The E in STEM
Standards Analysis
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While this paper is focused on Standards Analysis and how math, science and technology and engineering education documents overlap with regard to engineering design and problem solving, I think it is important to acknowledge that problem solving is already significant in a child's world. Therefore, as we talk about the standards and the connections or lack of connections, children (and families) will make authentic associations to what they are doing, whether the task is termed an "engineering design" or "technology design" task.

Problem solving is key in a child's world of better understanding and connecting authentically to everything around them. Most parents innately know this is true and work with their children as the child explores and discovers their world. As children move to preschool, this world of authentic discovery continues with teachers and other adults helping children to construct their world. Children move on to elementary school and both formal and informal education becomes more structured and prescribed.

As I looked at the ITEEA Standards for Technological Literacy, Third Edition, Virginia Public Schools Standards of Learning for Math, Science and Technology Standards, and the Next Generation Science Standards, I am reminded that terminology can be misleading. Interpretation is always something that varies greatly between people, fields, and institutions. The history of technology and engineering design are evidence of this.

Virginia Standards (of Learning)
The "Computer Technology Standards" were written for 2010-2015 and, in my opinion, based on how rapidly our society changes, especially with regard to technology and engineering, were out-of-date almost as soon as they were published. The standards mostly refer to digital technology, however there are two standards, C/T 3-5.8 and C/T 3-5.9, that may leave room for interpretation. These standards say to "determine when technology tools" and resources "are appropriate to solve a problem and make a decision" (VDOE website, Computer Technology Standards). Other than those two standards there is no mention of engineering or engineering design.

The Virginia Math Standards again are lacking with regard to identifying technology and engineering design aspects. While the standards do suggest that problem solving be included and students should "recognize, create, and extend" a wide variety of problem types, the standards fall short of being specific in what I would consider today's expectation in the STEM Education field of technology and engineering. The Math standard does say, "Problem solving has been

integrated throughout the six content strands...Students must be helped to develop a wide range of skills and strategies for solving a variety of problem types" (VDOE website, Mathematics Standards). So, as an Integrative STEM Educator, I would take that and feel confident with whatever engineering design activities that I wanted to use in my classroom.

The Virginia Science Standards are written in the typical scientific language of "experiments and investigations." I look at these standards and immediately think about engineering design projects and investigations that can be proposed and done and easily meet the standards. Although the Virginia Science Standards do not specifically mention engineering, engineering design, or technology, it seems reasonable to be able to substitute terminology without sacrificing content knowledge.

ITEEA Standards for Technological Literacy

The ITEEA Technology Standards are specific in the technologies that each grade should be introduced and familiar with. These standards help to set the stage for engineering design projects and activities. Each standard is stated in a manner that offers examples of specific aspects of technological and engineering understanding. I interpret the ITEEA Technology Standards as an important document in the forefront of the Integrative STEM Education field. This document sets forth the expectation of what is to be taught, when it is to be taught, and gives insight in ways that the specific standard could be taught and connect to the engineering field.

The Next Generation Science Standards

The Next Generation Science Standards are an excellent example of how other standards should be clearly written and connections made across the curriculum. These standards not only state what the student will be able to demonstrate, they also list "Science and Engineering Practices," "Disciplinary Core Ideas," and "Crosscutting Concepts." These standards clearly show the significant advancement and importance of the STEM Education field. I believe these standards will help to solidify the extremely important field of technology, engineering design, and all things related to Integrative STEM Education.

The ITEEA Standards and the Next Generation Science Standards were clearly written with the idea of technology and engineering design in mind. While I would like to think that the Virginia Standards were written with the idea of connecting technology and engineering design, I do not believe that Virginia DOE has had a strong enough voice in support of technology and engineering design, as evidenced in their standards.

RESOURCES

ITEEA Standards for Technological Literacy, Third Edition retrieved on February 27, 2018 at 10:04 a.m. from https://www.iteea.org/Publications/STEMProducts/77454.aspx

Next Generation Science Standards retrieved on May 29, 2018 at 4:59 p.m. from http://www.nextgenscience.org/overview-dci

Virginia's Standards of Learning for Public Schools (Grades 3-5) retrieved on May 29, 2018 at 3:35 p.m. from http://www.doe.virginia.gov/testing/index.shtml