Unpacking the 'M' in Integrated STEM Tasks: A Systematic Review

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Despite the promise of integrated STEM for authentic learning, the notion of integration is problematic, and it remains unclear whether such integrated approaches can result in significant learning in STEM disciplines. This is particularly true for mathematics, which is often underrepresented in integrated STEM tasks (English, 2016; Fitzallen, 2015; Maass et al., 2019), considered an "accessory" discipline in many cases. In this systematic review, we investigate the issue of integrating mathematics by unpacking the centricity of STEM tasks (Teo et al., 2021), analysing the connections between mathematics and the other STEM disciplines (Tan et al., 2019), and highlighting the different faces of mathematics presented in these such tasks (Devlin, 2000). Our findings suggest that although current STEM tasks anchored in mathematics are problem-centric, they embed relatively weak inter-disciplinary connections. Analyses also revealed less emphases on mathematics as a way of knowing in comparison to other mathematical faces presented. We discussed possible implications and suggestions for strengthening the 'M' in STEM through designing tasks to promote more authentic integrated STEM learning experiences. A suggested task design element to consider is the implementation of mathematics as a creative medium and way of knowing, in combination with considering user-centric and solution-centric approaches. This would offer different affordances for mathematics content, thereby increasing the strength of the interdisciplinary connections underpinned in the tasks and fostering more authentic integrated STEM experiences for learners.

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