Career Academy Teacher Externship Program

Pipe Bender: Lesson on Measurement

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District:
Marinette School District, Marinette, WI

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Overview:

The Pipe Bender lesson allows students to review measurement. In speaking with those in working in the shipyard, they emphasized the important skills of measurement, system of measurement conversion, and diagram reading.

Featured Externship Business:

Fincantieri Marinette Marine

Subject:

Mathematics

Grade Level:

Various: CCSS indicate measurement skills in grades 3-5 and unit conversion in grade 6, but this activity could be used as a review or team building activity in later grades.

Learning objectives:

After doing this activity, students should be able to:

- Measure segments in imperial and metric
- Measure angles in degrees
- Communicate with peers effectively

Workplace Readiness Skill:

- ❏ X Social Skills
- ❏ X Teamwork
- ❏ Attitude and Initiative
- ❏ Professionalism
- ❏ X Communication
- ❏ Critical Thinking
- ❏ Planning and Organization
- ❏ Media Etiquette

Type of Activity:

- ❏ Individual
- ❏ X Small Group
- ❏ Whole Class

Common Core Math Standards:

CCSS.MATH.CONTENT.3.MD.B.4

Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

CCSS.MATH.CONTENT.4.MD.C.6

Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

CCSS.MATH.CONTENT.5.MD.A.1

Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

CCSS.MATH.CONTENT.6.RP.A.3

Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

Model Academic Standards for School Counseling:

Content Standard C: Students will understand the relationship of academics to the world of work, and to life at home and in the community.

- Core Performance Standard 1: Understand how to relate school to life experiences.

Time: 1 class period -
Introductory Activity: 5-10 minutes
Activity: 20 minutes
Wrap-up: 5-10 minutes

Materials:

- Ruler
- Protractor
- Activity Sheets
- Scissors
- Pipe Cleaners

Directions:

1. Assign students to elbow partners.

Introductory Activity

2. Pose the following questions to groups:
    a. Draw a segment of length 3 1/4 inches.
    b. Draw a segment of length 68 mm.
    c. Draw an angle of 35°, and an angle measuring 127°

d. Use elbow partners to check work and have students come to a consensus.
e. Follow up Questions:
    i. How could these lengths have otherwise have been communicated? (Ex. 68mm = 6.8cm= 2 5/8 inches approximately.)
    ii. Have students clarify how they know which set of numbers to use on the protractor.

3. Assign one partner to be the diagram reader and the other partner to be the pipe bender. (Task Division Strategies: Birthdate earliest in the year, big foot/small foot,...)
    a. The diagram reader is responsible for going to the front of the classroom and gathering information from the design. The student will need a protractor and ruler. The diagram reader is not allowed to touch the pipe cleaner or write anything down.
    b. The pipe bender is responsible for constructing the design out of the pipe cleaner. The student will need a pipe cleaner, protractor, ruler, and scissors. The pipe bender is not allowed to see the design paper.
    c. The diagram reader is to go to the front of the classroom, take measurements, and communicate to the pipe bender to replicate the design. On the first design all measurements are to be made in inches.
    d. After completing the first design, roles switch and the second design is made. On the second design the metric system is to be used.
    e. EMPHASIZE communication with precise measurement. Example: 2 5/8 inches not 2 and so many tick marks.

Wrap-Up:

- Have students check their designs. Look for any inconsistencies.
- Discuss any inconsistencies.
- Lead a discussion to debrief on the communication skills. What worked well? What did you learn to improve on?

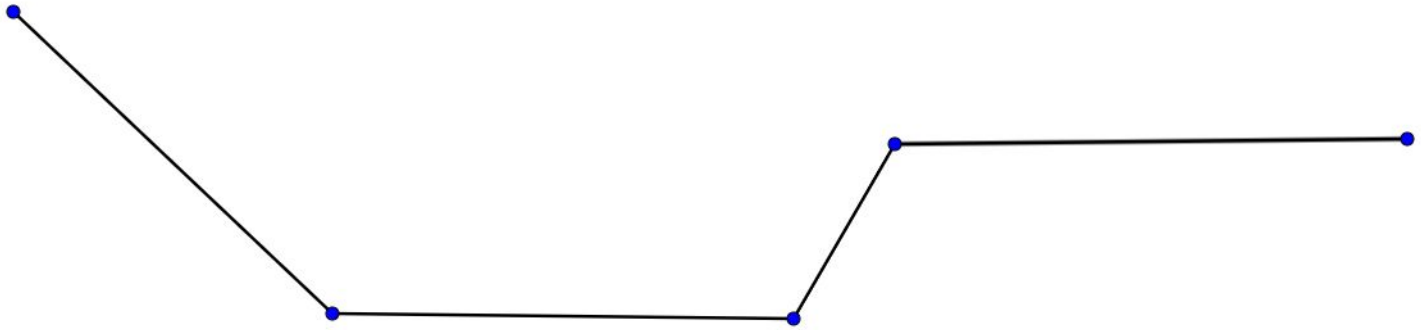
Extension Activity:

- The diagram reader could be required to measure in the metric system and the pipe bender measure in the imperial system. (Or vice versa) This would encompass the sixth grade standard of unit conversion.

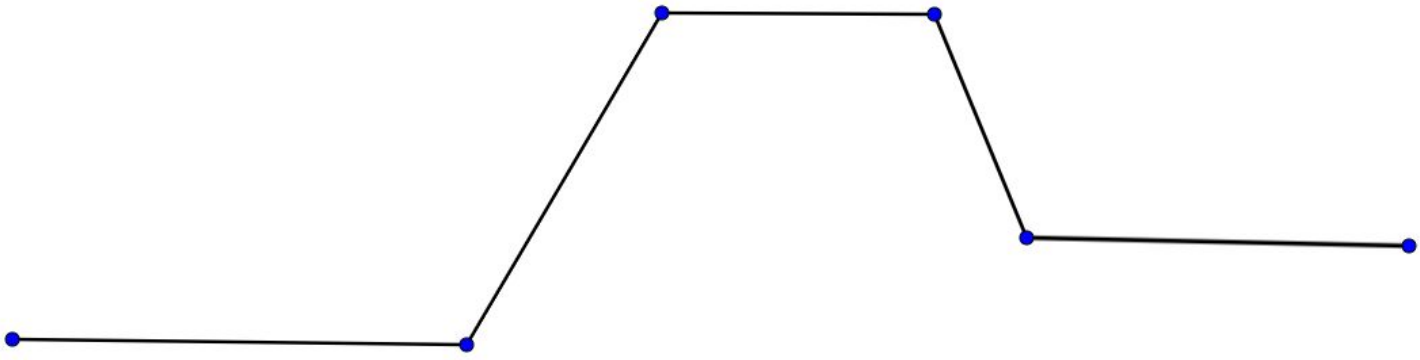
- For older students, a 3-D model could be pre-constructed by the teacher for students to replicate. Adding a third dimension will require a different level of measurement and communication.

Pipe Bender

DESIGN 1
Measure in inches.



DESIGN 2
Measure using the metric system.



DESIGNS DRAWN USING GEOGEBRA