



Content Analysis of International STEM Education Research Journals

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Abstract

Integrated, STEM-driven curricula and instruction are spreading in order to improve students' STEM literacy, critical thinking, and 21st-century workforce skills'. To investigate trends in STEM education, this study used summative content analysis^{2,3} to analyze all articles published in three international STEM education research journals. The criteria for journal selection were origination date, number of articles published, and article availability through student-accessible databases or the journals' websites. Data included STEM field combinations, whether STEM subjects were integrated (iSTEM) or not, publication date, and setting and participants. Findings from this study supported that STEM education research articles tend to focus on two or more STEM silos, with the number of iSTEM education research articles increasing in publication over time. The authors suggest that future research in STEM education should include K-12 settings to complement the work already performed in higher education settings.

Research Questions

- Does the literature in three international STEM journals reveal any trends in STEM education research from 2013 to 2018?
 - Do STEM education research studies focus mostly on integration of 2, 3, or 4 disciplines?
 - What level of education are participants in STEM education research?
 - What were the changes in the number of iSTEM education articles published from 2013-2018?

Methods

June	
4	Created Google Sheet to Facilitate Search for STEM Education Research Journals
11	Reviewed list of STEM Education Research Journals Decided on criteria for selecting journals Narrowed the list of journals based on the criteria Coded journal articles (most recently published articles ($n = 20$))
13	Narrowed list of journals based on publication years Reviewed columns for article codes sheet Eliminated and added columns of codes Divided the remaining articles amongst the doctoral students
25	Delimited data with peers Added columns of codes
July	
23	Finalized Database Peer Reviewed Start of Content Analysis Papers
August	
1	Turned in Findings and Final Content Analysis Paper

Selected Journals

Journal	Journal Description	Average Number of Articles per Year	Total Number of Articles
<i>IJEMST</i>	Quarterly Publication No publication Fee	24	146
<i>IJSE</i>	Annual Publication Publication Fee	23	113
<i>J-STEM</i>	Annual/Bi-Annual Publication No Publication Fee	7	37
	Article Total		296

Results

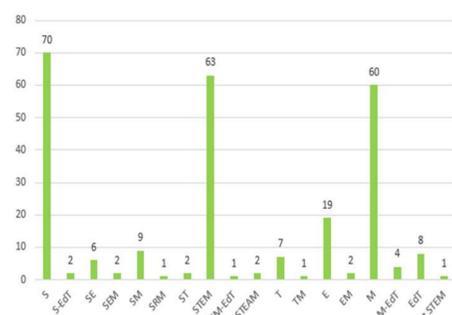


Figure 1. Distribution of Articles by Field

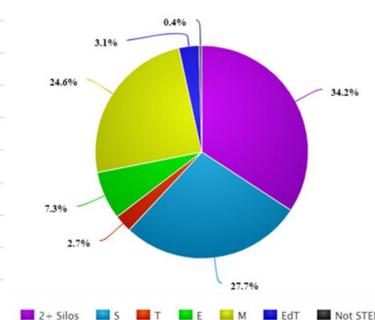


Figure 2. Percentage of Articles by Discipline

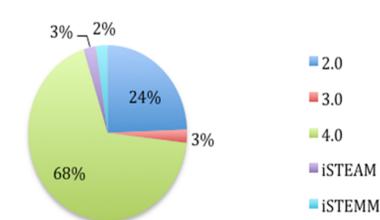


Figure 3. Percentage of iSTEM Articles

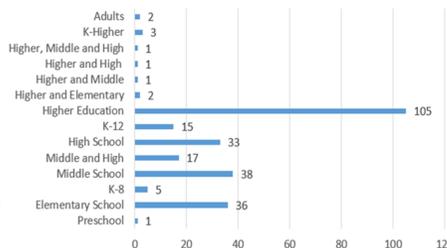


Figure 4. Types of Participants in STEM Education Research

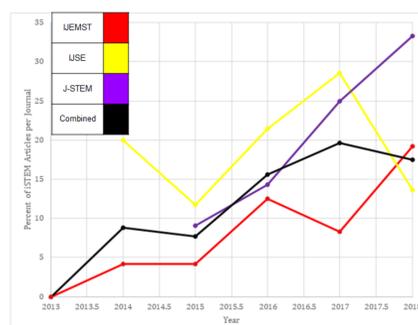


Figure 5. iSTEM Education Research Trends

Discussion

- About 65% of the articles reviewed addressed only one of the STEM silos or some type of educational technology, being Science and Mathematics the most predominant. (Figures 1 and 2).
- The most common type of integration of STEM disciplines was the 4.0 type (68% of iSTEM articles), followed by the 2.0 type (24%). (Figure 3).
- STEM Education research seemed to be split almost evenly between higher education settings and K-12. (Figure 4).
- IJEMST* and *J-STEM* presented a positive trend in the number of iSTEM articles they published since their release dates. *IJSE* showed a considerable decline between 2017 and 2018. (Figure 5).

Conclusions

- The large amount of one-siloed articles published in *IJEMST*, *IJSE*, and *J-STEM* might indicate a disconnect between STEM Education research being done and the goals of the STEM curricula found in schools.
- Although there is a positive trend in the number of iSTEM articles that newer international STEM Education journals publish, the focus on integration is still not very heavy. We recommend fostering iSTEM so these journals can help fill the gap in the literature.
- The line between Technology Education and Educational Technology is hard to draw, given their intersection. An operational definition could help STEM journals increase the amount of Technology Education research published.

References

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