addressed by the Nature's Academy Science Literacy Project. Standards are listed for Science, Social Studies, English, and Mathematics.

## Science Essential Benchmarks

### Body of Knowledge: SC.5.N: Nature of Science

*Big Idea/Supporting Idea: SC.5.N.1: The Practice of Science*

#### SC.5.N.1.1

Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

#### SC.5.N.1.2

Explain the difference between an experiment and other types of scientific investigation.

#### SC.5.N.1.3

Recognize and explain the need for repeated experimental trials.

#### SC.5.N.1.6

Recognize and explain the difference between personal opinion/interpretation and verified observation.

*Big Idea/Supporting Idea: SC.5.N.2: The Characteristics of Scientific Knowledge*

#### SC.5.N.2.1

Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.

#### SC.5.N.2.2

Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.

### Body of Knowledge: SC.5.E: Earth and Space Science

*Big Idea/Supporting Idea: SC.5.E.7: Earth Systems and Patterns*

#### SC.5.E.7.2

Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

#### SC.5.E.7.3

Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time.

#### SC.5.E.7.4

Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.

#### SC.5.E.7.5

Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains.

**SC.5.E.7.6**

Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water.

**Body of Knowledge: SC.5.P: Physical Science**

*Big Idea/Supporting Idea: SC.5.P.9: Changes in Matter*

**SC.5.P.9.1**

Investigate and describe that many physical and chemical changes are affected by temperature.

*Big Idea/Supporting Idea: SC.5.9.10: Forms of Energy*

**SC.5.P.10.1**

Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.

**SC.5.P.10.2**

Investigate and explain that energy has the ability to cause motion or create change.

**Body of Knowledge: SC.5.L: Life Science**

*Big Idea/Supporting Idea: SC.5.L.14: Organization and Development of Living Organisms*

**SC.5.L.14.2**

Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

*Big Idea/Supporting Idea: SC.5.L.15: Diversity and Evolution of Living Organisms*

**SC.5.L.15.1**

Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

*Big Idea/Supporting Idea: SC.5.L.17: Interdependence*

**SC.5.L.17.1**

Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

## **Social Studies Essential Benchmarks**

### **Strand SS.5.A: American History**

*Standard 3: SS.5.A.3: Exploration and Settlement of North America*

#### **SS.5.A.3.2**

Investigate (nationality, sponsoring country, motives, dates and routes of travel, accomplishments) the European explorers.

#### **SS.5.A.3.3**

Describe interactions among Native Americans, Africans, English, French, Dutch, and Spanish for control of North America.

## **ELA (English Language Arts) Common Core Standards:**

### **Strand: Standards for Speaking and Listening**

*Cluster 2: Presentation of Knowledge and Ideas*

#### **LAFS.5.SL.2.4**

Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

#### **LAFS.5.SL.2.5**

Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

### **Strand: Writing Standards**

*Cluster 2: Production and Distribution of Writing*

#### **LAFS.5.W.2.4**

Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience

#### **LAFS.5.W.2.5**

With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

*Cluster 4: Range of Writing*

#### **LAFS.5.W.4.10**

Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

**Strand: Language Arts**

*Cluster 1: Conventions of Standard English*

**LAFS.5.L.1.2**

Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

- a. Use punctuation to separate items in a series.
- b. Use a comma to separate an introductory element from the rest of the sentence.
- c. Use a comma to set off the words *yes* and *no* (e.g., *Yes, thank you*), to set off a tag question from the rest of the sentence (e.g., *It's true, isn't it?*), and to indicate direct address (e.g., *Is that you, Steve?*).
- d. Use underlining, quotation marks, or italics to indicate titles of works.
- e. Spell grade-appropriate words correctly, consulting references as needed.

*Cluster 3: Vocabulary Acquisition and Use*

**LAFS.5.L.3.4**

Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

- a. Use context (e.g., cause/effect relationships and comparisons in text) as a clue to the meaning of a word or phrase.
- b. Use common, grade-appropriate Greek and Latin affixes and roots as clues to the meaning of a word (e.g., *photograph*, *photosynthesis*).
- c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.

## **MA (Mathematics) Common Core Standards:**

### **Domain: Geometry**

*Cluster 1: Graph points on the coordinate plane to solve real-world and mathematical problems*

#### **MAFS.5.G.1.1**

Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

#### **MAFS.5.G.1.2**

Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

#### **MAFS.K12.MP.5.1**

Use appropriate tools strategically - Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

### **Domain: Mathematical Practice**

*Cluster 3: Construct viable arguments and critique the reasoning of others*

#### **MAFS.K12.MP.3.1**

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of



others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.



## Part Two: Field Trip Activities

This section is a guide to all of the activities included on the Nature's Academy field trip. Background information, activity objectives, vocabulary, and highlighted organisms are provided to help educators prepare students for their trip.

## ***Field Trip Activities***

As a peninsula, Florida has special access to many varieties of aquatic ecosystems, but it is also home to an amazing diversity of terrestrial ecosystems. The state boasts over 50,000 square miles of rich natural areas. The biodiversity within these systems creates a plethora of learning opportunities to students lucky enough to call Florida their home.

Due to the centrality of water within earth science, we begin our investigation into Floridian ecosystems by focusing on the connections that the bodies of water in and around Florida, including rivers, estuaries, and the ocean, create between the inhabitants of both aquatic and terrestrial environments via the water cycle. By exploring an estuarine environment, students are also introduced to the native and invasive living organisms that make these locations their home, as well as asked to explore the problems associated with invasive organisms.

Through observing terrestrial organisms during a nature walk and through a biodiversity investigation of seagrass inhabitants, students are encouraged to investigate the connections between the adaptations of species they encounter and the limitations of their environment. To further explore the benefit of scientific investigation and connections between living organisms, we then allow the student's to test the water quality within specific parameters.

Returning to the topic of the water cycle, it is possible for students to visualize how the health of the water in one area is connected to the overall quality of water as it progresses through various phases to travel to new locations.

## Mangrove Nature Walk

### Background Information:

Functioning as an introduction to both Earth and life science, the mangrove nature walk allows students to get up-close and personal with native and invasive plants and animals in Florida. Using trees as a pivotal example, the imbalance that invasive species introduce to natural areas is explored. Students also discuss the history of Native Americans and the European explorers. Upon identifying the natural resources that were used by Florida's early inhabitants, we explore some of the resources once more through the lens of life science. Students are instructed to observe the living organisms in the area, as well as specific adaptations they have taken on to allow them to thrive in their natural habitats.

Mangrove systems are home to *hordes of insects, a tremendous mixture of invertebrates, and an astonishing 220 species of fish – even more than in salt marshes, thanks to the more complex structure of the vegetation which provides more micro habitats and niches to occupy. Besides supporting myriad residents, mangrove communities also serve as nursery grounds for as host of fish and birds who emigrate to the outside world to live out most of their lives.* The importance of mangrove communities cannot be understated. *Without mangrove trees to nest in, the diverse arrays of birds that raise their young in the swamps would be gone. Without the rich detrital soup made from mangrove roots and leaves, uncountable tiny recyclers would die out, depriving hordes of shrimp, crabs, snails, and mullet of their nourishment, so that they too would disappear. When storms swept the coast, the great peat beds on which the mangroves grow would be eroded away.* Mangrove swamps protect Florida's shores from the wrath of the weather and also provide protection for the marvelous array of species that call those areas home.

*Excerpts taken from "Priceless Florida," by E. Whitney, D. Means, and A. Rudloe*

### Activity Objectives:

The student will:

- Define the term ecology and discuss examples from local estuary habitats
- Discuss the critical role of fire in maintaining the health of the forest and the importance of prescribed burns
- Identify Native Americans' use of plants for shelter, food, medicine, and transportation
- Discuss the arrival of European settlers and their impact on native cultures and the environment
- Explain the term barrier island and the importance of preserving native vegetation
- Describe the characteristics of a typical estuarine environment and observe several of the organisms that inhabit the area
- List several reasons that estuaries are of great ecological and economical value (e.g. nursery, reduce wave action, reduce erosion, filter sediment and pollution, and provide food and shelter)
- Name and identify the 3 types of mangroves trees

- Identify and understand that non-native, invasive species harm ecosystems
- Describe current threats to mangrove forests (e.g. water quality pollution, exotic species, and coastal development)
- Discuss mangrove biology and their adaptations that allow them to survive in both salt and fresh water

### Vocabulary

Mangrove Tree	Runoff	Native Species*
Detritus	Filtration	Prescribed burn
Ecology	Estuary	Exotic Species
Nursery	Mutualism	Barrier Island
Adaptation	Invasive species	Erosion
Symbiosis	Organism	Adapt
Physical Characteristics	Behavioral Characteristics	Survival
Camouflage	Habitat	Migration
Predator/Prey	Organism	Stem
Leaf	Roots	Flowers
Reproduction	Transport	Bark
Protection	Structure	Function
Acid Rain	Population	

### Organisms to be highlighted

Buttonwood	Sea grape	Southern red cedar
Poison ivy	Australian pine	Brazilian pepper
Great egret	Snowy egret	Great blue heron
Little blue heron	Green heron	Osprey
Brown pelican	Double-crested cormorant	Laughing gull
White ibis	Oysters	Mullet
Barnacles	Sponges	Manatee

## Seagrass, Dip Net, and Biodiversity Study

### Background Information

In the biodiversity study, students are able to take part in an investigation as well as make their own conjectures about the health of the seagrass beds due to the variety of life found. This exercise is also used to identify different groups of animals and explore taxonomy differences. The many positive impacts of healthy seagrass beds as well as possible consequences of their removal are explored. As the variety of life found within the seagrass beds is an indirect indicator of water health, students are asked to come up with ways to improve water quality. At this point, the idea of the water cycle is approached once more to discuss the variety of states water can exist in before it reaches the ocean.

Seagrass beds are a vital part of Florida's coastal ecosystems. Their *grassy realms allow sunlight to penetrate the water far enough to reach the bottom, and where the seagrasses and large algae can attach, grow, and spread. Numerous other organisms then find habitats among the plants and form communities of great complexity. To a small invertebrate animal, a meadow of seagrass is a wonderland of different kinds of foliage and a forest of blades on which to feed, hide, mate, and travel from place to place. To carnivorous fish and shellfish, it is a jungle in which to find abundant prey. To the sea turtles and manatees for which two of the grasses are named, a seagrass meadow is a luxuriant pasture in which to feed to the heart's content. And to tiny travelers such as shrimp and small fish, seagrass meadows provide safe passage across the ocean floor.* These and many other species inhabit the seagrass beds at some point in their development, in fact, over 90% of Gulf species begin their lives in a seagrass community. The integral part that seagrass beds play in the life cycles of a vast array of species makes it imperative to maintain the health of these seagrass communities. As seagrasses are true flowering plants, the clarity and chemical makeup of the water in which they are submerged has a significant impact on their growth and health, thereby making water quality an important component of the entire living ecosystem. It is for this reason and many others that water quality needs to be monitored and improved via changes in human waste management and in environmental restoration policy.

*Excerpts taken from "Priceless Florida," by E. Whitney, D. Means, and A. Rudloe*

### Activity Objectives:

The student will:

- Name the three main species of seagrasses, their ecological/economical importance, major threats, and conservation efforts
- List organisms they encounter (including birds) and potential safety hazards
- Discuss general life history of collected organisms with a focus on taxonomy and classification by describing characteristics and adaptations unique each phylum
- Distinguish and identify major differences between vertebrates and invertebrates
- Explain and understand that seagrass communities help to stabilize sediment, filter sediment and pollutants from runoff, provide food and shelter for many invertebrates and fish, and provide oxygen through photosynthesis

- Investigate the relationship between water quality and biodiversity
- Understand that water can be found in different states of matter as it moves through the water cycle
- Investigate the concept of a watershed and discuss anthropogenic impacts to the estuary

### Vocabulary

Seagrass	Vertebrates	Arthropoda
Invertebrates	Exoskeleton	Chordata
Photosynthesis*	Mollusca	Watershed
Echinodermata	Annelida	Water Cycle
Porifera	Brackish	Adaptation
Estuary	Phylum	Classification
Organism	Adapt	Survival
Physical characteristics	Behavioral characteristics	Camouflage
Habitat	Migration	Inherit
Predator/Prey	Reproduction	Skeleton
Function	Population	Generation

### Organisms to be highlighted

Turtle grass	Shoal grass	Manatee grass
Sponges	Florida fighting conch	Lightening whelk
Tulip snail	Lettered olive snail	Pen shell
Quahog	Coquina	Barnacle
Grass shrimp	Arrow shrimp	Gulf shrimp
Arrow crab	Spider crab	Blue crab
Hermit crab	Sea cucumber	Variiegated urchin
Lugworms	Tunicates/sea squirts	Pinfish
Filefish	Pipefish	Seahorse
Porgies	Mojarra	Mullet

## Water Quality Investigation

### Background Information:

While biodiversity is an indirect indicator of estuary health, water quality is a direct indicator. In this activity, students are asked to recall the observations they have made about the water they have experienced throughout the day as well as different variables they happened to notice about it, such as if it was “salty” or what color it was. These notions and more are explored through water quality parameters and units are explained. Causes for specific changes in data are explored as well as the potential impact of drastic changes. Students are once again asked to address the water cycle and possible causes from the land that could lead to problems with the water.

### Temperature

To determine whether or not this temperature reading is optimum, you must learn more about the aquatic organisms that are native to your region. All aquatic organisms (e.g. stream insects, fish, plants, etc.) need a certain temperature range to survive and thrive. For example, Chinook Salmon prefer temperatures from 5°C to 10°C, but tropical Altum Angelfish prefer temperatures from 26°C to 29°C. If the temperature of a water body rises or falls significantly for a prolonged period of time, aquatic organisms will become stressed and die.

Temperature also affects the amount of oxygen water can hold (cold water holds more oxygen than warm water) and affects the rate of photosynthesis by aquatic plants. Warm water discharged from factories, the removal of trees and vegetation that shade streams, and water that runs off city streets can cause temperature changes that threaten the balance of aquatic systems.

### Salinity

Most of the salt in the oceans came from land. Over many, many years, rain, rivers, and streams have washed over rocks containing the compound sodium chloride (NaCl), and carried it into the sea. You may know sodium chloride by its common name: table salt! Some of the salt in the oceans comes from undersea volcanoes and hydrothermal vents. When water **evaporates** from the surface of the ocean, the salt is left behind.

Different bodies of water have different amounts of salt mixed in, or different salinities. Salinity is expressed by the amount of salt found in 1,000 grams of water. Therefore, if we have 1 gram of salt and 1,000 grams of water, the salinity is 1 part per thousand, or 1 ppt. The average ocean salinity is 35 ppt. This number varies between about 32 and 37 ppt. Rainfall, evaporation, river runoff, and ice formation causes the variations. For example, the Black Sea is so diluted by river runoff, its average salinity is only 16 ppt. Freshwater salinity is usually less than 0.5 ppt. Water between 0.5 ppt and 17 ppt is called brackish. Estuaries (where fresh river water meets salty ocean water) are examples of brackish waters.

Most marine creatures keep the salinity inside their bodies at about the same concentration as the water outside their bodies because water likes a balance. If an animal that usually lives in salt



water were placed in fresh water, the fresh water would flow into the animal through its skin. If a fresh water animal found itself in the salty ocean, the water inside of it would rush out. The process by which water flows through a semi-permeable membrane (a material that lets only some things pass through it) such as the animal's skin from an area of high concentration (lots of water, little salt) to an area of low concentration (little water, lots of salt) is called **osmosis**.

