

HOW MUCH WATER WOULD WOOD ABSORB IF WOOD WOULD ABSORB WATER?

LESSON 2: COMPARING WATER ABSORPTION

INTRODUCTION

Composite materials are engineered or naturally occurring materials made from two or more materials with significantly different physical or chemical properties that remain separate and distinct in the composite material. Wood is a composite material used in aircraft. Students will collect dimensions and weight on the wood samples before and after immersion in water. Half of the wood samples will be painted to emulate protective coatings used in building aircraft. Students will use the class data from Lesson 1: Percent Change to determine if painting the wood has an effect on water absorption.

LEARNING OUTCOMES

- Students will graph the class percent change data for the painted and unpainted wood samples using a dot plot.
- Students will draw informal comparative inferences about the painted versus unpainted wood samples based on the dot plot.

CURRICULUM ALIGNMENT

COMMON CORE STANDARDS – 7TH GRADE MATHEMATICS

Math 7.SP Statistics and Probability

Draw informal comparative inferences about two populations.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

CLASSROOM TIME REQUIRED

One 55-minute class

TEACHER PREPARATION

This activity uses the class data set from Lesson 1: Percent Change.

MATERIALS NEEDED

- Calculators
- Graph paper – $\frac{1}{4}$ inch
- Hand-outs: Class Data: Comparing Water Absorption

TECHNOLOGY RESOURCES

Students will need calculators.

A document camera can be used to share student work during the Guided Practice.

PRE-ACTIVITIES FOR STUDENTS

Students will need to be able to represent data in multiple ways such as dot plot, scatterplot, histogram, and a table.

ACTIVITIES

MODEL SYSTEM

Students will use the data set from Lesson 1: Percent Change.

- Give graph paper and a copy of the class data set to each pair of students.
- Working in pairs, tell students to use the class data set to create a dot plot of the percent change in weight of the painted wood samples.
- Ask students what scale and interval they should use for the dot plot. The provided class data set has values from 9% to 40%. The class should decide to use a scale of 0 to 40 with an interval of ones or fives depending on space. See file *Percent Change Dot Plot*.
- Use a solid dot to represent the data points for painted samples. There are 15 data points for the painted samples in the provided data set.
- Have students use the first dot plot to guide them in plotting the percent change in weight of the unpainted wood samples. Have them start the second dot plot several lines (about 2 inches) above the first set of data.
- Use an open circle to represent the data points for unpainted samples. There are 15 data points for the unpainted samples in the provided data set.
- Remind students to give their dot plot a title and key.
- When all students have finished, have several student pairs share their dot plots.

CONTENT WRAP-UP:

Lead a class discussion about the dot plot. Ask students to describe the dot plot. Observations should include similar spread of both painted and unpainted samples. They may also notice that the percent weight change for the unpainted samples is higher than for the painted samples. Ask students if they think a difference between the percent changes in weight between the painted or unpainted wood samples exist and why. Answers should include noticing that most of the unpainted samples have a higher percent change in weight than the painted samples. Ask students if other methods can be used to make comparisons. Answers might include comparing the measures of center (mean, median) and measures of variability (mean absolute deviation) of the data.

GUIDED PRACTICE

- Using the class data set, have students work independently to create dot plots to compare the dry weight to the wet weight for the *painted* samples.
- When the students finish, ask them to share their dot plots.
- Ask students what they can infer from their dot plots. Answers should include the wet weights are higher due to water absorption.
- Using the class data set, have students create dot plots to compare the dry weight to the wet weight for the *unpainted* samples.
- When the students finish, ask them to share their dot plots.
- Ask students what they think can infer from their dot plots. Answers should include the wet weights are higher due to water absorption.

ASSESSMENT

Administer the Lesson 2 Assessment as a quiz at the end of the lesson.

MODIFICATIONS

Teachers can modify the data set to include fewer points for special needs students. They can also provide students with a number line already drawn and labeled.

CRITICAL VOCABULARY

Dot plot: a set of data using dots over a number line.

WEBSITES AND RESOURCES

Water immersion effect on swelling and compression properties of Eco-Core, PVC foam and balsa wood

<http://www.sciencedirect.com/science/article/pii/S0263822309000919>

Putting it together – the science and technology of composite materials.

<http://www.science.org.au/nova/059/059key.htm>

SUPPLEMENTAL INFORMATION

Originally, the US military sought out balsa wood as a substitute for cork during World War I, but it soon proved more useful as a lightweight construction material for gliders and shipping containers. Hobbyists also began to work with balsa wood because it could be carved easily with standard woodworking tools and bent into a number of shapes without sacrificing strength.

AUTHOR INFO

Carol L. Taylor is a 7th grade math teacher currently at Hanes Magnet School, Winston-Salem/Forsyth County Schools. She has over ten years of classroom experience as well as several years working as a Biostatistician for Wake Forest School of Medicine. Mrs. Taylor has a Bachelor of Science degree in Mathematics from Miami University (OH) and a Master's of Applied Statistics degree from Ohio State University. She is a National Board Certified Teacher, Kenan Fellow, and a recipient of the 2009 Edyth Sliffe Award for Excellence in Middle School Mathematics Teaching.

As part of her Kenan Fellowship, Mrs. Taylor worked at the NASA Center for Aviation Safety in the Center for composite Materials Research, Department of Mechanical Engineering at North Carolina A&T University. Her mentors were Kunigal N. Shivakumar, Ph.D., Director and Research Professor, and Robert Sadler, Adjunct Research Associate Professor.

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