Core Concept: Measurement & Precision

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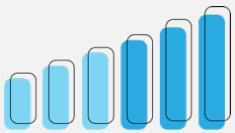
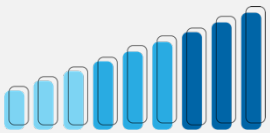
Engineering Literacy Dimension: Engineering Practices
Practice: Material Processing
Overview: *Measurement* is the process of comparing the qualities of an object, such as size, shape, or volume, to an established standard in order to describe, analyze, or plan to modify the object. *Precision* in measurement includes the determination of the tolerances and dimensional controls necessary for the quality production of products. Accordingly, this core concept includes knowledge related to the appropriate application of (a) *measurement tools and instruments (including linear, diameter, and angle measuring devices as well as indirect-reading/automated instruments),* (b) *performing precise measurements for the accurate layout of a production process*, and (c) *ensuring accuracy through appropriate unit analysis and engineering notation*. This core concept is important to the practice of Material Processing as engineering professionals are required to apply appropriate measurement practices and tools in the design, fabrication, and communication of technological products and systems. Also, as measurements are provided in many different forms and inaccuracy in measurement calculations can cause major problems, engineering professionals need the mathematical skills to conduct unit conversions or analyses.

Performance Goal for High School Learners
I can successfully select the appropriate measurement devices and units and apply them with precision to design, produce, and evaluate quality products.

	 Basic	 Proficient	 Advanced
MEASUREMENT TOOLS & INSTRUMENTS	I can describe how various instruments are used to measure quantities, such as linear distances, diameters, and angles.	I can correctly apply measurement instrumentations to record measurements.	I can evaluate the acceptable amount of error (differentiate between standard and precision measurements) when making measurements in a variety of situations using the appropriate instrumentation.
PRECISE MEASUREMENT & ACCURATE LAYOUT	I can interpret scale, dimensions, and tolerances of a technical illustration or diagram (e.g. orthographic or isometric drawings).	I can accurately transfer the dimensions from a technical illustration or diagram (e.g. orthographic or isometric drawings) to a raw material, using appropriate layout/measurement tools to enable the fabrication of a product within specified tolerances.	I can analyze the relationship between measurement and quality control in terms of reporting accurate quantities, performing precise calculations, and ensuring tolerances.
UNITS ANALYSIS & ENGINEERING NOTATION	I can identify the appropriate measurement system (e.g. U.S. customary or metric systems) and the corresponding unit of measure for accurately recording/reporting precise quantities.	I can apply unit conversions using the appropriate significant figures and notation (i.e. scientific or engineering notation) to ensure that precise measurements of quantities will be translated to reliable design dimensions.	I can infer how errors in unit analysis and conversions can propagate inaccuracies when generating technical solutions to problems.