This is also why humans (and nearly all mammals) cannot drink salt water. When you take in those extra salts, your body will need to expel them as quickly as possible. Your kidneys will try to flush the salts out of your body in urine, and in the process pump out more water than you are taking in. Soon you'll be dehydrated and your cells and organs will not be able to function properly.

### *Dissolved Oxygen (DO)*

DO levels fluctuate seasonally and over a 24-hour period. They vary with water temperature, altitude, and time of day. Cold water can hold more dissolved oxygen than warm water. For example, water at 28°C will be 100% saturated with 8 ppm dissolved oxygen. However, water at 8°C can hold up to 12 ppm of oxygen before it is 100% saturated. Water also holds less oxygen at higher altitudes. DO levels tend to be lower in the early morning because aquatic plants have been “resting” all night without sunlight for photosynthesis (and oxygen generation).

When the temperature of a water body increases, it is likely that its DO levels will diminish (see causes under “Temperature”). Additionally, high levels of bacteria and/or large amounts of rotting matter can cause DO levels to decrease because bacteria require oxygen to decompose organic waste. A typical range for DO in an estuary is 5 – 8 ppm.

### *Turbidity*

In general, the clearer (or less turbid) the water, the better. If your water tested high for turbidity, that implies that there are solid particles suspended in the water that are making it hazy. These particles can be bad for water quality because they could clog fish gills, block light from aquatic plants, and absorb heat.

Turbid water is caused by things like clay, silt, organic and inorganic matter, and microscopic organisms. Turbid water might be the result of soil erosion, urban runoff, algae, and the stirring up of bottom sediment (often caused by boats or too many bottom feeding fish). Turbidity is not the same thing as color, since darkly colored water can still be clear and not turbid.

### *pH*

Again, to truly determine whether your reading is acceptable, you should do a little research about the needs of the species native to your region. In general, the majority of freshwater organisms live in a pH range of 5.5 to 7.5 on a 14-point scale with 0 being the most acidic and 14 being the most alkaline. (For comparison, a lemon is 2 to 3 on the pH scale, while laundry detergents tend to fall anywhere from 7.5-10.5). Most aquatic animals prefer a range of 6.5 to 8.0 and will stop reproducing at pH levels around 4. If levels drop to around 3 on the pH scale, adult fish will die unless they are able to move away. pH can be affected by acid rain, wastewater discharges, drainage from mines, and the type of rock naturally found in the area.

### Activity Objectives:

The student will:

- Describe an estuary and the type of water found within one
- List and describe water quality parameters and their respective units
- Describe how water quality parameters affect one another and influence flora and fauna
- Discuss how water quality affects biodiversity
- Use probeware to collect water quality measurements
- Compare/contrast water quality measurements with empirical observations
- Discuss threats to water quality
- List possible solutions to reducing water pollution
- Compare/contrast these water quality readings with other water systems (i.e. fresh vs. brackish vs. salt)

### Vocabulary

Estuary

Acid

Saltwater/Freshwater

Base

Brackish Water

Invasive species

Acid Rain

Salinity

Native species

Temperature

Exotic species

Dissolved Oxygen

Neutral

Population

Nitrate

Stormwater runoff

Turbidity

Groundwater

pH

Anthropogenic effects

Pollution

## Coastal Cleanup

### Background Information:

Finally putting together the observations taken throughout the day concerning water quality and different theories about what could affect those parameters, students are lead to make a tangible change for good in the environment. After collecting trash from the beach and surrounding areas, students are asked to assess the harm that such trash could cause to the water as well as to animals in the area.

Manatee County is situated near both the Lower Tampa and Sarasota Bay estuaries. These areas are both ecologically and economically important, while serving as nursery grounds for fish, crabs, oysters and other animals relevant to the local seafood industry. Manatee County's economy is mainly tourism-driven, as our beaches and attractions brought in nearly 3 million visitors in 2012 ([www.mymanatee.org](http://www.mymanatee.org)). Manatee County's growing resident population also benefits from the aesthetics and recreational value of Sarasota Bay, which is classified as an Outstanding Florida Water Body (<http://www.dep.state.fl.us>).

However, the health of our local estuaries is greatly impacted by inland activities. Land-based litter accounts for 80% of the marine debris found on beaches and offshore (EPA). Much of this litter travels from roadways toward the shoreline through storm drains, streams and rivers. Stormwater runoff also carries harmful pollutants into Lower Tampa/Sarasota Bay.

### Activity Objectives:

The student will:

- Participate in collection and removal of trash from coastal habitats
- Measure and record data on the amount of trash collected by each group
- Understand the value of our limited resources and the importance of protecting them
- Recognize that trash contributes to water quality degradation and can have negative impacts on the surrounding habitat, estuary, and watershed
- Recognize that trash has negative impacts on wildlife, such as sea turtles and sea birds
- Identify alternative solutions for waste disposal and better ways to promote stewardship of the bay, estuary and watershed within the community

### Vocabulary

Ecology

Watershed

Pollutant

Runoff

Estuary

Habitat

Water Cycle

Infiltration



## Part Three: Lesson Plans

Even after your Nature's Academy field trip, there is still more to do!

This section provides comprehensive lesson plans that utilize the Nature's Academy Citizen Science Database to bring real-world data to your classroom, all of which align with Manatee County science standards. Lessons are arranged by quarter, so that no matter what time of year you come on your field trip, there is a relevant lesson that connects it to your current curriculum.

# Year-Round Classroom Activity

## Litter Lessons

### Overview

This activity allows students to use data from the Nature's Academy Citizen Science Database to observe how the amount of litter collected during a coastal cleanup varies with the time of year. Then, students participate in their own litter cleanup and upload their data to the Citizen Science Database.

### Time

30 minutes for discussion and graph construction

20 minutes for sharing and discussion

30 minutes for discussion and *Extension Activity*

30 minutes for evaluation

### 5E Integration

Students have already had the opportunity to **engage** in their environment by attending a Nature's Academy field trip. Now, they have the opportunity to further **explore, explain, elaborate** on, and **evaluate** their knowledge of the nature of science through the Nature's Academy Citizen Science Database.

### Learning Outcomes

#### SC.5.N.1.1

Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

### Materials

- Computer or computer lab
- Projector or document camera
- Paper (butcher, poster, graph, or 8.5" x 11")
- Colored pencils, markers, or pens
- Ruler or protractor

#### *Extension Activity*

- Buckets
- Rubber gloves
- Spring scale
- Litter cleanup location
- Cleanup Data sheet

### Preparation

Teachers should access the data set from the Nature's Academy Citizen Science Database prior to the activity. Specific instructions on how to do this are included at the end of this lesson plan. The computer used to download the data set must have Excel installed. Teachers can either print out the data set to distribute to students or project it using a projector or document camera.

## Activity

- 1) **Engage** – Remind students about their experience at Nature’s Academy. What do they remember doing and learning? Remind students about participating in the coastal cleanup. Make the connection that the data they collected during the beach clean-up, water quality testing, and dip-netting are all added to a large online database. Next, ask students if they remember anything about the cleanup. How much did they collect? What did they find? How do they think the litter got there?
- 2) **Explore** – Have students look at the cleanup data. Is the same amount of litter picked up every time? What do they **predict** the relationship between time of year and the amount of litter collected might be? Next, have students (either individually or in small groups) graph the data set using bar graphs. Students should use the data table provided in the data set to graph the average litter collected in March, April, May, etc. Students should make graphs large and colorful enough to be presented later (either on a poster board or a video). After they have finished graphing, have students write down or discuss what they see happening to the amount of litter in different months.
- 3) **Explain** – After students have completed their graphs, have them divide into groups and compare their results. Next, ask students questions about the **patterns** they see in their graphs. How does the amount of litter in May compare to the amount of litter in June? Ask students why they think the amount of litter increases during certain months, like June or March. What factors do they think could cause that? Help lead students to the idea that certain events during the school year allow for more people to go to the beach (spring break is typically in March, especially for colleges, and summer break begins in June). Help students think of the cleanups like a **scientific investigation**. As the number of people who can go to the beach increases, the average amount of trash collected also increases.
- 4) **Elaborate** – Now that students have used coastal cleanup data from the Nature’s Academy database, it is time for them to collect and submit their own data! **Extension Activity** – Cleanups don’t just happen at the beach. Your school is located in a **watershed**, which means that any time it rains, the extra water (**runoff**) flows toward storm drains, streams, rivers, and eventually the ocean. It isn’t just water that makes this journey – everything in its path (including litter) goes with it. Students can help prevent **marine debris** by conducting their own cleanup on school grounds! Nature’s Academy has provided your school with all necessary materials (buckets, rubber gloves, and spring scale). Pick a location for your cleanup, and have students collect litter using the supplied materials. At the end of the cleanup, empty the buckets onto a sidewalk or other paved area and have students analyze what was collected. Record the data on the Nature’s Academy Cleanup data sheet (included at the end of this lesson plan). Then, submit your data to the Nature’s Academy Citizen Science Database and become a part of a national effort to monitor litter and marine debris! (Data can be submitted by visiting <http://goo.gl/forms/8UJLV0MGmh>)
- 5) **Evaluate** – The best way to demonstrate understanding? Teach! Have students explain their graphs and the concept of litter and marine debris by creating a poster or video. Then, students can pair with a younger grade level or another class and explain their results! Other options include displaying posters in a public place, such as the library or cafeteria, or posting videos to the school website or the morning news. Students can be evaluated based on their graphs, answers to questions during discussion, and the teaching materials they develop.

## Resources

### SC.5.N.1.1

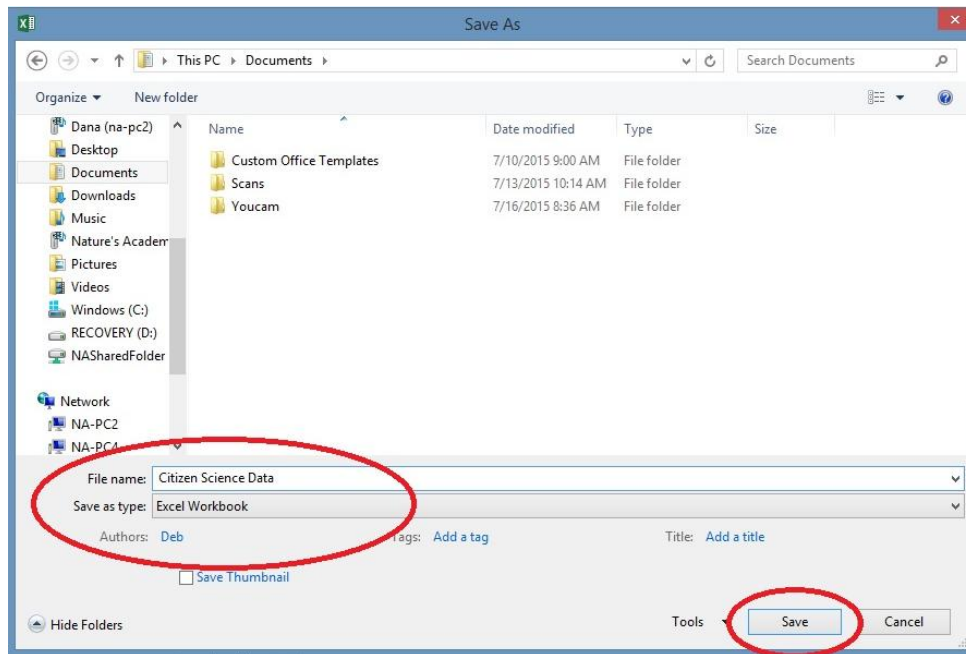
- CPALMS resource from the University of California describing “The Scientific Method” and how science *really* works:  
[http://www.cpalms.org/Uploads/resources/54384/10/96/docs/how\\_science\\_works.pdf](http://www.cpalms.org/Uploads/resources/54384/10/96/docs/how_science_works.pdf)

### Marine Debris

- 15-minute NOAA video about marine debris – what it is, where it comes from, why it is important, and how you can help! <https://youtu.be/uCQMZfnM-a4>

## Accessing the Data Set

1. Go to our SLP teacher’s resource page at <http://www.naturesacademy.org/science-literacy-project/teacher-resources/>.
2. Scroll down and click on “Litter Lesson Data Set.”
3. The data should open in an Excel file. To ensure you can properly use the data on your computer, go to “File” and “Save As.” Give the document a title, then under “Save as type,” save the file as an EXCEL document. Hit “Save.”



4. Your Excel file should look like the image below. The first sheet titled “Litter Data” lists Location, Date, and Litter data taken directly from the citizen science database. This information can be used to create a simpler chart and then a corresponding bar graph.

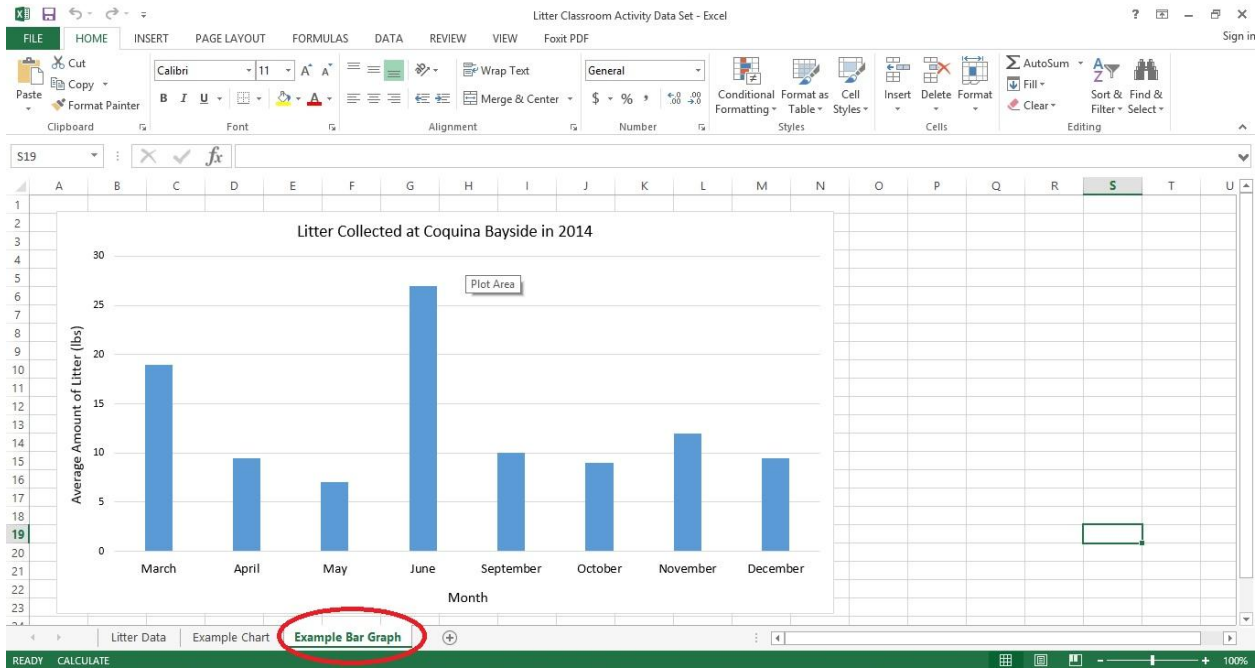
Location	Date	Litter
Coquina Bayside	3/20/2014	19
Coquina Bayside	4/10/2014	11
Coquina Bayside	4/17/2014	8
Coquina Bayside	5/19/2014	8.5
Coquina Bayside	5/31/2014	5
Coquina Bayside	6/17/2014	31.5
Coquina Bayside	6/18/2014	22.5
Coquina Bayside	9/15/2014	19
Coquina Bayside	9/16/2014	15.5
Coquina Bayside	9/18/2014	12
Coquina Bayside	9/25/2014	4
Coquina Bayside	9/26/2014	5
Coquina Bayside	9/29/2014	5.5
Coquina Bayside	10/1/2014	5
Coquina Bayside	10/2/2014	3.5
Coquina Bayside	10/6/2014	12
Coquina Bayside	10/7/2014	8.5
Coquina Bayside	10/9/2014	15.5
Coquina Bayside	10/21/2014	12.5
Coquina Bayside	10/22/2014	5.5
Coquina Bayside	10/24/2014	6

- The second sheet in this document, called “Example Chart,” lists the data in a form that is easier to use for making bar graphs. This chart includes the average amount of litter collected each month for the data provided. Students can create a similar chart from the original data or they can use this chart to make their bar graphs.

