

INTRODUCTION TO MEASUREMENT / INSTRUCTOR INFO

Summary

This lesson includes vocabulary, content, examples, and activities to help students learn how to use both standard and non-standard units of measurement. Students will apply mathematics to problems arising in everyday life and practice measurement using real-life data from the Global Shark Tracker™.

Part 1. Introduction

Part 2. Standard Units of Measurement

Part 3. Non-standard Units of Measurement

Activity 1. Standard Units of Measurement

Activity 2. Non-standard Units of Measurement

Goals & Objectives

The students will:

- Learn about the different types of measurement;
- Identify standard and non-standard units of measurement;
- Be able to explain the importance of measurement in the scientific world;
- And be able to measure shark lengths using standard and non-standard units.

// STANDARDS

This lesson aligns with the following TEKS:

Kindergarten Math: 1A, 1B, 1C, 1E, 1G,

Grade 1 Math: 11A, 11B, 14A, 14B, 15A, 15B

Grade 2 Math: 12A, 12B, 14C, 15A, 15B, 16A, 16B

STEM

This lesson plan aims to assist teachers in implementing a STEM-based program into their classroom while inspiring the next generation of explorers, scientists, and stewards of the ocean. Based on real science and the Global Shark Tracker™, “Introduction to Measurement” is intended to promote environmental awareness and to prepare students for STEM careers.

Helpful Tips

1. The content in this lesson is based on the conservation work of OCEARCH™ and the Global Shark Tracker™. Spend a few minutes getting familiar with the website and the tracker if you have not done so already. The Global Shark Tracker™ is also available as an app for iPhone and Android.
2. This lesson plan is designed to be adaptable to suit your specific needs. Use the entire lesson plan or just parts of it. This material can be expanded to be an entire unit or condensed for just one day in the classroom.
3. Vocabulary words will be underlined as they first appear in the lesson plan. A complete list of vocabulary words is included as well.
4. Answers to questions and prompts for discussions will appear in italics.
5. Optional activities and content (side notes) will appear in a box. Use these to enhance your lesson and adapt it to suit your needs!
6. Have questions for OCEARCH Expedition Leader, Chris Fischer? Email info@OCEARCH.org to schedule a Skype session and let your students/child talk directly to Chris and the OCEARCH crew!
7. Email all questions about this lesson to info@OCEARCH.org.

Vocabulary

Measurement: The assignment of a number to a characteristic of an object or event which can be compared with other objects or events. Measurement is used to find out how long, tall, or big around an object is.

Standard Unit of Measurement: A unit of measurement that is the same for everyone that uses them. (Example: feet, inches, meters, etc.)

Non-standard Unit of Measurement: A unit of measurement that is not common and is unknown outside of local content. (Example: pencils, notebooks, desks, etc.)

ENDANGERED SPECIES / PRE-LESSON ASSESSMENT

Use the following true/false and multiple-choice questions as an introduction/warm-up to the lesson topics. You can do this in a verbal or written format, as a game, individually, or as a whole class! A handout is provided if you wish to hand the questions out in a quiz format.

The questions do not need to be graded. They are intended to give the students an idea of what they will be learning and to see what they already know.

1. True or False

Measurement is used to find out how long, tall, or big around an object is.

Answer: True

2. True or False

Using a pencil box is a standard unit of measurement.

Answer: False

3. Which of the following is a non-standard unit of measurement?

- a. Textbook
- b. Feet
- c. Inches
- d. Meters

Answer: a

4. Why do scientists aboard the OCEARCH research vessel use measurement?

- a. Find the length of a shark
- b. Find the distance a shark has traveled
- c. Find the weight of a shark
- d. All of the above!

Answer: d

5. It is important to use _____ units of measurement in science because they are always the same for everyone.

- a. Imaginary
- b. Non-standard
- c. Standard
- d. Guessed

Answer: c

Name: _____

Date: _____

Introduction to Measurement

Select the correct answer to each of the following questions.

