

Engineering Design Problem Solving as an unifying concepts/skill across STEM

After reading all four education standards on the reading list, all three standards including Common Core Math Standard, ITEEA standard for technological literacy and Next Generation of Science Standard (NGSS) are related to problem solving and engineering designing. These three standards share similarities in their core concepts and procedures, while having differences in approaches and methods. The details are explained below.

One of the similarities that Common Core Math Standard, ITTEA and NGSS shared is that these three standards all make conjectures about the form and meaning of the solution and plan a solution pathway rather than jumping into a solution attempt. This similarity shared among all three standards allows teachers to provide a well-balanced combination of learning and application of concepts and skills, which leads to further extensive learning and designing for students. In Common Core Math Standard, students are given the opportunities to understand and practise the math language by using tools and objects from the Kindergarten age. These tools help students to visualize and make sense of problem before they are able to reason abstractly or quantitatively and eventually solve the problems. Same as in ITTEA standard for technological literacy, prior to the process of problem solving and designing, students need to know how to differentiate between natural world and man made world. They have to understand the reason, source and purpose of the technology design under the influence from society, environment, culture and etc. It is a crucial step for students to take because without learning and understanding the whole context of technology literacy, the problem solving and designing will only be a procedure that they follow, hence further implication of knowledge and higher order of thinking can not be achieved in the later study. Another similarity that worth to mention is how all three standards require students to further evaluate their design or answer upon the completion of projects. This procedure not only provides students an opportunity to reassess their solutions and answers, but also encourages students to make for different approaches, which would eventually generate more questions and inquiries leading to further thinking and designing.

Although the framework of the three standards shares many similarities, differences still exist due to the nature of the subject

that each standard set upon. One of the differences appears in the procedure of reasoning. In NGSS, analysing the Data collected from various source for the subjects or events plays an important role in reasoning the problem. Valid data collections are creating tools that can be used to interpret and help translate the streams of information for students, thus providing a solid reasoning in the problem solving and design. In ITEEA, the reason can be more abstractive than quantitative due to the definition of Technological design. In ITEEA, "Technology is how people modify the natural world to suit their own purpose and needs." The reason for solving the problem or designing can be drawn based upon the needs and desire of community, society or a classroom. Quantitative reasoning can be useful in technological designing, but it might not be fully utilized in the procedure of reasoning.

After reading Common Core Math Standard, ITEEA standard for technological literacy and Next Generation of Science Standard, I would think engineering design problem solving could be used as a unifying concept and skill across the STEM learning. Discard some minor differences in the procedure that may required for different subjects, engineering design problem solving provides a concrete structure to intrigue the genuine curiosity from students and later lead to the knowledge acquiring in order to solve the problems. By following the standards, Students are able to practise problem solving, yet not being detract from the urgency of attention to basic literacy skills in the school. Students are also given opportunities to make different approaches and reassess their answer for further learning and implementation. This concept of learning can be well utilized in other subjects in order to meet the needs for the future learning.