Month	Average Amount of Litter (lbs)
March	19
April	9.5
May	7
June	27
September	10
October	9
November	12
December	9.5



6. The third sheet, “Example Bar Graph,” provides an example bar graph created from this data.



7. The data shows that the most litter collected was during the months of March and June. One *possible* explanation for this is that more people visit the park during these months because they mark spring break and the beginning of summer. Discuss possible explanations for the data trends with your students. How could you test these hypotheses?

# Cleanup Data Sheet

2015

## Thank you!

Thank you for conducting a cleanup with your class! Please use this data sheet to record the type and amount of litter you collect during your cleanup. Then, you can submit your data to the Nature's Academy Citizen Science Database by visiting <http://goo.gl/forms/8UJLV0MGmh>.

## Basic Information

**School Name:** \_\_\_\_\_

**Teacher Name:** \_\_\_\_\_

**Date of Cleanup:** \_\_\_\_\_

**Time of Cleanup:** \_\_\_\_\_

**Number of Students:** \_\_\_\_\_

**Number of Adults:** \_\_\_\_\_

## Cleanup Data

Abundance codes are used to describe the amount of each type of item collected. Select Z for zero, F for few (1-5 pieces), M for many (6-10 pieces), or A for abundant (greater than 10 pieces).

Material	Abundance (circle one)			
Metal	Z (0)	F (1-5)	M (6-10)	A (>10)
Plastic	Z (0)	F (1-5)	M (6-10)	A (>10)
Glass	Z (0)	F (1-5)	M (6-10)	A (>10)
Rubber	Z (0)	F (1-5)	M (6-10)	A (>10)
Cloth	Z (0)	F (1-5)	M (6-10)	A (>10)
Fishing Gear	Z (0)	F (1-5)	M (6-10)	A (>10)
Cigarette Butts	Z (0)	F (1-5)	M (6-10)	A (>10)
Other	Z (0)	F (1-5)	M (6-10)	A (>10)
Please describe "other":				

What was the most abundant material you collected?

\_\_\_\_\_

What was the total weight (lbs) of the trash you collected?

\_\_\_\_\_

Don't forget to visit <http://goo.gl/forms/8UJLV0MGmh> to submit your data!

## Quarter 1 Classroom Activity

### Weather Trends

#### Overview

This activity allows students to use data from the Nature's Academy Citizen Science Database to observe trends in weather over time, make weather predictions, and learn about what factors contribute to weather.

#### Time

30 minutes for discussion and graph construction

20 minutes for sharing and discussion

30 minutes for *Extension Activity* research

30 minutes for evaluation

#### 5E Integration

Students have already had the opportunity to **engage** in their environment by attending a Nature's Academy field trip. Now, they have the opportunity to further **explore**, **explain**, **elaborate** on, and **evaluate** their knowledge of weather through the Nature's Academy Citizen Science Database.

#### Learning Outcomes

##### SC.5.E.7.2

Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

##### SC.5.E.7.3

Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time.

##### SC.5.E.7.5

Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains.

##### SC.5.E.7.6

Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water.

#### Materials

- Computer with Microsoft Excel
- Projector or document camera
- Paper (either butcher, poster, graph, or 8.5" x 11")
- Colored pencils, markers, or pens
- Ruler or protractor

#### Preparation

Teachers should access the data set from the Nature's Academy Citizen Science Database prior to the activity. Specific instructions on how to do this are included at the end of this lesson plan. The computer used to download the data set must have Excel installed. Teachers can either print out the data set to distribute to students or project it using a projector or document camera.

## Activity

- 1) **Engage** – Remind students about their experience at Nature’s Academy. What do they remember doing and learning? Make the connection that the data they collected during the beach clean-up, water quality testing, and dip-netting are all added to a large online database. Next, ask students if they remember what the weather was like during their Nature’s Academy trip. Do they think that all of the students who ever went to Nature’s Academy experienced the same weather? Next, ask about a time that they noticed a change in weather. Can weather change within a day? A week? A month? What factors changed that signaled a change in weather? (Temperature, precipitation, humidity, wind, pressure?)
- 2) **Explore** – Have students look at the weather data. Data is provided for two different months over the course of 3 years – June and October. These two months represent a sample of the wet season (June) and beginning of the dry season (October). Ask students to predict (either verbally or written) how the weather might change throughout the data set. Next, have students (either individually or in small groups) graph a section of the data set using bar graphs. For instance, some groups could graph October data while others could graph June data. Students should count the number of “clear” “partly-cloudy” and “cloudy” days within their section of the data set, and then plot them on their bar graph. Students should create colorful graphs that are large enough for them to present later (either poster or video).
- 3) **Explain** – After students have completed their graphs, have them present their data and explain their graphs. Next, ask students how the number of clear, partly-cloudy, and cloudy days changes between the two months. Are there more rainy or cloudy days in a certain month? Ask students to explain why this might be the case. Try to develop concepts relating to how temperature, precipitation, humidity, wind, and pressure can affect the overall weather in a location at a certain time. For instance, Florida is a subtropical environment and experiences a wet season and a dry season due to changes in temperature and proximity to the ocean. Ask questions leading students to make predictions about the weather, such as, “If it is winter in Florida, what do you expect the weather to be like? How about in the spring or summer?” “Do you think being near the ocean affects weather patterns in Florida, like how much it rains?”
- 4) **Elaborate** – Based on their discoveries within the data set, ask student to identify some trends that might exist in other parts of the country. **Extension Activity** – Have students pick a city in a different state and explore their weather. Have students answer questions such as: 1) What is the weather like in this city during the fall, winter, summer, and spring? 2) How is the weather in this location the same and different from the weather observed in Florida? 3) Is this city near a coast or large body of water? How do you think this affects the weather? 4) What is the elevation of this city? Are there mountains in or near this city? How do you think this affects the weather?
- 5) **Evaluate** – The best way to demonstrate understanding? Teach! Have students explain their graphs and research by creating a poster or video. Then, students can pair with a younger grade level or another class and explain their results! Other options include displaying posters in a public place, such as the library or cafeteria, or posting videos to the school website or the morning news. Students can be evaluated based on their graphs, answers to questions during discussion, and the teaching materials they develop.

## Resources

### SC.5.E.7.2

- NOAA Water and Climate - provides basic background information about the water cycle and how water is related to climate. <http://www.esrl.noaa.gov/research/themes/water/#what>
- A 9 minute NSF video about the water cycle. <https://www.youtube.com/watch?v=al-do-HGulk>

### SC.5.E.7.3

- Edheads weather prediction game that allows students to explore the different components of weather: <http://www.edheads.org/activities/weather/index.shtml>
- CPALMS online tutorial detailing the 5 major factors contributing to weather: <http://www.cpalms.org/Public/PreviewResource/Preview/121033>

### SC.5.E.7.5

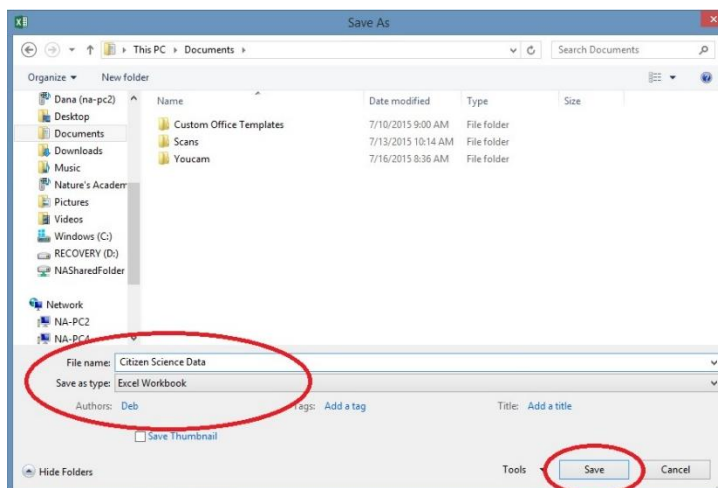
- CPALMS online tutorial discussing weather-related differences in climates: <http://www.cpalms.org/Public/PreviewResource/Preview/115589>

### SC.5.E.7.6

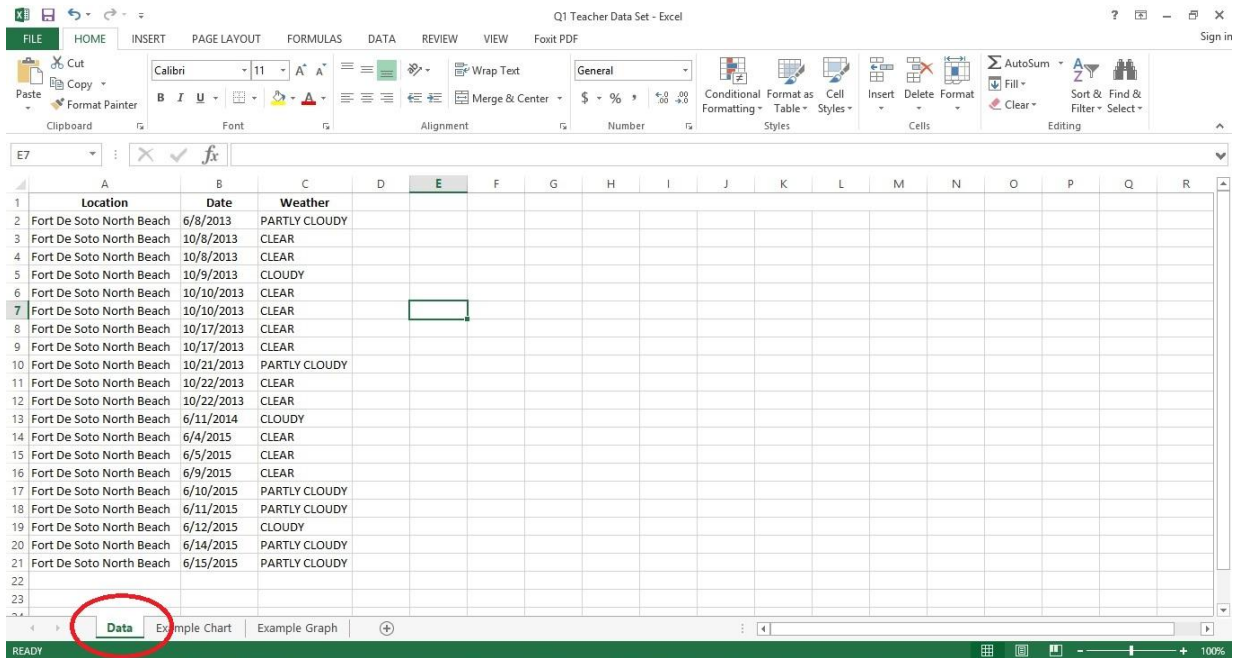
- CPALMS online tutorial describing the relationship between latitude and temperature: <http://www.cpalms.org/Public/PreviewResource/Preview/108186>
- NOAA interactive map describing climate characteristics in different climate zones: [http://oceanservice.noaa.gov/education/pd/oceans\\_weather\\_climate/media/climate\\_zones.swf](http://oceanservice.noaa.gov/education/pd/oceans_weather_climate/media/climate_zones.swf)

## Accessing the Data Set

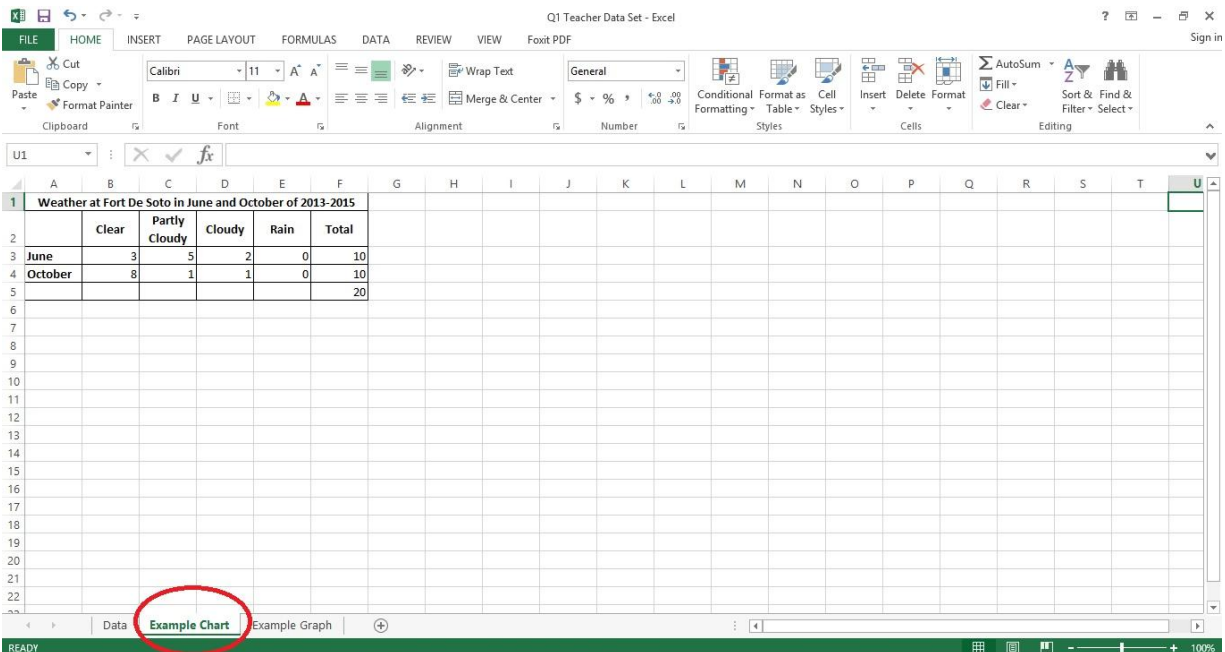
1. Go to our SLP teacher's resource page at <http://www.naturesacademy.org/science-literacy-project/teacher-resources/>.
2. Scroll down and click on "Quarter 1 Lesson Data Set."
3. The data should open in an Excel file. To ensure you can properly use the data on your computer, go to "File" and "Save As." Give the document a title, then under "Save as type," save the file as an EXCEL document. Hit "Save."



