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E in STEM  
Standards Analysis

I chose to evaluate the engineering portions of the NGSS, ISTE and ITEEA. Specifically, I evaluated the following standards:

**NGSS:**

**HS-ETS 1-2.** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

**HS-ETS 1-3.** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

**ISTE:**

**4A :** Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

**4b:** Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

**4c:** Students develop, test and refine prototypes as part of a cyclical design process.

**ITEEA:**

**8: Students will develop an understanding of the attributes of design.**

H. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.

I. Design problems are seldom presented in a clearly defined form

J. The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.

K. Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other

**9. Students will develop an understanding of engineering design.**

I. Established design principles are used to evaluate existing designs, to collect data, and to guide the design process.

J. . Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly

K. A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.

L. The process of engineering design takes into account a number of factors.

I noticed that among all three of these sets of standards there was a common bond of stressing the importance of the design process. Each set of standards encouraged students to

not just dive in and try to fix a problem, but to actually identify the issue and do research on how to solve it. Also all three sets of standards encouraged the use of prototypes as well as testing, then making changes.

The main difference that I noticed among these three sets of standards is that NGSS is the shortest and focuses on the use of the design process in real world situations and stresses aspects beyond just solving the problem such as cost, safety and aesthetics. The ISTE standards actually specifically include the use of technology as part of the design process through the use of digital tools. While that is not to say that technology would not be incorporated into the other standards, this is the only one to specifically mention it. The ITEEA standards have many that hit on engineering and the design process, but in my opinion are vaguer. This is not necessarily a bad thing as it allows the teacher some room for interpretation and to determine how standards can be applied to content.

I think that engineering is a great unifying concept across curriculums. In math and science, it naturally lends itself well to incorporating real world issues into the classroom and giving students the opportunity to solve them. While engineering may seem like an intimidating concept to incorporate to non-science and math teachers, it can be utilized in an ELA class very easily by pulling concepts from novels or readings and attempting to solve problems from the selected piece. Regardless of the content I think that engineering is a great way to get kids involved in engaging hands on activities in class.