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Asunda, P. 2014, 'A conceptual framework for STEM integration into curriculum through career and technical education', *Journal of STEM Teacher Education*, vol. 49, issue 1, pp. 3–15. Retrieved from: https://doi.org/10.30707/JSTE49.1Asunda

Summary

This article explores the benefits of an interdisciplinary STEM program in the quest for providing students with a holistic approach to problem-solving that reflects real-world practice. This is supported by a conceptual framework that comprises four constructs: systems thinking, situation learning theory, constructivism and goal-orientation theory.

Analysis

The author identifies several definitions of STEM integration including 'STEM integration is an interdisciplinary teaching approach, which removes the barriers between the four [Science, Technology, Engineering and Mathematics] disciplines' (Wang et al, 2011, p. 2).

Asunda acknowledges an even more detailed definition of STEM than Wang's, which contends that integration occurs when there is a deliberate combining of content, processes and learning outcomes (behavioural learning objectives) from the curriculum offerings of mathematics or science, and technology or engineering. There are integration choices (Sanders, 2009, as cited in Walkington, Nathan, Wolfgram, Alibali & Srisurichan, 2014). Another consideration is that this interdisciplinary approach requires teachers to explicitly assimilate concepts from more than one discipline (Huntley, 1999, p. 58). It is argued that 'equal attention' from two or more disciplines should take place in a learning period (Huntley, 1999, p. 58).

The article implies that Asunda supports the notion that STEM integration offers students the opportunity to learn about different concepts in a holistic fashion rather than learning about the individual pieces and assimilating them later.

Asunda reports that integrated approaches are typically based on problems/issues to be solved (which are at the heart of STEM); however, the article cautions about project-based learning, where expected outcomes are more clearly defined. He contends that this does *not* reflect the real world where it is important to define the problem and develop a solution (setting goals and outcomes is considered very valuable).

Asunda reflects on the fact that there is no one clear answer on how STEM should be integrated into the curriculum. However, he does contend that when there are published standards, student learning improves because of a common goal.

The author recognises the role of design in STEM education and places significant emphasis on the role of systems thinking: ‘it is the process of synthesizing all of the relevant information we have about an object so that we have a sense of it as a whole’, which focuses on the ‘characteristics and functionality of the entire system and the interrelating subsystems’.

Asunda offers a conceptual framework that articulates a set of interconnected theories about how something functions – it shows the multi-causal patterns associated with phenomena, and illustrates the four theoretical constructs of systems thinking, situation learning theory, constructivism and goal-orientation theory (see Figure 1).

Reflection

Asunda acknowledges that there is no ‘right’ way of integrating STEM into school programs; however, his contention that equal attention should be placed on at least two different disciplines in a learning period is interesting. It is also interesting to note Asunda’s contention about the role of standards in affecting student performance in this area.

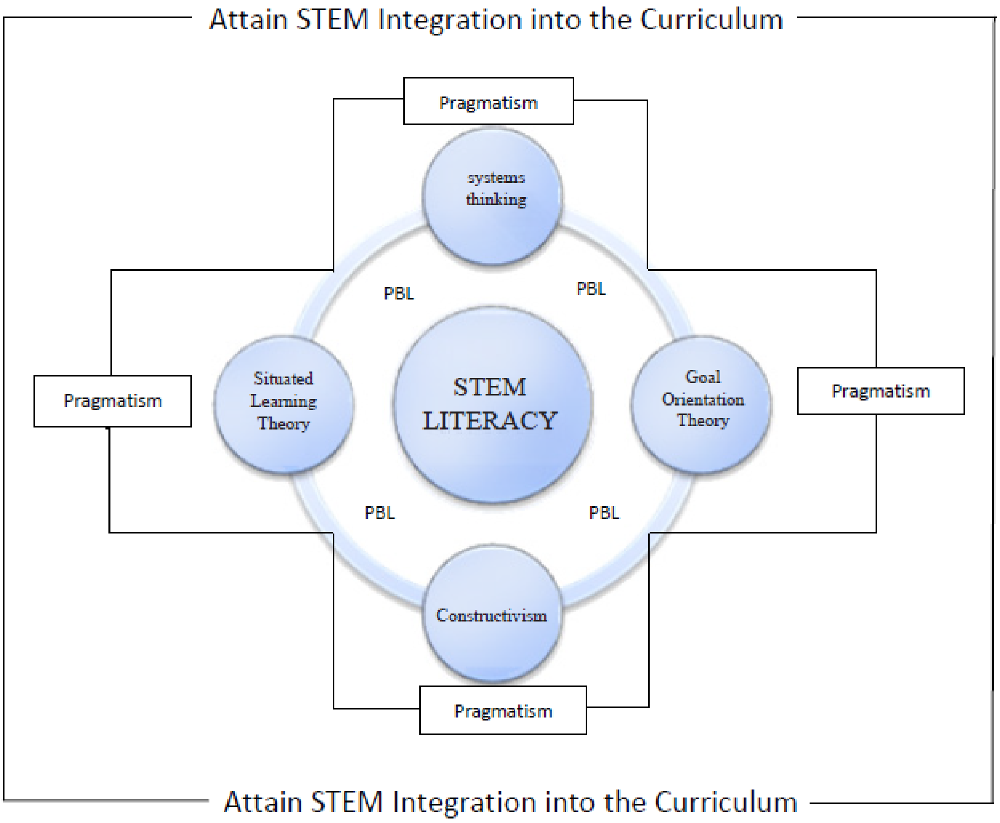

Figure 1. A conceptual framework for STEM integration into the curriculum.

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