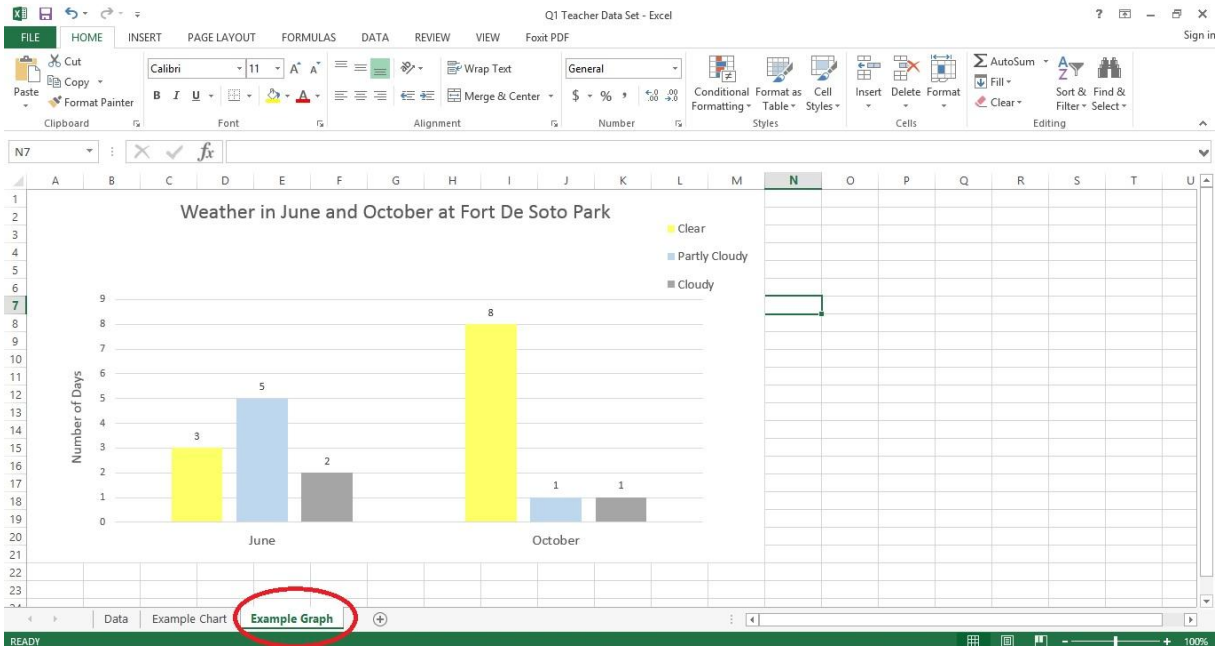
- Your Excel file should look like the image below. The first sheet titled “Data” lists Location, Date, and Weather data taken directly from the Citizen Science database. This information can be used to create a simpler chart and then a corresponding bar graph.



- The second sheet in this document, called “Example Chart,” lists the data in a form that is easier to use for making bar graphs. Students can create a similar chart from the original data or they can use this chart to make their bar graphs.



- The third sheet, “Example Graph,” provides an example bar graph created from this data. This graph includes both June and October in one graph. If this is too complicated, simpler graphs can be made if some students graph June, some graph October, and comparisons are made between separate graphs.



## Quarter 2 Classroom Activity

### Underwater Oxygen

#### Overview

This activity allows students to use data from the Nature's Academy Citizen Science Database to observe variance in dissolved oxygen (DO) levels as temperature changes, and learn how temperature affects different physical and chemical changes.

#### Time

30 minutes for discussion and graph construction

20 minutes for sharing and discussion

30 minutes for discussion and *Extension Activity*

30 minutes for evaluation

#### 5E Integration

Students have already had the opportunity to **engage** in their environment by attending a Nature's Academy field trip. Now, they have the opportunity to further **explore, explain, elaborate** on, and **evaluate** their knowledge of physical science through the Nature's Academy Citizen Science Database.

#### Learning Outcomes

##### SC.5.P.9.1

Investigate and describe that many physical and chemical changes are affected by temperature.

##### SC.5.P.8.2

Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.

#### Materials

- Computer or computer lab
- Projector or document camera
- Paper (either butcher, poster, or 8.5" x 11")
- Colored pencils, markers, or pens
- Ruler or protractor

##### *Extension Activity*

- 2 large glasses/cups
- Access to ice/refrigerator
- Access to coffee maker/water boiler/heating element
- Granulated Sugar
- Spoon

#### Preparation

Teachers should access the data set from the Nature's Academy Citizen Science Database prior to the activity. Specific instructions on how to do this are included at the end of this lesson plan. The computer used to download the data set must have Excel installed. Teachers can either print out the data set to distribute to students or project it using a projector or document camera.



## Activity

- 1) **Engage** – Remind students about their experience at Nature’s Academy. What do they remember doing and learning? Make the connection that the data they collected during the beach clean-up, water quality testing, and dip-netting are all added to a large online database. Next, ask students if they remember using the water quality set to measure dissolved oxygen. Ask students leading questions, such as “What do fish breathe?” “What is dissolved oxygen?” and “Do you think the amount of oxygen in the water can change?” Next, ask students to brainstorm some ways that oxygen gets into the water (waves/wind, photosynthesis of underwater plants).
- 2) **Explore** – Have students look at the dissolved oxygen and temperature data. Is it always the same? What do they predict the relationship between temperature and dissolved oxygen might be? Next, have students (either individually or in small groups) graph a section of the data set using line graphs. The graphs should be large and colorful enough to be presented later (either on a poster board or video). For instance, some students could create a graph for temperature (Date vs Temperature) while another group could create a graph for dissolved oxygen (Date vs Dissolved Oxygen). Students should draw a line to connect the dots between each date using a protractor or ruler. Student should also record on a piece of paper whether their variable increased or decreased between each data point (for example, if the temperature on Day 1 was 32 degrees C and 28 degrees C on Day 2, the student would write “decrease”, and so on).
- 3) **Explain** – After students have completed their graphs, have them pair up with another student or small group that graphed the opposite variable that they did. Students should now be able to compare dissolved oxygen levels and temperature for each day in the data set. Ask leading questions, such as “When dissolved oxygen was the highest, what was the temperature?” and “When dissolved oxygen was the lowest, what was the temperature?” Next, prompt students to compare their increase/decrease data. What happened to temperature when dissolved oxygen increased? What happened when it decreased? Ask students to identify a relationship between dissolved oxygen and temperature (inverse). Next, help students identify that because there is an inverse relationship between temperature and dissolved oxygen, dissolved oxygen is **high** when the temperature is **low**.
- 4) **Elaborate** – Based on their discoveries within the data set, ask students to develop some theories about why water is able to hold more oxygen when it is cold. Encourage students to think about how close together or spread-out particles are in a solid, liquid, and gas. Ask leading questions, such as “Are particles packed the tightest and moving the slowest in a solid, liquid, or gas?” and “When are they the furthest apart and moving the fastest?” Lead students to the idea that when water gets colder (closer to the solid state of ice) its particles become **closer** together and move **slower**. This makes it harder for the spread-out particles of oxygen (a gas) to escape from the water (therefore, there is more oxygen stuck in the water). **Extension Activity** – A related concept to explore is the effect of temperature on the solubility of **solids** in liquids. Solids will dissolve more readily in hot water than in cold. Students might be confused by this because it seems to contradict what they just learned about dissolved **gases**. However, it is based on the same concept! Solids dissolve more readily in hot water because as temperature increases, water particles become faster-moving and more spread out, allowing solids to enter and dissolve. The same property of water that keeps gases like oxygen **trapped in** keeps solids **trapped out** at low temperatures. To demonstrate this, a short lab can be conducted. Prepare one large glass of ice water and another large glass of hot water. Have students spoon one tablespoon of granulated sugar into each glass and record their observations. Students should be able to answer questions such as, “Which dissolved quicker – sugar in hot water, or sugar in cold water?”

and “Why do you think the sugar dissolved quicker at different temperatures?”

- 5) **Evaluate** – The best way to demonstrate understanding? Teach! Have students explain their graphs and labs by creating a poster or video. Then, students can pair with a younger grade level or another class and explain their results! Other options include displaying posters in a public place, such as the library or cafeteria, or posting videos to the school website or the morning news. Students can be evaluated based on their graphs, answers to questions during discussion, and the teaching materials they develop.

## Resources

### SC.5.P.9.1

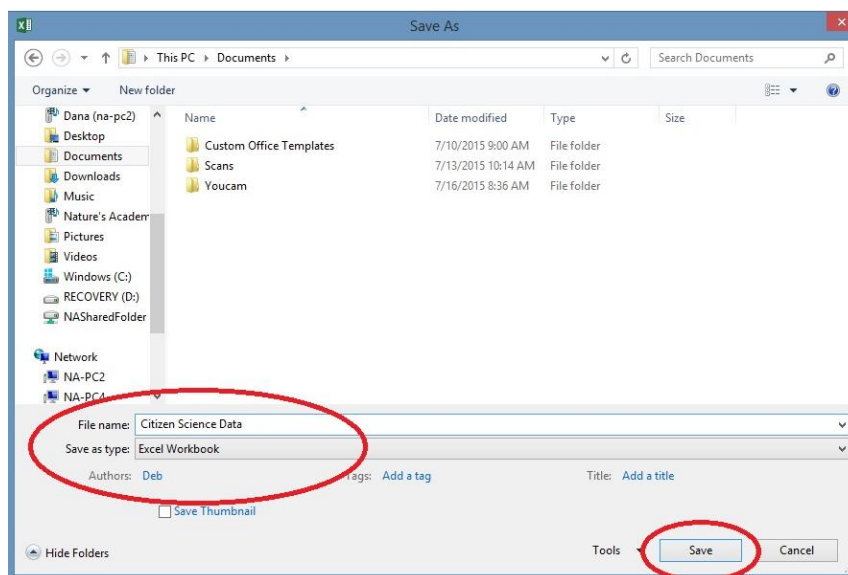
- MIT K12 video explaining what dissolved oxygen is, how it gets in the water, its relationship to temperature, and why it is important: <https://www.youtube.com/watch?v=oVW5LAzd7Ec>
- *Chapter 5: Lesson 2 (Properties of Matter)* in National Geographic textbook corresponds with discussion about states of matter.
- *Chapter 5: Lesson 6 (Physical and Chemical Changes)* in National Geographic textbook corresponds with discussion about states of matter and temperature.

### SC.5.P.8.2

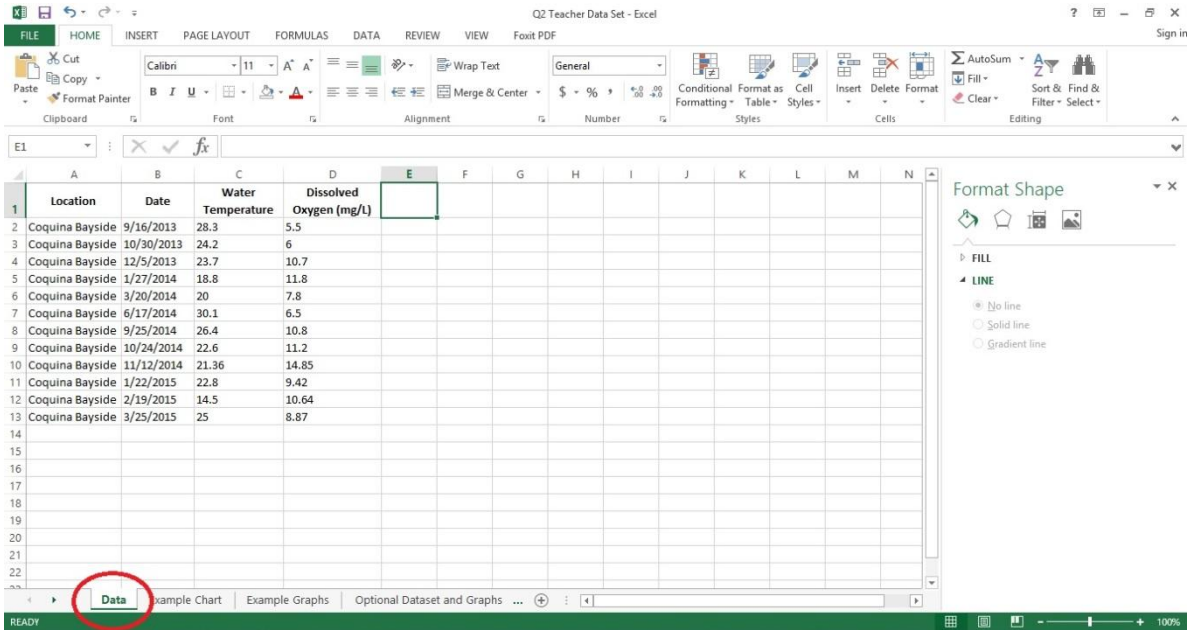
- *Chapter 5 Lesson 8: Investigate Dissolving* in National Geographic textbook provides an extended lab activity that explores solubility and the effect of temperature.

## Accessing the Data Set

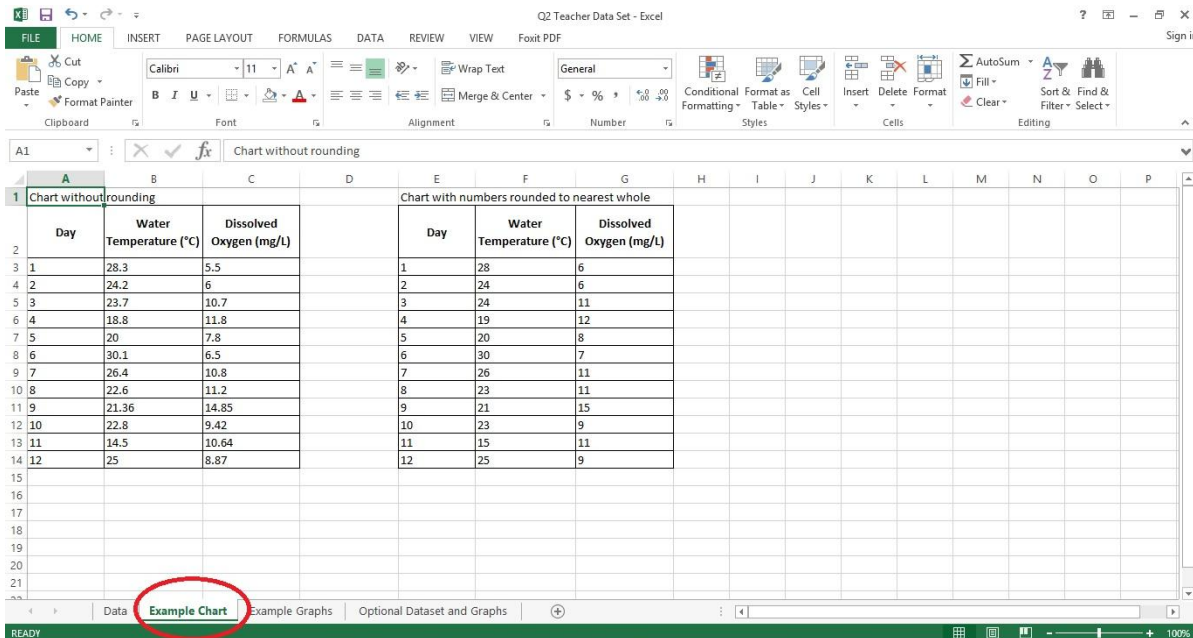
1. Go to our SLP teacher’s resource page at <http://www.naturesacademy.org/science-literacy-project/teacher-resources/>.
2. Scroll down and click on “Quarter 2 Lesson Data Set.”
3. The data should open in an Excel file. To ensure you can properly use the data on your computer, go to “File” and “Save As.” Give the document a title, then under “Save as type,” save the file as an EXCEL document. Hit “Save.”



