

Engineering Design Practice Brief



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SRI Education



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What is Engineering Design?

From the *NGSS Framework*: “*Engineering* is a systematic and often iterative approach to designing objects, processes, and systems to meet human needs and wants....”

The engineering design process generally involves multiple iterations of designing, building, and testing. The design part of this process also involves defining the purpose and goals further by:

- Identifying the problem
- Researching the problem
- Specifying clear goals, or *criteria*

Criteria should reflect the needs of the expected end-user of the solution. *Criteria* should also be quantifiable whenever possible so that a final design can be assessed using them.

Testing can be done by producing a physical model to test or through the use of a computational or virtual model. The results from testing should be compared to the criteria to evaluate the performance of the design. In the second iteration of design, the testing results are used to revise the existing design, so that revisions address areas where the design can be improved in relation to the *criteria*. This is why using measurable *criteria* is important - so that the results from testing can be compared to the *criteria* in a meaningful way.

What isn't Engineering Design?

Engineering design isn't just building. The engineering design process includes cycles of testing and revising of the design based on the results from testing to better solve the problem within the constraints.

Developing a solution without a second iteration of designing, building, and testing, where students only have the opportunity to develop one solution, is not a high quality representation of engineering design.

How are we using engineering design in the curriculum?

Students design the surfaces they will use within the school grounds. The students determine which surfaces to use in order to support recess/play activities as well as parking and accessibility, while reducing the downhill flow of water to other areas.

This design process in this curriculum consists of:

- Defining the problem at Walker, including student and teacher needs
- Developing knowledge by creating conceptual models of water runoff
- Generating solutions by drawing different designs
- Developing a computational model to test different design solutions
- Conducting fair tests of designs to help optimize and refine designs
- Creating a presentation that explains and justifies their final design choice.