1. True or False Measurement is used to find out how long, tall, or big around an object is.
2. True or False Using a pencil box is a standard unit of measurement.
3. Which of the following is a non-standard unit of measurement?
 - a. Textbook
 - b. Feet
 - c. Inches
 - d. Meters
4. Why do scientists aboard the OCEARCH research vessel use measurement?
 - a. Find the length of a shark
 - b. Find the distance a shark has traveled
 - c. Find the weight of a shark
 - d. All of the above!
5. It is important to use _____ units of measurement in science because they are always the same for everyone.
 - a. Imaginary
 - b. Non-standard
 - c. Standard
 - d. Guessed

INTRODUCTION TO MEASUREMENT / LESSON PLAN

PART 1. INTRODUCTION TO MEASUREMENT 3-5 mins

Measurement is used to describe an object or event so that it can then be compared to other objects or events. Scientists use measurement to describe the length, width, weight, distance, or capacity of different things.

Ask the students what they would use to measure the length of an object, like their notebooks, pencil boxes, or desk. Record several students' answers on the board.

There are two basic ways to measure an object: using either standard units of measurement or non-standard units of measurement. Standard units of measurement (Example: inches, feet, etc.) are the same for everybody. Non-standard units of measurement (Example: finger length) can be different for each person and unknown outside of local context.

Ask the students which type of measurement unit scientists would most likely use.

PART 2. STANDARD UNITS OF MEASUREMENT 10-15 mins

Scientists aboard the M/V OCEARCH use standard units of measurement such as feet, inches, and miles to record the length, girth, and weight of a shark or to measure how far a shark has traveled. It is important to use standard units of measurement in science so that all people, no matter who they are or where they are, can use and understand the information recorded by the scientists. If scientists used non-standard units of measurement, there could be confusion about how long, wide, or heavy a shark is or how far the shark is traveling.

Scientists can gather important information by taking measurements of the sharks tagged by OCEARCH. They can tell how old the shark is, whether the shark is male or female, if a female is about to have pups or not, and whether the shark is healthy. Measurement is also used to find out how far the sharks are swimming and how long it takes to travel those distances.

Ask the students to measure the length of their math books using their ruler to describe the length of the book. Record several students' findings on the board.

Are all of the answers for measuring the math book the same? *Discuss with the students, why or why not?*

PART 3. NON-STANDARD UNITS OF MEASUREMENT 10-15 mins

Scientists can gather important information by taking measurements of the sharks tagged by OCEARCH. They can tell how old the shark is, whether the shark is male or female, if a female is about to have pups or not, and whether the shark is healthy. Measurement is also used to find out how far the sharks are swimming and how long it takes to travel those distances.

Non-standard units of measurement are units that have been invented and are generally unknown outside of local context. Typically, non-standard units of measurement are used to create a measurement that may be loosely understood. An example of a non-standard unit of measurement would be using car-lengths to measure a distance. A car-length is non-standard unit of measurement because cars come in all different sizes. A car length for one person may not be the same for another.

Ask the students what kinds of non-standard units of measurement could be used to measure their desks. Record several students' answers on the board.

Ask the students to use the length of their hands to measure the desk. Record several students' answers on the board.

Are all of the answers for measuring the desk the same? *Discuss why or why not?*

If the scientists aboard the M/V OCEARCH used non-standard units of measurement to measure sharks, there could be confusion about how long, wide, or heavy a shark is. Standardized and accurate information is important for scientists, especially when comparing data between multiple sharks.

ACTIVITY 1. STANDARD UNITS OF MEASUREMENT 20-30 mins

Scientists can gather important information by taking measurements of the sharks tagged by OCEARCH. They can tell how old the shark is, whether the shark is male or female, if a female is about to have pups or not, and whether the shark is healthy. Measurement is also used to find out how far the sharks are swimming and how long it takes to travel those distances.

Introduction

This activity provides an excellent opportunity for students to develop skills using both standard and non-standard units of measurement. Using real-life data from the OCEARCH Global Shark Tracker™, students will use standardized units of measurement to create a visual representation of an assigned shark. Students should record their observations in their notebooks or on the provided worksheet. Students will also learn to work in groups as a “research team” just like the scientists aboard the M/V OCEARCH!