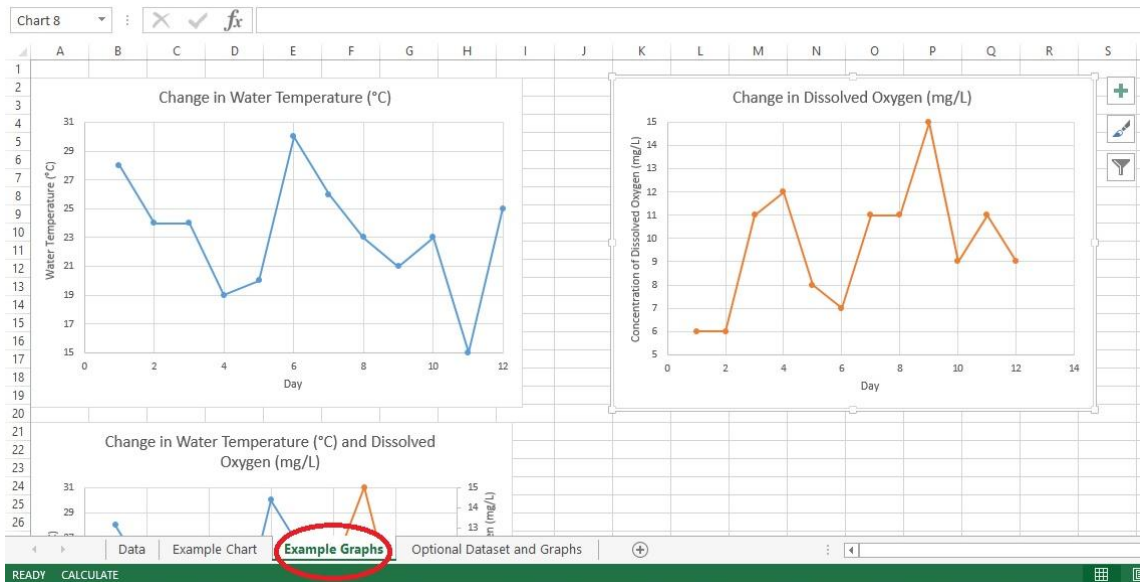
- Your Excel file should look like the image below. The first sheet titled “Data” lists Location, Date, and Water Temperature and Dissolved Oxygen data taken directly from the citizen science database. This information can be used to create a simpler chart and a corresponding line graph.



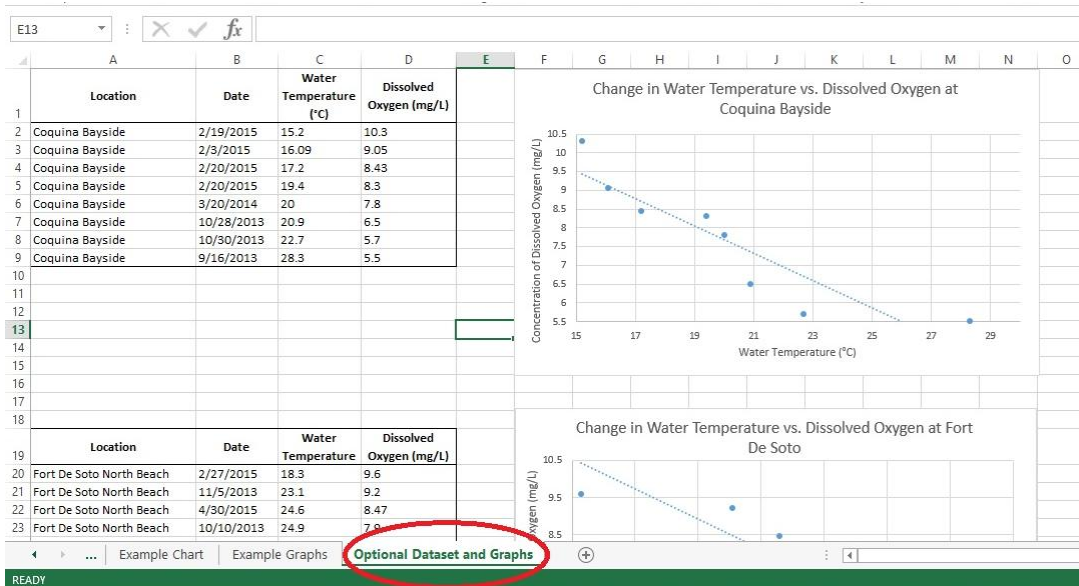
- The second sheet in this document, called “Example Chart,” lists the data in a form that is easier to use for making line graphs. Students can create a similar chart from the original data or they can use these charts to make graphs. Students can graph the numbers as are, practice rounding, or use the already rounded numbers provided. They can plot the dates on the x-axis or use Days 1-12 as provided.



6. The third sheet, “Example Graphs,” provides example line graphs created from this data. Students can make two different graphs, one with water temperature and one with dissolved oxygen, or they can graph both lines on the same graph. Either way, they should observe and explain that the lines move in different directions from point to point and discuss why that is.



7. The fourth sheet, “Optional Datasets and Graphs,” provides some additional datasets and graphs if teachers would like to continue practicing line graphs and exploring the relationship between dissolved oxygen and water temperature. There are two sets of data, one for Coquina Bayside and one for Fort De Soto North Beach. The associated line graphs show the water temperature on the x-axis and concentration of dissolved oxygen on the y-axis. A trendline (“line of best fit”) was added to the scatterplot to better show that as water temperature increases, dissolved oxygen decreases.



## Quarter 3 Classroom Activity

### What's Wind?

#### Overview

This activity allows students to use data from the Nature's Academy Citizen Science Database to observe how wind speed varies with time of day and explore why air moves as wind.

#### Time

30 minutes for discussion and graph construction

20 minutes for sharing and discussion

30 minutes for discussion and *Extension Activity*

30 minutes for evaluation

#### 5E Integration

Students have already had the opportunity to **engage** in their environment by attending a Nature's Academy field trip. Now, they have the opportunity to further **explore, explain, elaborate** on, and **evaluate** their knowledge of physical science through the Nature's Academy Citizen Science Database.

#### Learning Outcomes

##### SC.5.P.10.1

Investigate and describe some basic forms of energy, including: light, heat, sound, electrical, chemical, and mechanical.

##### SC.5.P.10.2

Investigate and explain that energy has the ability to cause motion or create change.

#### Materials

- Computer or computer lab
- Projector or document camera
- Paper (either butcher, poster, graph, or 8.5" x 11")
- Colored pencils, markers, or pens
- Ruler or protractor

##### *Extension Activity*

- 1 large, clear container (small fish tank, clear jar, etc.)
- Access to ice cube tray and freezer
- Access to coffee maker/water boiler/heating element
- Small jar/vial
- Food coloring

#### Preparation

Teachers should access the data set from the Nature's Academy Citizen Science Database prior to the activity. Specific instructions on how to do this are included at the end of this lesson plan. The computer used to download the data set must have Excel installed. Teachers can either print out the data set to distribute to students or project it using a projector or document camera.

## Activity

- 1) **Engage** – Remind students about their experience at Nature’s Academy. What do they remember doing and learning? Make the connection that the data they collected during the beach clean-up, water quality testing, and dip-netting are all added to a large online database. Next, ask students if they remember how windy it was when they were at the beach. What do they think wind is? Where does it come from? Why do we feel it? Is the wind the same all the time, or can it change within an hour or day?
- 2) **Explore** – Have students look at the wind speed vs time data. Is it always the same? What do they predict the relationship between time and wind speed might be? Next, have students (either individually or in small groups) graph the data set using bar graphs. Students should use the data table provided in the data set to graph the average wind speed from 9 -10 AM, 10 – 11 AM, etc. Students should make graphs large and colorful enough to be presented later (either on a poster board or a video). After they have finished graphing, have students write down or discuss what they see happening to the wind as the time moves from morning to afternoon.
- 3) **Explain** – After students have completed their graphs, have them divide into groups and compare their results. Next, ask students questions about the trends they see in their graphs. How does the average wind speed from 9 – 10 AM compare to the average wind speed from 12 – 1 PM? Ask students why they think the wind increases throughout the morning. What factors do they think could cause that? Help lead students to the idea that **energy** can cause motion and create change. Wind is simply the particles in the air **moving**. What source of energy could cause that? Help students realize that the **sun** releases energy as light and heat. There isn’t a lot of energy yet in the morning, when the sun first appears. However, as the day progresses, the sun releases more and more energy. This causes the air to heat up (become more energized), and allows for the possibility of wind!
- 4) **Elaborate** – Now that students have discovered that wind is caused by the energy released by the sun, we can answer another important question: *Why does the wind blow in different directions and at different speeds?* **Extension Activity** – At the Earth’s surface, the wind doesn’t come from straight up (where the sun is) but from the North, South, East, or West. Why would this be? Wind is caused by the **uneven heating of the Earth’s surface**. In other words, different parts of the Earth heat up faster or slower than one another when the sun shines on them. This is especially true near the water. Water and land heat up and cool down at different rates, which warms and cools the air above them at different rates. This difference in temperature is what creates wind. The temperature of the air changes its density (hot air is less dense, cold air is more dense). Hot air rises because it is less dense, while cold air sinks. This creates movement of the air, also known as wind! To illustrate this, a simple demonstration using hot and cold water (simulating air) can be conducted. A video of this demonstration is available at this link: <https://youtu.be/bN7E6FCuMbY>
- 5) **Evaluate** – The best way to demonstrate understanding? Teach! Have students explain their graphs and lab by creating a poster or video. Then, students can pair with a younger grade level or another class and explain their results! Other options include displaying posters in a public place, such as the library or cafeteria, or posting videos to the school website or the morning news. Students can be evaluated based on their graphs, answers to questions during discussion, and the teaching materials they develop.

## Resources

### SC.5.P.10.1

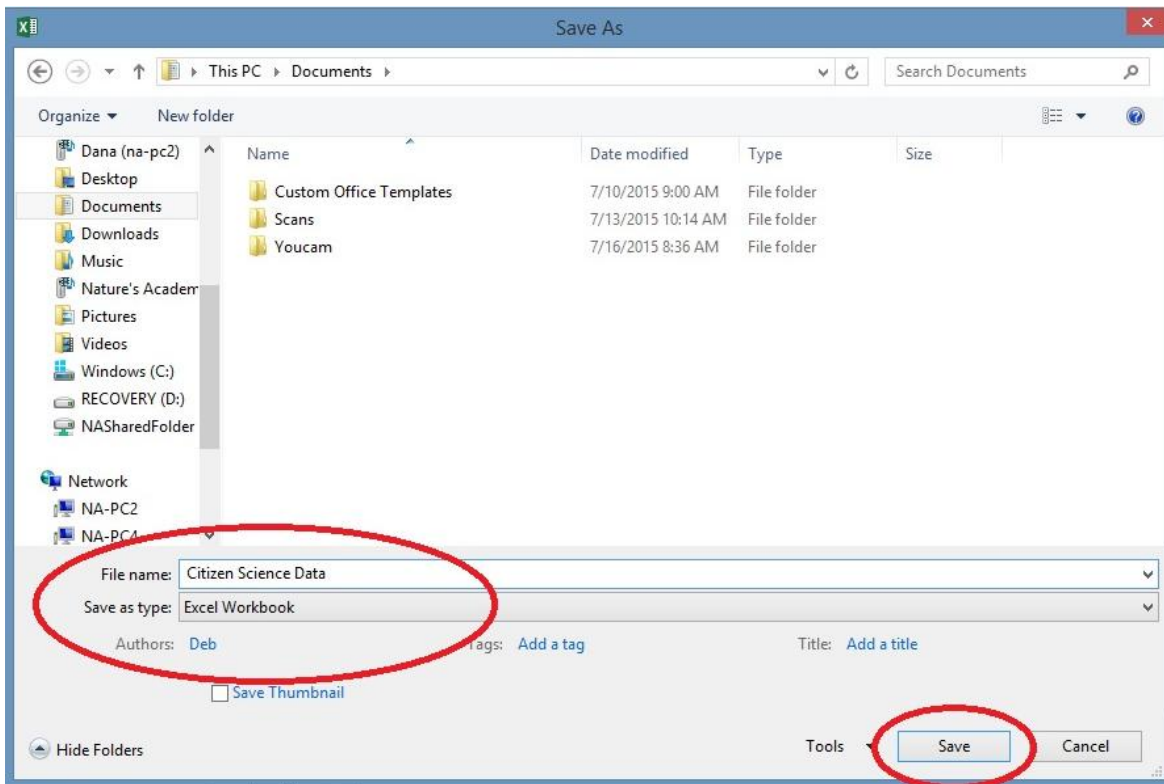
- *Chapter 4: Lesson 3 (Weather) pgs 154-155* in National Geographic textbook describes wind and references the movement of air from areas of high pressure to low pressure.
- A tutorial describing that heat is a form of energy:  
<http://www.cpalms.org/Public/PreviewResource/Preview/119033>

### SC.5.P.10.2

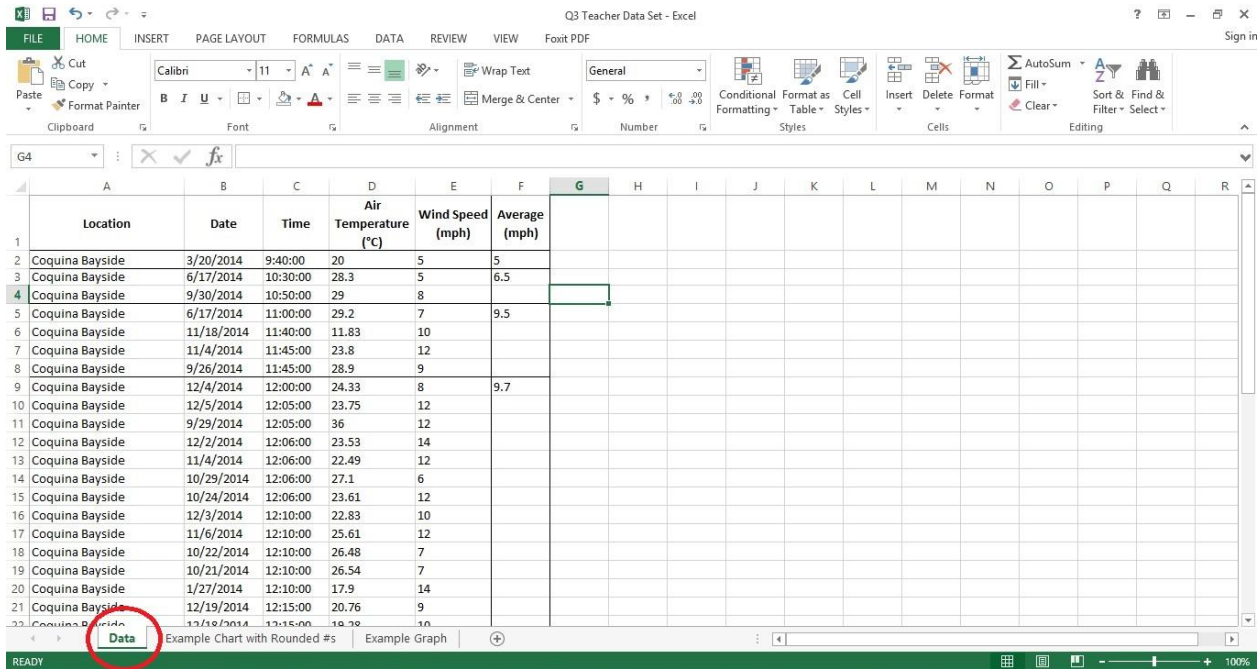
- Bill Nye the Science Guy video about how heat energy influences the movement of air:  
<https://youtu.be/uBqohRu2RRk>
- A moving wind map showing wind across the United States: <http://hint.fm/wind/>

