Unit 3 Measurement and Statistics Lesson Plan

COURSE:
Introduction to Engineering Design (Honors)

TEACHER:
Jason D. Redd

DURATION:
15 Days

STANDARDS:
This course

Understandings

Students will understand that:

- Error is unavoidable when measuring physical properties, and a measurement is characterized by the precision and accuracy of the measurement.
- Units and quantitative reasoning can guide mathematical manipulation and the solution of problems involving quantities.
- Dimensions are included on technical drawings according to accepted practice and an established set of standards so as to convey size and location information about detailed parts and their features.
- Statistical analysis of uni-variate data facilitates understanding and interpretation of numerical data and can be used to inform, justify, and validate a design or process.
- Spreadsheet programs can be used to store, manipulate, represent, and analyze data efficiently.

Knowledge and Skills

Knowledge: Students will:

- Identify general rules for dimensioning on technical drawings used in standard engineering practice.
- Distinguish between sample statistics and population statistics and know appropriate applications of each.
- Distinguish between precision and accuracy of measurement.

Skills: Students will:

- Measure linear distances (including length, inside diameter, and hole depth) with accuracy using a scale, ruler, or dial caliper and report the measurement using an appropriate level of precision.
- Use units to guide the solution to multi-step problems through dimensional analysis and choose and interpret units consistently in formulas.
- Convert quantities between units in the SI and the US Customary measurement systems.
- Convert between different units within the same measurement system including the SI and US Customary measurement systems.
- Dimension orthographic projections of simple objects or parts according to a set of dimensioning standards and accepted practices.
- Identify and correct errors and omissions in the dimensions applied in a technical drawing based on accepted practice and a set of dimensioning rules.
- Calculate statistics related to central tendency including mean, median, and mode.
- Calculate statistics related to variation of data including (sample and population) standard deviation and range.
- Represent data with plots on the real number line (e.g., dot plots, histograms, and box plots).
- Use statistics to quantify information, support design decisions, and justify problem solutions.
- Use a spreadsheet program to store and manipulate raw data.
- Use a spreadsheet program to perform calculations using formulas.
- Use a spreadsheet program to create and display a histogram to represent a set of data.
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ESSENTIAL QUESTIONS:

Students will keep considering:

- Can statistics be interpreted to justify conflicting viewpoints? Can this affect how we use statistics to inform, justify and validate a problem solution?
- Why is error unavoidable when making a measurement?
- When recording measurement data, why is the use of significant figures important?
- What strategy would you use to teach another student how to use units and quantitative reasoning to solve a problem involving quantities?
- What would happen if engineers did not follow accepted dimensioning standards and guidelines but, instead, used their own individual dimensioning methods?
- When measuring the length of a part, would an inaccurate (but precise) measuring instrument be more or less likely to indicate the actual measurement than an imprecise (but accurate) measuring instrument? Justify your answer.

EQUIPMENT / MATERIALS / RESItrummC(NT /)3TETQq0reW*nB/F2Tf1 0 0 1 8Tm0 0 0 rg0 0 RG[(E)2]QUETQ EM

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- Assess student presentations/work.
- Provide instructions for the *Unit 3 Test*.

Guided Practice

The teacher will:

- Review agenda, learning objectives, and essential questions daily.
- Lead students to recall prior knowledge / e