Core Concept: Problem Framing
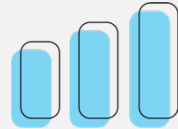
Engineering Literacy Dimension: Engineering Practices
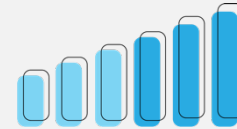**Practice:** Engineering Design
Overview: *Problem Framing* is a process, which occurs early in and throughout the practice of Engineering Design that involves outlining one's mental interpretation of a problem situation by identifying the goals and essential issues related to developing a desired solution. This includes identifying design parameters to formulate a problem statement that (a) *considers multiple perspectives*, (b) *removes perceived assumptions that unnecessarily limit the problem-solving process*, and (c) *frames the design scenario in such a manner that helps guide the problem-solving process*. This core concept is important to the practice of Engineering Design as design problems are, by nature, ill-structured and open-ended.
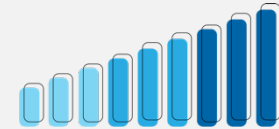
Performance Goal for High School Learners

I can successfully construct justified problem statements that highlight the key elements of a design scenario, including multiple perspectives (clients/end-users), to guide the evaluation of trade-offs between multiple, and sometimes conflicting, goals, criteria, and constraints during a design project.

	Basic	Proficient	Advanced
IDENTIFYING DESIGN PARAMETERS	I can analyze a provided description of a design situation in order to identify explicit design criteria and constraints.	I can infer design criteria and constraints that are not explicitly described in a provided description of a design situation.	I can evaluate the relationships between design criteria and constraints, prioritizing them within a specific context of a design in order to effectively balance trade-offs between any conflicting goals.
PROBLEM STATEMENT DEVELOPMENT	I can identify the key elements of a design situation, including "what the central issue is that requires a resolution", "who the issue affects", "when/where the issue occurs", and "why the issue needs a novel solution".	I can summarize the key elements of a design situation in order to write a concise problem statement that represents a clear description of a justifiable issue along with the main goal(s) to be addressed by the problem-solving team.	I can evaluate a problem statement to determine if a vision for a design team is clearly stated with sufficient information that justifies the execution of a problem-solving process.
CONSIDERING ALTERNATIVES	I can identify the assumptions or perceived rules associated with a problem statement that are limitations for solution opportunities.	I can rephrase a problem from multiple perspectives to generate alternative problem frames/statements that remove assumptions limiting solution designs.	I can evaluate alternative problem frames/statements in an effort to select the ones which have the greatest opportunity to generate innovative solutions.