Materials

- Computer(s) with internet access
- Pencil
- String of any color

- Scissors
- Measuring tape or ruler
- Tape (optional)
- Journal or paper to record observations
- Optional worksheet (provided)

Instructions

1. This activity is designed to be a group activity with about five students in each group.
2. Explain that while on the OCEARCH research vessel, everyone has to know what their job is in order to help the team to be successful and complete tasks.
 - a. Assign two students in the group to be taskmasters – the students who hold the measuring tape and measure the length of the string to cut.
 - b. Assign another student within the group to be the presenter. This student will tell the class about their shark and how long it is.
 - c. The group leader will explain the instructions and help other group members if needed.
 - d. The checker is the student who will look over the worksheets or notebooks and speak respectfully to a student if any answer needs to be corrected.
3. Use the Global Shark Tracker™ to select five or six sharks for the students to use in this activity (each group will be assigned one shark from that list).
 - a. You can choose to use only one shark species in order to compare different lengths based on age and gender.
 - Example of using all great white sharks:
 - Katharine (14ft 2in)
 - Genie (14ft 8in)
 - Philip (10ft 5in)
 - Riley (10ft 3in)
 - Courage (12ft 6in)
 - b. You can use multiple species of sharks to compare sizes of sharks in general.
 - Example of using different species of sharks:
 - Lampaio (8ft 3in)
 - Bonac (9ft 8in)
 - Wyatt (7ft 2in)
 - Mary Lee (16ft)
 - Pablo (5ft)
4. Explain the activity to the students.
 - a. Students will measure out the length of string and cut it to be the same length as their assigned shark.
 - b. Remind students to hold the end of the string at the 0 mark on the measuring tape for accurate measurements.
 - c. After cutting the string, students will tape the length of string to the floor of the classroom.
 - d. Students will then measure the string in inches, centimeters, and meters.
5. After completing their measurements and worksheets, each group presenter will present their findings to the class.
6. Collect the worksheets to assess the students' comprehension of the lesson.
7. Keep the measured strings for Activity 2. Non-standard Units of Measurement.

Activity 1. Standard Units of Measurement

Name: _____

Date: _____

You and your group will be measuring the length of an OCEARCH shark!

Standardized and accurate information is important for scientists, especially when comparing data between multiple sharks.

1. What is the name of your shark?
2. What species of shark is your shark?
3. What will you be using to measure your shark?
4. My shark is _____ feet _____ inches long!
5. My shark is _____ centimeters long!
6. My shark is _____ meters long!

ACTIVITY 2. NON-STANDARD

UNITS OF MEASUREMENT 10-20 mins

Introduction

In this activity, students will use the pre-measured strings from Activity 1. Standard Units of Measurement to measure their sharks in non-standard units of measurement. The students should work in the same groups as before. Students will gain skills and knowledge in using non-standard units of measurement to collect data. Students will become critical thinkers when asked why non-standard units of measurement should not be used in science.

Materials

- Pre-measured strings representing shark lengths
- Pencils
- Textbooks
- Non-standard Units of Measurement worksheet (provided)

Instructions

1. Students should return to their groups from the previous lesson. If assigning new groups, remind the students that scientists aboard the M/V OCEARCH must know what their job is in order for the team to be successful and complete tasks.
 - a. Assign two students in the group to be **taskmasters** – the students who hold the measuring tape and measure the length of the string to cut.
 - b. Assign another student within the group to be the **presenter**. This student will tell the class about their shark and how long it is.
 - c. The **group leader** will explain the instructions and help other group members if needed.
 - d. The **checker** is the student who will look over the worksheets or notebooks and speak respectfully to a student if any answer needs to be corrected.
2. Once situated in their groups, students will complete the task and worksheet.
 - a. Students will use non-standard units of measurement (textbooks, hands, arms, students, and teachers) to measure the length of their shark (the same shark as Activity 1).
 - b. Students may again tape the string to the floor to allow for easier and more accurate measurement.
3. After completing the task, presenters should take turns talking about the length of their shark in terms of textbooks, hands, arms, students, and teachers.
4. Collect the worksheets to assess the students' comprehension of the lesson.

Activity 2. Non-standard Units of Measurement

Name: _____

Date: _____

Answer the questions below using non-standard units to measure your shark.

1. What is the name of your shark?
2. What species of shark is your shark?
3. How many textbooks long is your shark? _____ Textbooks long
4. How many hands long is your shark? _____ Hands long
5. How many students long is your shark ? _____ Students long
6. How many teachers long is your shark? _____ Teachers long
7. How many arms long is your shark? _____ Arms long
8. Would your answer be different if you used a teacher's hand to measure instead of a student's hand?
9. Why would a shark scientists NOT want to use non-standard units of measurement?