## Accessing the Data Set

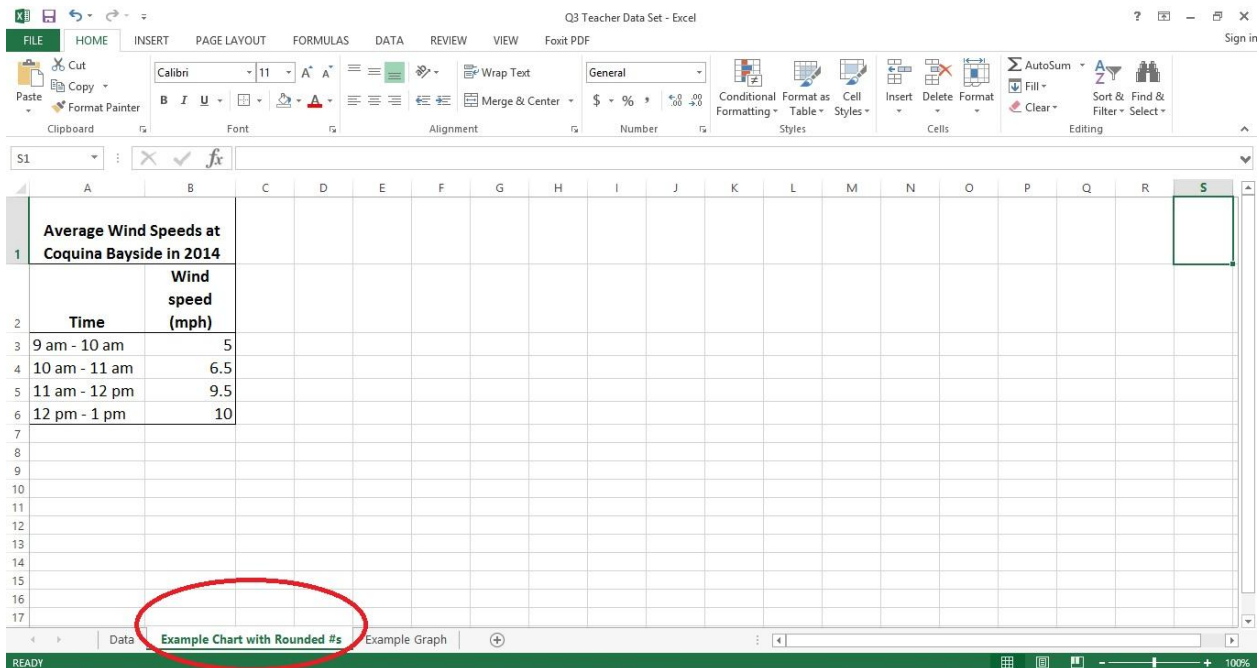
1. Go to our SLP teacher's resource page at <http://www.naturesacademy.org/science-literacy-project/teacher-resources/>.
2. Scroll down and click on "Quarter 3 Lesson Data Set."
3. The data should open in an Excel file. To ensure you can properly use the data on your computer, go to "File" and "Save As." Give the document a title, then under "Save as type," save the file as an EXCEL document. Hit "Save."



- Your Excel file should look like the image below. The first sheet titled “Data” lists Location, Date, Time and Wind Speed data taken directly from the citizen science database. This information can be used to create a simpler chart and then a corresponding bar graph.

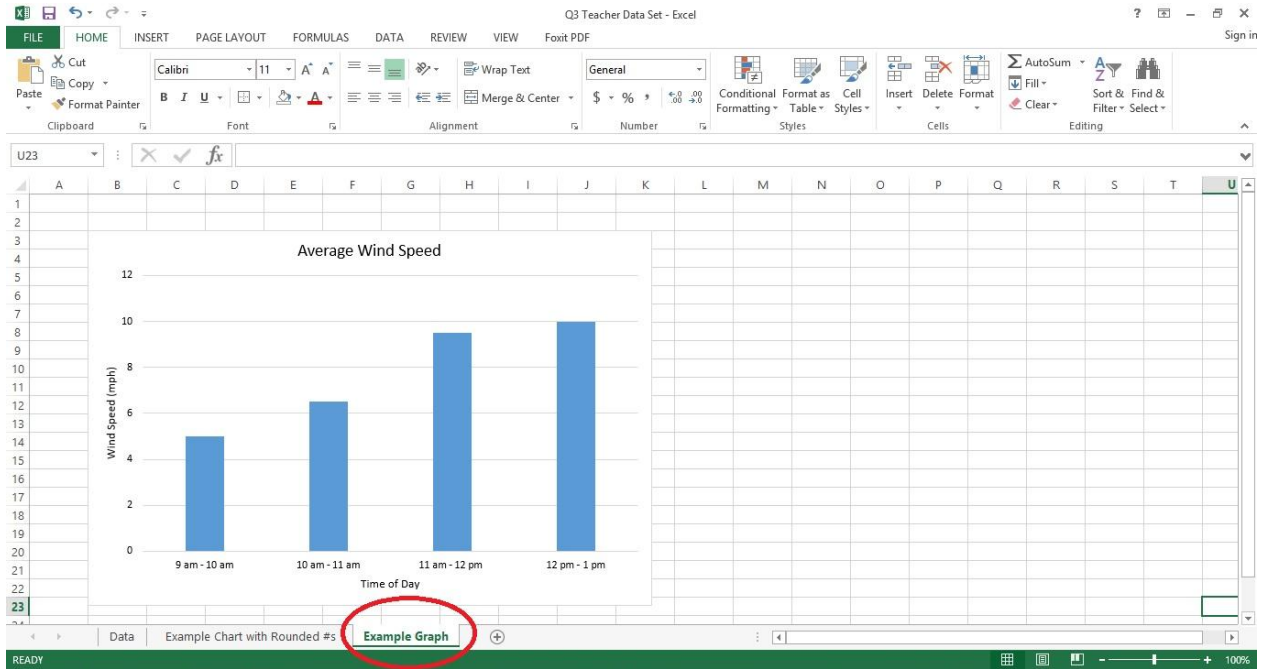


- The second sheet in this document, called “Example Chart,” lists the data in a form that is easier to use for making bar graphs. Students can create a similar chart from the original data or they can use this chart to make their bar graphs.





6. The third sheet, “Example Graph,” provides an example bar graph created from this data. Students will create a bar graph similar to this one and discuss the trend.



## Quarter 4 Classroom Activity

### Name That Species

#### Overview

This activity allows students to use data from the Nature's Academy Citizen Science Database to observe and describe different marine species observed along a local coast.

#### Time

- 30 minutes for discussion and graph construction
- 20 minutes for sharing and discussion
- 30 minutes for discussion and *Extension Activity*
- 30 minutes for evaluation

#### 5E Integration

Students have already had the opportunity to **engage** in their environment by attending a Nature's Academy field trip. Now, they have the opportunity to further **explore, explain, elaborate** on, and **evaluate** their knowledge of life science through the Nature's Academy Citizen Science Database.

#### Learning Outcomes

##### SC.5.L.14.2

Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support – some with internal skeletons others with exoskeletons – while some plants have stems for support.

#### Materials

- Computer or computer lab
- Projector or document camera
- Paper (either butcher, poster, graph, or 8.5" x 11")
- Colored pencils, markers, or pens
- Ruler or protractor

##### *Extension Activity*

- Access to computer lab or library
- Notebook
- Colored pencils, markers, or pens
- Ruler or protractor

#### Preparation

Teachers should access the data set from the Nature's Academy Citizen Science Database prior to the activity. Specific instructions on how to do this are included at the end of this lesson plan. The computer used to download the data set must have Excel installed. Teachers can either print out the data set to distribute to students or project it using a projector or document camera.

## Activity

- 1) **Engage** – Remind students about their experience at Nature’s Academy. What do they remember doing and learning? Make the connection that the data they collected during the beach clean-up, water quality testing, and dip-netting are all added to a large online database. Next, ask students if they remember dip-netting at the beach. What do they remember catching? Is there a specific animal that they remember catching a lot of? Next, ask students whether they think every student who goes on a Nature’s Academy field trip catches the same animals. Do they think some animals are **always** more common than others, or do they think it changes every day?
- 2) **Explore** – Have students look at the most abundant species data (be sure to discuss the meaning of “abundant”). Explain that this data shows which animals were the most common on the different days students went on a Nature’s Academy field trip. Is the most common animal always the same? What do they predict will be the most common animal overall? Next, have students (either individually or in small groups) graph the data set using bar graphs. Students should use the data table provided in the data set to graph the number of days each species was said to be the “most abundant”. Students should make graphs large and colorful enough to be presented later (either on a poster board or a video). After they have finished graphing, have students write down or discuss any patterns they see in the data.
- 3) **Explain** – After students have completed their graphs, discuss what patterns they see. Are some species a lot more common than others? Can the most abundant species change from day to day? Have students brainstorm about why the most common species might change every day. Lead them to the idea that factors such as what time of year it is, how many students were dip-netting, and where students were dip-netting can all change which species they caught the most of. Help students realize that some animals *migrate* throughout the year, which can change when they are common in a certain area.
- 4) **Elaborate** – Now that students have discovered that the most common species in an area can change, they can explore more about each animal! **Extension Activity** – Have students (either individually or in small groups) pick one of the species to research (you may consider assigning a species to each student/small group to ensure equal distribution). Have students gather information about the animal’s appearance, internal structure (skeleton, senses, reproductive, digestive system, etc.), and preferred habitat. Have students write down this information in a notebook or word document. Next, have students/small groups who chose different animals pair up and compare the species they researched. What is similar about their animals? What is different? How do each of their animals compare to humans?
- 5) **Evaluate** – The best way to demonstrate understanding? Teach! Have students present their graphs and species research by creating a poster or video. Then, students can pair with a younger grade level or another class and explain their results! Other options include displaying posters in a public place, such as the library or cafeteria, or posting videos to the school website or the morning news. Students can be evaluated based on their graphs, answers to questions during discussion, and the teaching materials they develop.

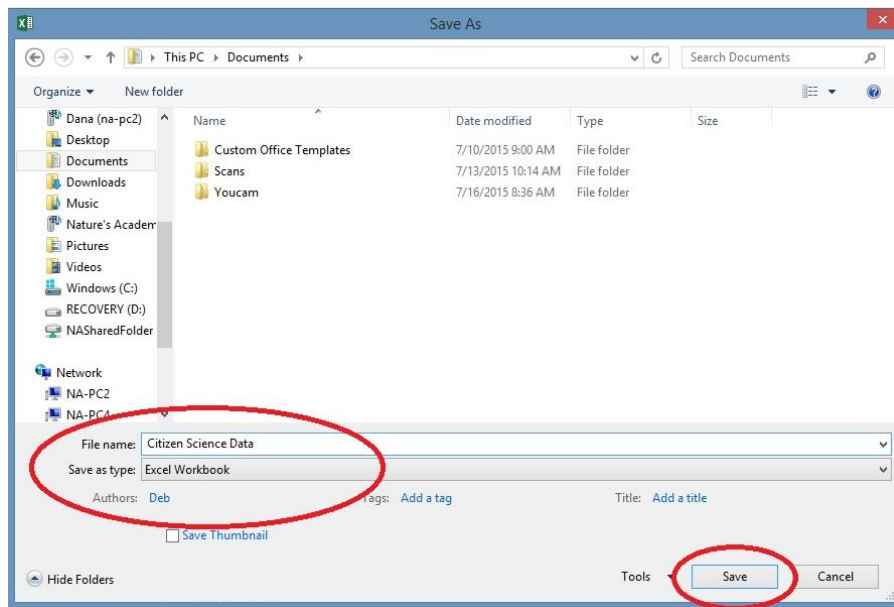
## Resources

### SC.5.L.14.2

- National Geographic resource for students to conduct research about animals:  
<http://kids.nationalgeographic.com/animals/>

## Accessing the Data Set

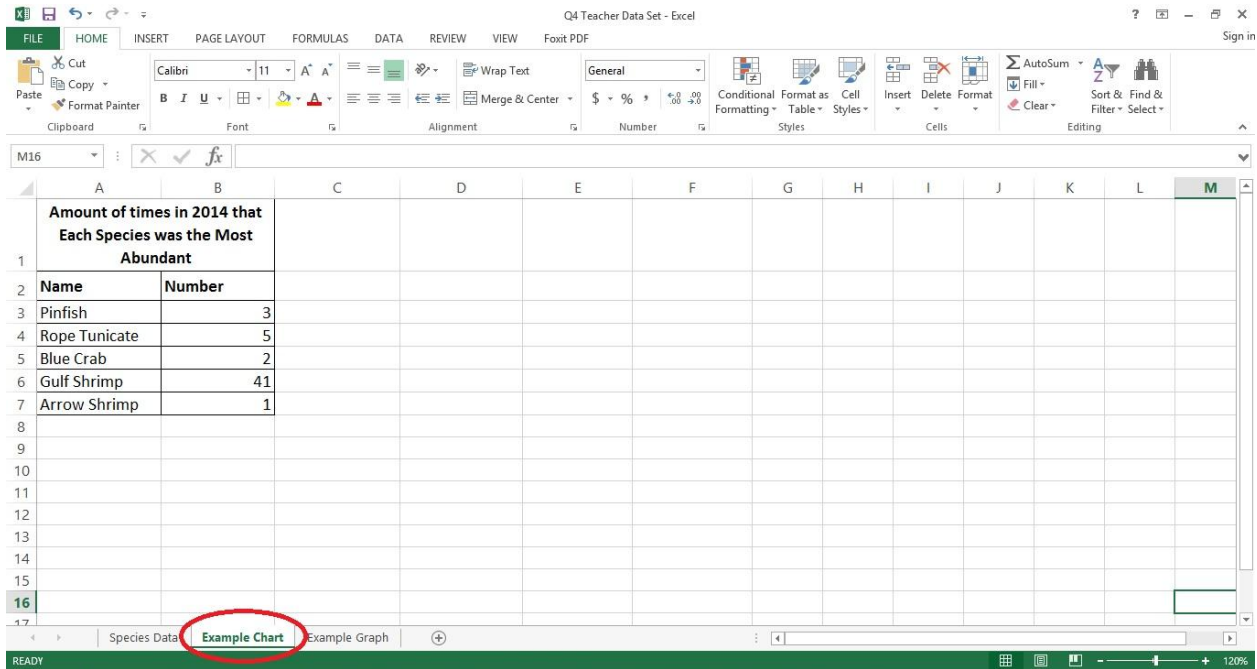
1. Go to our SLP teacher’s resource page at <http://www.naturesacademy.org/science-literacy-project/teacher-resources/>.
2. Scroll down and click on “Quarter 4 Lesson Data Set.”
3. The data should open in an Excel file. To ensure you can properly use the data on your computer, go to “File” and “Save As.” Give the document a title, then under “Save as type,” save the file as an EXCEL document. Hit “Save.”



