

ZMATH 2016f.00458

English, Lyn D.

STEM education K–12: perspectives on integration.

Int. J. STEM Educ. 3, No. 1, Paper No. 3, 8 p., electronic only (2016).

Summary: This commentary was stimulated by *Y. Li's* first editorial [“International Journal of STEM Education – a platform to promote STEM education and research worldwide”, *ibid.* 1, No. 1, Article 1, 2 p., electronic only (2014; doi:10.1186/2196-7822-1-1) citing one of the journal’s goals as adding multidisciplinary perspectives to current studies of single disciplines comprising the focus of other journals. In this commentary, I argue for a greater focus on STEM integration, with a more equitable representation of the four disciplines in studies purporting to advance STEM learning. The STEM acronym is often used in reference to just one of the disciplines, commonly science. Although the integration of STEM disciplines is increasingly advocated in the literature, studies that address multiple disciplines appear scant with mixed findings and inadequate directions for STEM advancement. Perspectives on how discipline integration can be achieved are varied, with reference to multidisciplinary, interdisciplinary, and transdisciplinary approaches adding to the debates. Such approaches include core concepts and skills being taught separately in each discipline but housed within a common theme; the introduction of closely linked concepts and skills from two or more disciplines with the aim of deepening understanding and skills; and the adoption of a transdisciplinary approach, where knowledge and skills from two or more disciplines are applied to real-world problems and projects with the aim of shaping the total learning experience. Research that targets STEM integration is an embryonic field with respect to advancing curriculum development and various student outcomes. For example, we still need more studies on how student learning outcomes arise not only from different forms of STEM integration but also from the particular disciplines that are being integrated. As noted in this commentary, it seems that mathematics learning benefits less than the other disciplines in programs claiming to focus on STEM integration. Factors contributing to this finding warrant more scrutiny. Likewise, learning outcomes for engineering within K–12 integrated STEM programs appear under-researched. This commentary advocates a greater focus on these two disciplines within integrated STEM education research. Drawing on recommendations from the literature, suggestions are offered for addressing the challenges of integrating multiple disciplines faced by the STEM community.

Classification: D30 M50 M60

Keywords: STEM integration; STEM research; multidisciplinary integration; interdisciplinary integration; transdisciplinary integration; engineering education

doi:10.1186/s40594-016-0036-1