Returning Voice to the ‘Silent M’:
A Review of Conceptions of Mathematics in Integrated STEM education
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Motivation and Research Questions

- Mathematics may actually be the least deeply integrated of the four disciplines (English, 2016; Fitzallen, 2015).
- The role of mathematics in integrated STEM teaching and learning remains unclear, understudied, and misunderstood.
- Mathematics is mainly a tool used for solving a science or engineering problem (Frykholm & Glasson, 2005; Walker, 2017).

Research questions
1) What conceptions of mathematics are evident in the literature on integrated STEM education?
2) How has the role of mathematics been defined in the context of STEM integration?

Methods

Conducted a brief review of 4072 articles published between the years 2013 to 2018 from 19 peer-reviewed journals that include research on STEM education in one or more of the STEM disciplines.

Findings from the 33 Relevant Publications

- Participants across the publications were mostly students and teachers.
- Most of the research took place in classroom settings.
- Integration mostly occurred through coordination across STEM disciplines.

The mathematical content of the articles we reviewed was distributed fairly evenly across content areas. This suggests multiple spaces for mathematics to occur within integrated STEM education.

Themes and Recommendations

- Researchers should identify mathematics teaching and learning goals within their integrated context and further use the mathematical strands of proficiency (NRC, 2001) as a guide to support a more accountable approach to mathematics.
- Researchers should follow the example of Popovic and Lederman (2015) in seeking to identify authentic mathematical tasks within the integrated STEM context.
- Researchers should not limit their focus on mathematics teaching and learning to formal educational spaces.
- STEM integration can be done and, to be impactful, it must be done on a much larger scale.

Themes from the relevant articles:
- Mathematical communication and engagement in mathematical practices
- Authentic tasks as the context for doing mathematics
- Inquiry-focused approaches to teaching and learning
- Settings outside of traditional or formal teaching and learning spaces
  - summer school (Kwon, 2017)
  - hospital (Nickels & Cullen, 2017)
  - web-based competition (Jacinot & Carreira, 2017)
  - community spaces (Wilson-Lopez et al., 2016)
  - museum (Popovic & Lederman, 2015)

Our recommendations:
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References, including relevant publications