

MEASUREMENT LAB

Subject area: Mathematics

Grade Levels: 7 -12

Nov. 23, 2009

Lesson Overview:

I developed this lesson while participating in an externship program sponsored by the Sacramento-Yolo Technical Education Partnership. The idea is experience firsthand what people do in the building and energy trades by partnering with a company for a week and observing what goes on. My experience was with Granite Construction working on a road repaving job on Interstate 80 in the Sierra foothills. While observing and talking with the engineers, foremen, equipment operators and others, I came away with large appreciation for the amount of math required for something that sounds relatively simple - repaving a road. My experience inspired me to develop some lessons related to what I experienced - the first concerning measurement.

“Hybrid Measurement”

While with a crew, I discovered that they use what I call a hybrid tape measure. The tape is divided into feet, but each foot is divided into tenths and hundredths instead of 16 fractions of an inch(scan of tape doc). After helping the guys take several dozen measurements, it became clear why. Its easier! From this sprang the lesson idea: have kids measure real objects using both systems of measurement and find out which they preferred and were more accurate with.

Learning Objectives For The Students:

My operating premise was to give the kids a taste of the types of skill sets needed in the construction industry. Keeping that in mind, I had them:

1. Working with their hands by making their own hybrid yardstick and 20 foot string measure.
2. Accurately measuring objects both with hybrid and standard measurement units.
3. Utilizing teamwork to problem solve difficult measurement problems.
4. Work outdoors to experience its pleasures.

DAY ONE:

I introduced the lesson with the information above and an overhead transparency

summarizing what they were about to undertake(Measurement Lab doc).

1. Measuring Devices:

Demonstrate or explain how to make the yardstick.. You will need a 37" stick, glue and 3 copies of the tape document for each group. I put three to a group. I cut the sticks from a 3/8 inch thick 4 foot by 8 foot sheet of press board from a building supply store(you could substitute cardboard for the wooden sticks). Have them cut out the copies and glue them to the stick, end to end(yardstick photo).

Demonstrate or explain the string measure. Precut 25 foot lengths of string. Supply them 25 foot tape measure(s) that are stretched out to about 21 feet and locked. Have them stretch out and pull the string taught at either end of the tape measure. The third member then makes a mark every foot with an overhead pen. If you can, precut a stick with a hole drilled in it to use as a storage device(string measure photo).

2. Measurement Standard:

Find an object all groups can measure quickly - I used my Algebra texts. You measure it first and post the correct length and width on the board. Then have them measure it to check if their measurement skills are up to the task ahead. Reteach as needed.

3. Measure Objects and Record:

Find several objects in the room of varying lengths and widths to measure. Have them use both sides of the ruler to record their results in both standard feet, inch and fractional inches and the hybrid scale based on feet, tenths, and hundredths. Try to make some of the measurements relatively easy and others more difficult. See the data sheet doc. for examples. You might offer prizes for the group who are most accurate.

DAY TWO:

Take the kids outside and have them measure big objects not appropriate for the yardstick, but for the string measure. I had them measure parts of a tennis court and basketball court. Extra credit was a light pole. Use your imagination - they could measure almost anything. Make sure some of the measurements are longer than the twenty foot maximum of the string measure. Again, have them record their results on a data sheet.

DAY THREE:

Discussion of results. What did they learn? What was easiest and hardest to measure? Which measurement scale was easier? Check their results against your own and find out which scale they were more accurate with. Which device they built was probably more accurate? Were teams really needed? How important was working with their hands? Relate the skills they needed to skills required in the construction trades such as carpentry,

plumbing, or steel workers.

Further broaden the discussion to include engineering, architecture, green energy and related fields.

FUTURE LESSONS:

Build on their measurement skills and have them calculate area, surface area and volume of objects large and small, inside the classroom and out. Building heights could incorporate proportional math with shadows or trigonometry. Be creative!

Lesson developed by:

Clint Bodene
Rosemont High School
Sacramento City Unified
clintbo@sac-city.k12.ca.us