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Working with the Engineering Design Process

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New section to be added to the *Science Day Standards*.**

Scientific inquiry vs. technological or engineering design projects.

Inquiry projects shall have *hypotheses*; technological and engineering design projects shall have *design statements* with measurable criteria for success.

Just as scientific inquiry projects require (1) the identification of a problem or question and (2) a proposed hypothesis that might offer a solution to the problem or answer the question, so too, engineering and technological design projects require (1) a problem or needs statement and (2) a design statement that identifies such limiting factors and criteria for success or meeting the design as cost or affordability, reliability (mean time between failure MTBF), material limits (strength, weight, resistance to corrosion, color, surface texture, ease of manufacture or reproducibility), operating environment or conditions (temperature, humidity, barometric pressure, caustic conditions), ergonomics (human factors), health and safety and general ease of use or operation.

In a manner similar to the development of methods used to test a hypothesis, engineering and technological design projects must test the “design statement” to see how close a prototype, for example, comes to meeting the design criteria. A prototype developed for an engineering and technological design project must achieve stated design objectives and satisfy specified constraints. Generally the results of an engineering and technological design project will describe the extent to which the prototype met the design criteria. An inquiry project shall state the extent to which the results derived from experimentation validate or invalidate a hypothesis. Thus a *hypothesis* is to *inquiry* as *design* is to *engineering* and *technology*. In all cases students must present the results of repeated trials.

The Scientific Method	The Technological or Engineering Design Process
State a question or problem.	Define a problem or need.
Gather background information.	Gather background information.
Formulate hypothesis; identify variables.	Establish design statement or criteria for success.
Design experiment; establish procedure(s).	Prepare preliminary designs.
Test hypothesis multiple times by an experiment.	Build a prototype and test multiple times.
Analyze results & draw conclusions.	Analyze results; verify, test & redesign as necessary.
Present results.	Present results.

Administrative notes:

1. Technology is not limited to computers. Technology encompasses aerospace & aviation, agriculture & food technology, construction, energy, environment and natural resources, information & communications, manufacturing, materials, medicine & health and transportation.
2. As appropriate, “hypothesis or design statement” will replace the term “hypothesis” in the *Science Day Standards*.