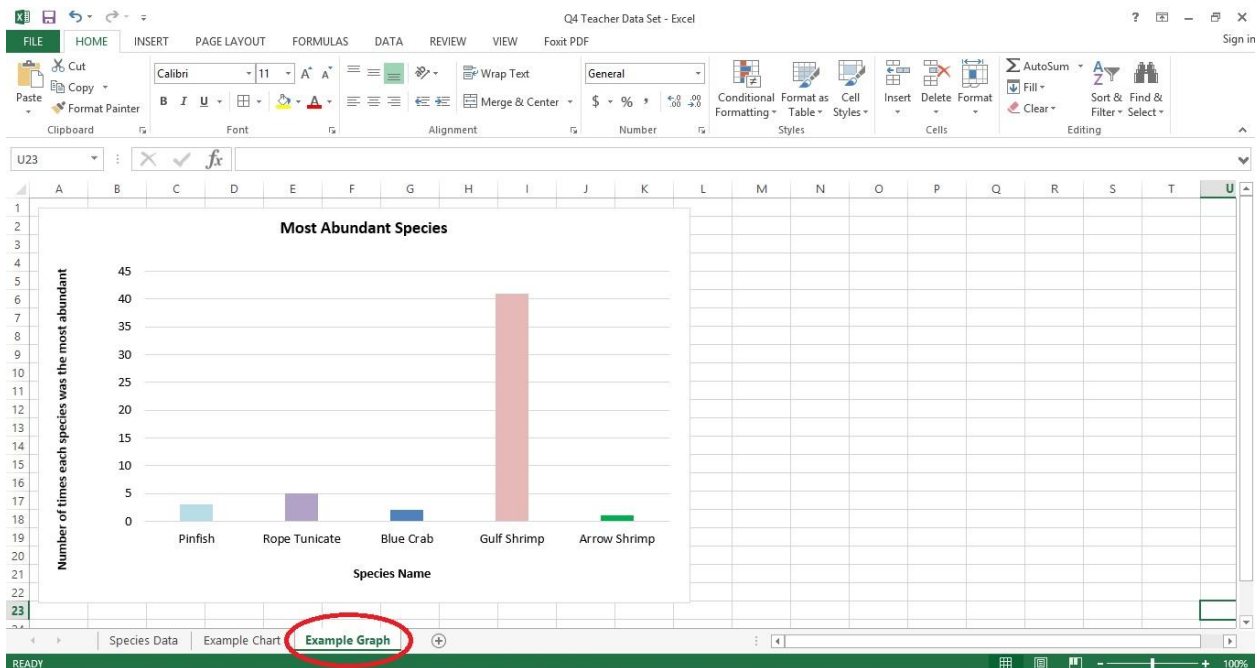
4. Your Excel file should look like the image below. The first sheet titled “Data” lists Location, Date, Time and Most Abundant Species data taken directly from the citizen science database. This information can be used to create a simpler chart and then a corresponding bar graph.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Location	Date	Time	Most abundant species												
2	Coquina Bayside	3/20/2014	9:40:00	Pinfish												
3	Coquina Bayside	3/20/2014	12:30:00	Arrow Shrimp												
4	Coquina Bayside	6/17/2014	11:00:00	Pinfish												
5	Coquina Bayside	6/17/2014	10:30:00	Pinfish												
6	Coquina Bayside	6/18/2014	11:30:00	gulf shrimp												
7	Coquina Bayside	8/7/2014	11:00:00	gulf shrimp												
8	Coquina Bayside	9/15/2014	12:30:00	gulf shrimp												
9	Coquina Bayside	9/15/2014	12:00:00	gulf shrimp												
10	Coquina Bayside	9/16/2014	12:00:00	gulf shrimp												
11	Coquina Bayside	9/16/2014	11:40:00	gulf shrimp												
12	Coquina Bayside	9/18/2014	12:00:00	gulf shrimp												
13	Coquina Bayside	9/25/2014	11:40:00	gulf shrimp												
14	Coquina Bayside	9/26/2014	12:20:00	gulf shrimp												
15	Coquina Bayside	9/26/2014	11:45:00	gulf shrimp												
16	Coquina Bayside	9/26/2014	12:30:00	gulf shrimp												
17	Coquina Bayside	9/29/2014	12:05:00	gulf shrimp												
18	Coquina Bayside	9/29/2014	12:45:00	gulf shrimp												
19	Coquina Bayside	9/30/2014	10:50:00	gulf shrimp												
20	Coquina Bayside	10/1/2014	11:45:00	gulf shrimp												
21	Coquina Bayside	10/1/2014	12:30:00	gulf shrimp												
22	Coquina Bayside	10/2/2014	11:40:00	gulf shrimp												
23	Coquina Bayside	10/6/2014	11:55:00	gulf shrimp												

- The second sheet in this document, called “Example Chart,” lists the data in a form that is easier to use for making bar graphs. Students can create a similar chart from the original data or they can use this chart to make their bar graphs.



- The third sheet, “Example Graph,” provides an example bar graph created from this data. This chart graphs the total number of times that each species was found as the most abundant during the 2014 field trips.



# Build a Data Set

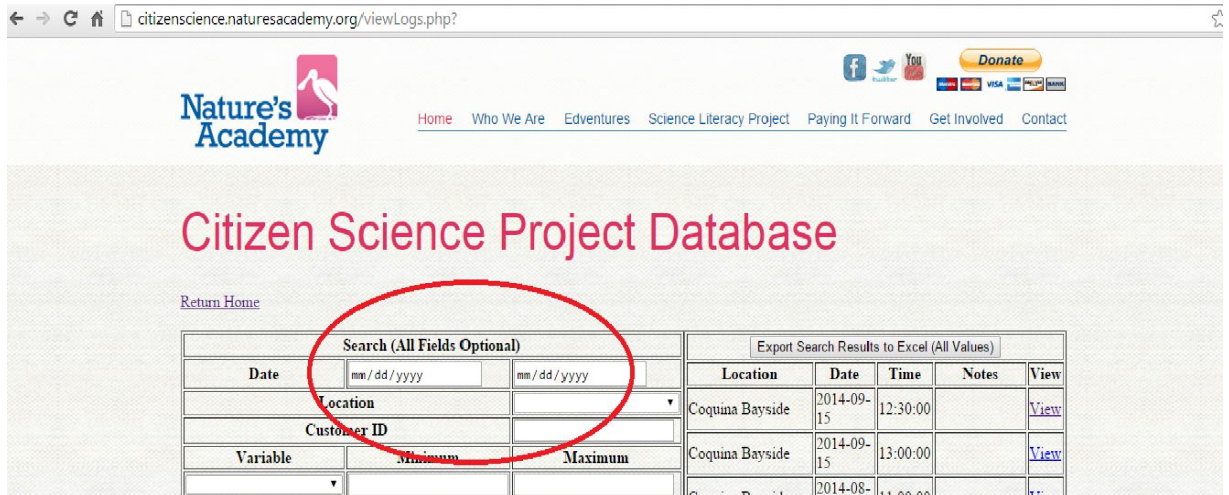
## Accessing Citizen Science Data

### Overview

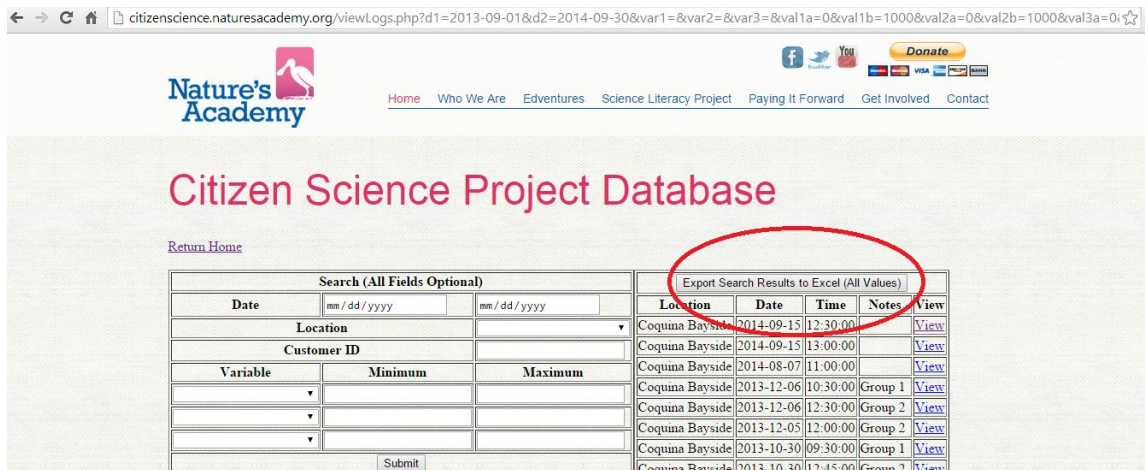
Feeling inspired? You can access the complete Nature’s Academy Citizen Science Database and build your **own** data set and corresponding lesson. These step-by-step directions show you how!

### Instructions for Accessing the Citizen Science Database

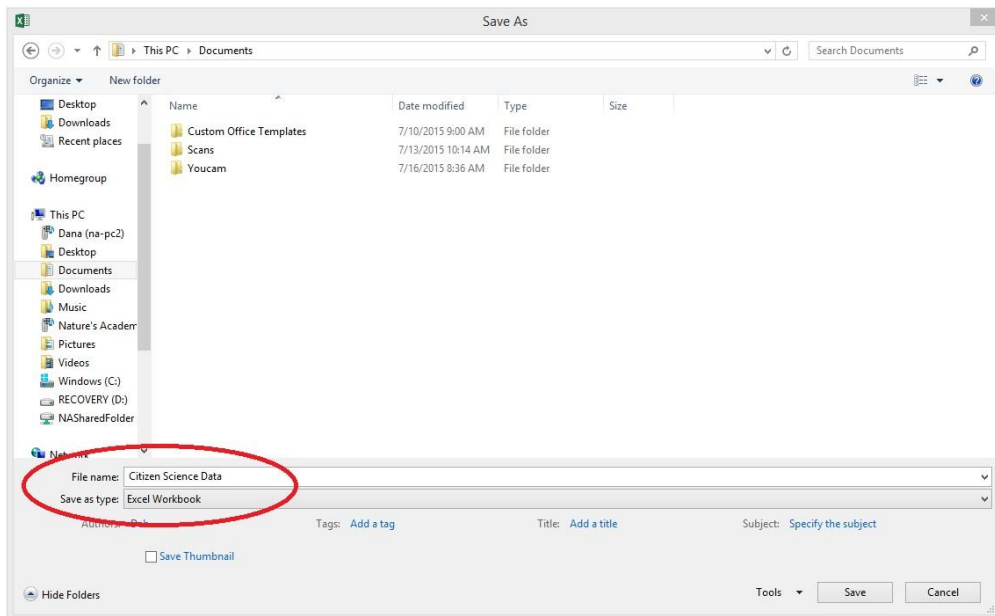
1. Go to the online database at <http://citizenscience.naturesacademy.org/home.php>.
2. Scroll down and click “Go Directly to Database.”
3. Enter desired dates and location for data and click “Submit.”



4. Click “Export Search Results to Excel.”



- The downloaded document should open in Excel. Open it and go to “File” and “Save As.” Give the document a title, then under “Save as type,” save the file as an EXCEL WORKBOOK. Click “Save.”



Now you can use this data to create different graphs and charts and to explore a number of relationships between parameters like temperature, weather, dissolved oxygen, etc.

- Choose data parameters from the Excel spreadsheet. In this example we will use **Water Temperature** and **Date** to see how the temperature changes over time. We will be looking at the water temperature between **March and October 2014 at Coquina Bayside**.
- First, we will sort the Location column to make it easier to find the Coquina Bayside data. Highlight the location column. Click “Sort and Filter” then “A to Z.” If you are asked to expand the selection, click “yes”.

Location	Date	Time	Air Temperature (C)	Wind Speed (mph?)	Wind Direction	Tide	Weather	Water Temperature	Salinity (ppt)	Turbidity (NTU)	pH	Dissolved Oxygen (mg/L)	Nitrates (ppm)	Notes
Fort De Soto East Beach	6/29/2015	9:30:00	31	10	NW	HIGH	PARTLY CLOUDY	NULL	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/28/2015	8:45:00	32	8	SW	HIGH	PARTLY CLOUDY	NULL	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/24/2015	11:30:00	32	9	SW	HIGH	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/19/2015	8:30:00	33	8	N	LOW	PARTLY CLOUDY	NULL	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/17/2015	13:15:00	33	6	W	HIGH	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/15/2015	12:30:00	31.7	4	SW	HIGH	PARTLY CLOUDY	NULL	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/14/2015	8:30:00	27.8	12	SE	HIGH	PARTLY CLOUDY	26.7	28.7	NULL	7.8	8.1	76	
Fort De Soto North Beach	6/12/2015	11:45:00	31	9	SE	LOW	CLOUDY	28.8	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/11/2015	13:30:00	33.7	6	SE	LOW	PARTLY CLOUDY	31.7	27.5	NULL	7.9	8.75	71.3	
Fort De Soto North Beach	6/10/2015	8:30:00	28.8	11	S	HIGH	PARTLY CLOUDY	29.4	29.1	NULL	8.13	7.51	58.1	
Fort De Soto North Beach	6/9/2015	8:30:00	31	6	SW	LOW	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL	
Coquina Bayside	6/8/2015	12:30:00	31	4	W	LOW	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/5/2015	10:50:00	NULL	NULL	NULL	HIGH	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL	
Fort De Soto North Beach	6/4/2015	11:45:00	32	NULL	NULL	HIGH	CLEAR	30	30.2	NULL	7.5	NULL	NULL	
Fort De Soto North Beach	5/29/2015	11:30:00	30.1	NULL	NULL	HIGH	CLEAR	28.8	30.1	NULL	8.83	9.22	37.7	
Fort De Soto North Beach	5/28/2015	23:45:00	29.3	5	E	HIGH	CLEAR	28.9	30.2	NULL	8.27	7.99	NULL	
Fort De Soto North Beach	5/27/2015	15:37:00	33	NULL	NULL	LOW	CLEAR	31.9	36	NULL	NULL	9.69	NULL	
Fort De Soto North Beach	5/22/2015	11:30:00	29.6	NULL	NULL	HIGH	CLEAR	31	35	NULL	8.33	8.29	60.9	
Fort De Soto North Beach	5/15/2015	13:35:00	30.7	8	ESE	LOW	CLEAR	30.7	29	NULL	8.39	9.29	79	
Fort De Soto North Beach	5/15/2015	15:00:00	31.1	8	ESE	LOW	CLEAR	28.9	NULL	NULL	8.29	7.46	78.6	
Fort De Soto North Beach	5/14/2015	13:00:00	31.7	6	NULL	HIGH	CLEAR	28.8	30.5	NULL	8.33	7.47	86	

