Lily Rutledge Ellison Standards Analysis
Which technology, education, mathematics, and science standards relate to problem solving or engineering design?

When considering problem solving in the classroom, I believe that moderately structured problems, and ill structured problems are more likely to occur. I also believe that these types of problems will have a further span of transfer in content and skills needed. Consider this NGSS standard: *5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the earth's resources and environment.*
These scenarios will offer multiple avenues for exploration, and even more solutions.

Compare this STEL standard: *1F. Describe the unique relationship between science and technology, and how the natural world can contribute to the human-made world to foster innovation.*
This poses opportunities for many solutions and optimizations. The content requires authentic contexts for explanations, practice, and hopefully, assessment. This standard asks for the content to be decontextualized.

Additionally, most problems in math will require declarative as well as procedural knowledge. Consider this CSS standard: *MATH.CONTENT.4.MD.A.1 Solve problems involving measurement and conversion of measurements. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.*
In a single standard we see facts that students must know, concepts that they must understand, principles of conversion, and the procedure of converting and recording data.

• How are these standards similar to each other?
The components of engineering can be entered at any section. This entrance at any level can also be seen in the inquiry cycle. There can also be back and forth between the different steps. There is no single path to design or scientific discovery. Additionally, a "systematic practice of design" can be applied to algebraic thinking in mathematics. There are constraints in problems with unknown variables, and in almost all categories of mathematics require that you generate and analyze patterns. This is mirrored in engineering design. Of course engineering requires measurement and data, defining results, and looking for solutions that need optimizing as well.

This combining feature of engineering and math is applicable to social studies as well. When dealing with societal issues, and perspectives in history, students must be ready to entertain multiple paths to the "truth" or the next optimal level.

Science meets the demands of the current world. As students engage in engineering they must consider social disparity, climate inequality, and more. societal demands, move existing technologies

• How are they different from each other?
Scientific inquiry has a slightly different end than engineering design. Inquiry is meant to generate more and more questions that lead to deeper understanding of concepts. Engineering is looking for the MOST efficient solution to a set of constraints.
Their cycles are different as well. Inquiry asks us to “Define, generate,& plan” where engineering asks us to “define, develop, & optimize .

• What are your thoughts on engineering design problem solving as a “unifying” concept/skill?
I loved how the engineering practices article by Kirkley spoke to children being “natural engineers. There is a truth in that all children, regardless of their background, or whether or not they have been marginalized in science, love “tinkering” and “creative construction.”

Most students can find relevance in these math, science, technology, and engineering design facts, concepts, and procedures coming together.