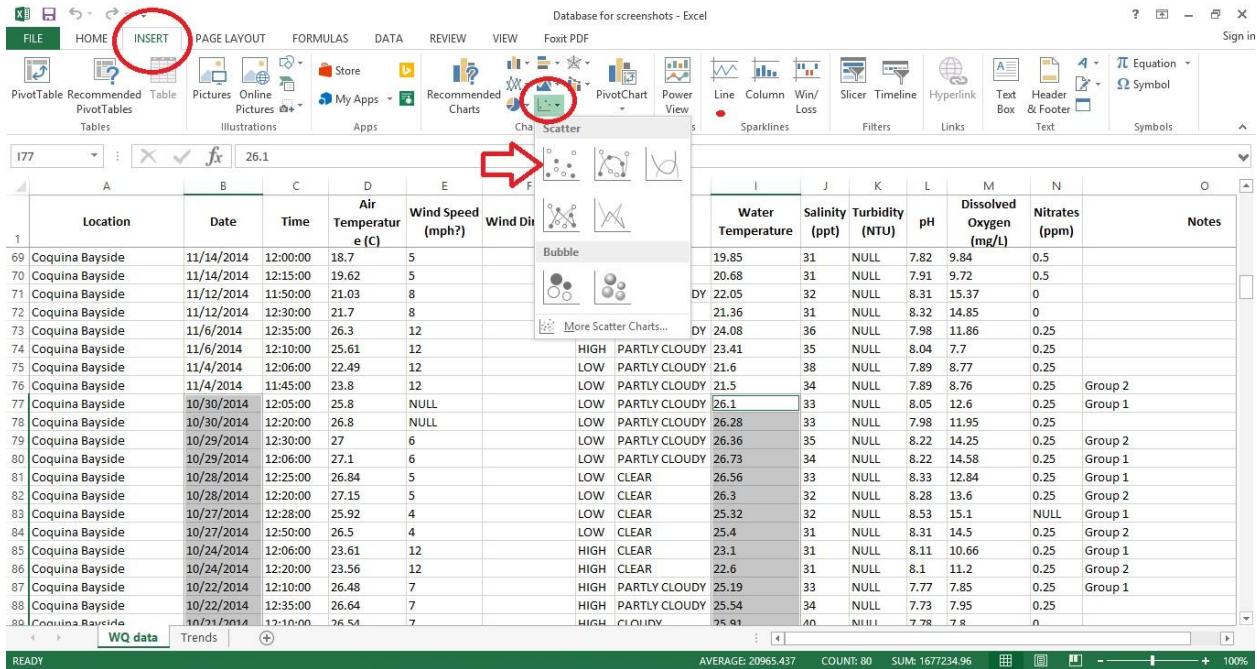
Location	Date	Time	Air Temperature (C)	Wind Speed (mph?)	Wind Direction	Tide	Weather	Water Temperature	Salinity (ppt)	Turbidity (NTU)	pH	Dissolved Oxygen (mg/L)	Nitrates (ppm)
Fort De Soto East Beach	6/29/2015	9:30:00	31	10	NW	HIGH	PARTLY CLOUDY	NULL	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/28/2015	8:45:00	32	8	SW	HIGH	PARTLY CLOUDY	NULL	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/24/2015	11:30:00	32	9	SW	HIGH	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/19/2015	8:30:00	33	8	N	LOW	PARTLY CLOUDY	NULL	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/17/2015	13:15:00	33	6	W	HIGH	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/15/2015	12:30:00	31.7	4	SW	HIGH	PARTLY CLOUDY	NULL	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/14/2015	8:30:00	27.8	12	SE	HIGH	PARTLY CLOUDY	26.7	28.7	NULL	7.8	8.1	76
Fort De Soto North Beach	6/12/2015	11:45:00	31	9	SE	LOW	CLOUDY	28.8	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/11/2015	13:30:00	33.7	6	SE	LOW	PARTLY CLOUDY	31.7	27.5	NULL	7.9	8.75	71.3
Fort De Soto North Beach	6/10/2015	8:30:00	28.8	11	S	HIGH	PARTLY CLOUDY	29.4	29.1	NULL	8.13	7.51	58.1
Fort De Soto North Beach	6/9/2015	8:30:00	31	6	SW	LOW	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL
Coquina Bayside	6/8/2015	12:30:00	31	4	W	LOW	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/5/2015	10:50:00	NULL	NULL		HIGH	CLEAR	NULL	NULL	NULL	NULL	NULL	NULL
Fort De Soto North Beach	6/4/2015	11:45:00	32	NULL		HIGH	CLEAR	30	30.2	NULL	7.5	NULL	NULL
Fort De Soto North Beach	5/29/2015	11:30:00	30.1	NULL		HIGH	CLEAR	28.8	30.1	NULL	8.83	9.22	37.7
Fort De Soto North Beach	5/28/2015	23:45:00	29.3	5	E	HIGH	CLEAR	28.9	30.2	NULL	8.27	7.99	NULL
Fort De Soto North Beach	5/27/2015	15:37:00	33	NULL		LOW	CLEAR	31.9	36	NULL	NULL	9.69	NULL
Fort De Soto North Beach	5/22/2015	11:30:00	29.6	NULL		HIGH	CLEAR	31	35	NULL	8.33	8.29	60.9
Fort De Soto North Beach	5/15/2015	13:35:00	30.7	8	ESE	LOW	CLEAR	30.7	29	NULL	8.39	9.29	79
Fort De Soto North Beach	5/15/2015	15:00:00	31.1	8	ESE	LOW	CLEAR	28.9	NULL	NULL	8.29	7.46	78.6
Fort De Soto North Beach	5/14/2015	13:00:00	31.2	5	NULL	HIGH	CLEAR	28.9	32.5	NULL	8.32	7.42	86

- Next, delete any rows where the word “NULL” appears under the parameters you are exploring. You can click on the row number on the left-hand side to highlight the entire row, then right-click and hit “delete.” In this case, there are no null values for Water Temperature.
- Select the data needed for graphing. In our example, select 10/30/2014 through 3/20/2014 (in Column B), then hold “ctrl” and select the corresponding Water Temperatures (Column I).

Location	Date	Time	Air Temperature (C)	Wind Speed (mph?)	Wind Direction	Tide	Weather	Water Temperature	Salinity (ppt)	Turbidity (NTU)	pH	Dissolved Oxygen (mg/L)	Nitrates (ppm)	Notes
Coquina Bayside	11/4/2014	11:45:00	23.8	12		LOW	PARTLY CLOUDY	21.5	34	NULL	7.89	8.76	0.25	Group 2
Coquina Bayside	10/30/2014	12:05:00	25.8	NULL		LOW	PARTLY CLOUDY	26.1	33	NULL	8.05	12.6	0.25	Group 1
Coquina Bayside	10/30/2014	12:20:00	26.8	NULL		LOW	PARTLY CLOUDY	26.28	33	NULL	7.98	11.95	0.25	
Coquina Bayside	10/29/2014	12:30:00	27	6		LOW	PARTLY CLOUDY	26.36	35	NULL	8.22	14.25	0.25	Group 2
Coquina Bayside	10/29/2014	12:06:00	27.1	6		LOW	PARTLY CLOUDY	26.73	34	NULL	8.22	14.58	0.25	Group 1
Coquina Bayside	10/28/2014	12:25:00	26.84	5		LOW	CLEAR	26.56	33	NULL	8.33	12.84	0.25	Group 1
Coquina Bayside	10/28/2014	12:20:00	27.15	5		LOW	CLEAR	26.3	32	NULL	8.28	13.6	0.25	Group 2
Coquina Bayside	10/27/2014	12:28:00	25.92	4		LOW	CLEAR	25.32	32	NULL	8.53	15.1	NULL	Group 1
Coquina Bayside	10/27/2014	12:50:00	26.5	4		LOW	CLEAR	25.4	31	NULL	8.31	14.5	0.25	Group 2
Coquina Bayside	10/24/2014	12:06:00	23.61	12		HIGH	CLEAR	23.1	31	NULL	8.11	10.66	0.25	Group 1
Coquina Bayside	10/24/2014	12:20:00	23.56	12		HIGH	CLEAR	22.6	31	NULL	8.1	11.2	0.25	Group 2
Coquina Bayside	10/22/2014	12:10:00	26.48	7		HIGH	PARTLY CLOUDY	25.19	33	NULL	7.77	7.85	0.25	Group 1
Coquina Bayside	10/22/2014	12:35:00	26.64	7		HIGH	PARTLY CLOUDY	25.54	34	NULL	7.73	7.95	0.25	
Coquina Bayside	10/21/2014	12:10:00	26.54	7		HIGH	CLOUDY	25.91	40	NULL	7.78	7.8	0	
Coquina Bayside	10/21/2014	12:30:00	26.44	7		HIGH	CLOUDY	25.75	40	NULL	7.79	7.75	0.25	
Coquina Bayside	10/9/2014	11:55:00	28.1	NULL		HIGH	CLEAR	25.4	NULL	NULL	9	28.02	0	Group 1
Coquina Bayside	10/9/2014	12:30:00	28.1	7		HIGH	CLEAR	25.4	NULL	NULL	7.98	28.02	0	Group 2
Coquina Bayside	10/7/2014	11:50:00	28.7	10		HIGH	CLOUDY	27.5	37.3	NULL	7	NULL	NULL	Group 1
Coquina Bayside	10/7/2014	12:40:00	28.8	10		HIGH	CLOUDY	27.7	37.1	NULL	8	NULL	0.25	Group 2
Coquina Bayside	10/6/2014	11:55:00	26.4	10		HIGH	CLEAR	25.1	37.5	NULL	8	7.4	0	Group 1
Coquina Bayside	10/6/2014	12:30:00	27	10		HIGH	CLEAR	25.2	37.2	NULL	7	8.5	0.25	Group 2

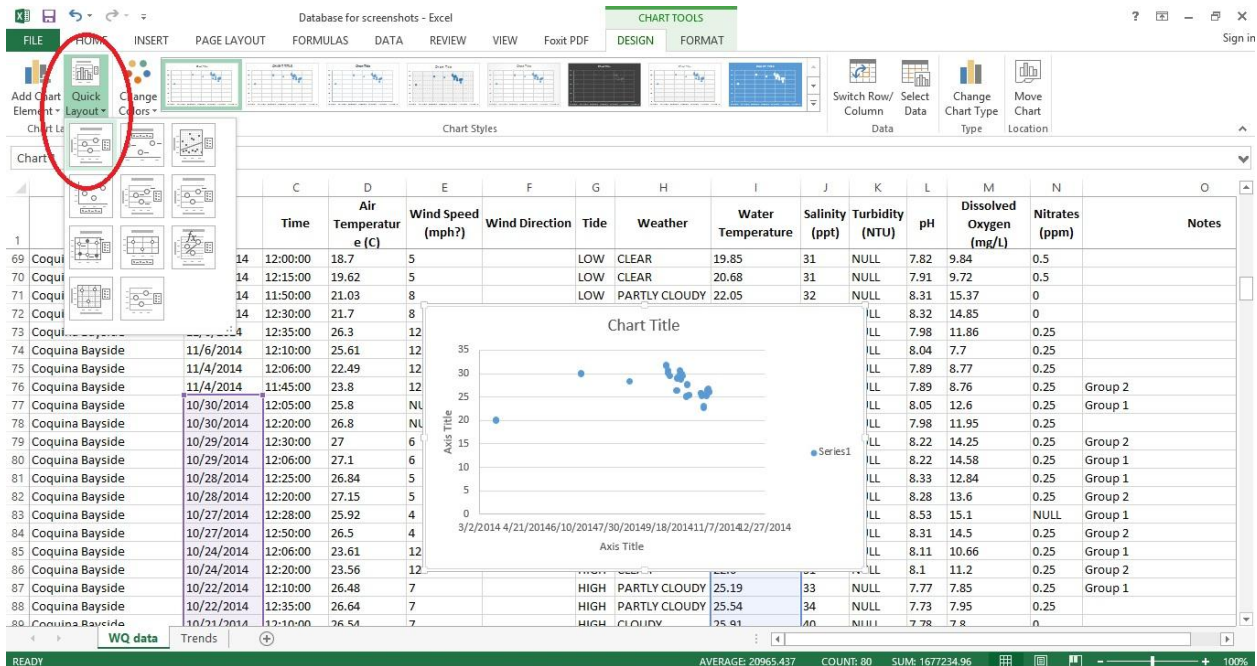


10. On the top menu bar, click “Insert” – “Chart” – “Scatter” – and select “XY Scatter.”

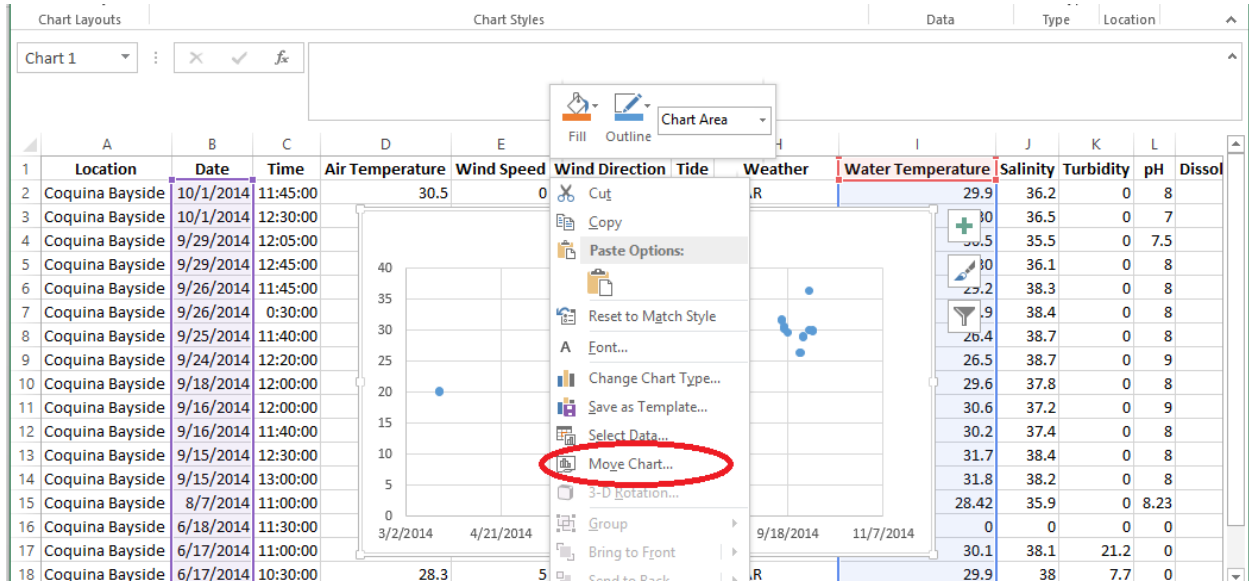


A graph should appear on the spreadsheet. Now it is time to format the graph.

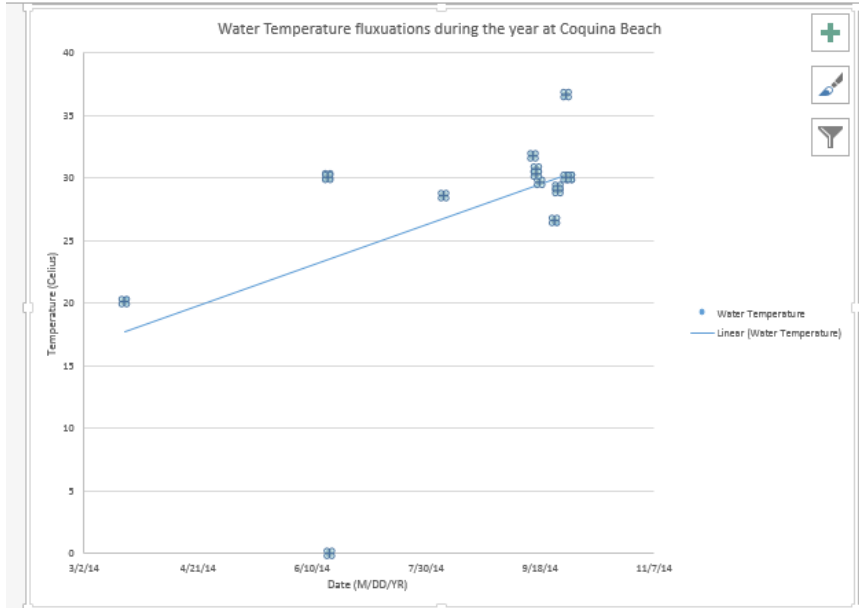
11. Click “Quick Layout” and choose the first option to give your graph a title and to give your axes labels. Label your axes. You can also change the scale on the axes by right-clicking on the axis and going to “Format Axis...”



12. Right click on the outside of the graph, and click Move Chart... and select Move Chart to New Sheet.



13. Now your graph should be on a separate sheet on your excel file. It should appear easier to read without the spreadsheet in the background. Right click on a data point and click "Add Trendline". Your graph should look similar to below:



14. In this graph, we can clearly see an increasing temperature from March to September 2014. Now you can discuss with your students why we see this trend.

15. You can continue to format the text, colors, scale, etc. on this graph.

16. You can use different sets of parameters from the data to create new graphs and explore other relationships that may exist! Let us know what you discover or feel free to reach out for help!