

The Effects of Informal STEM on 6th Grade Students

A Systematic Literature Review

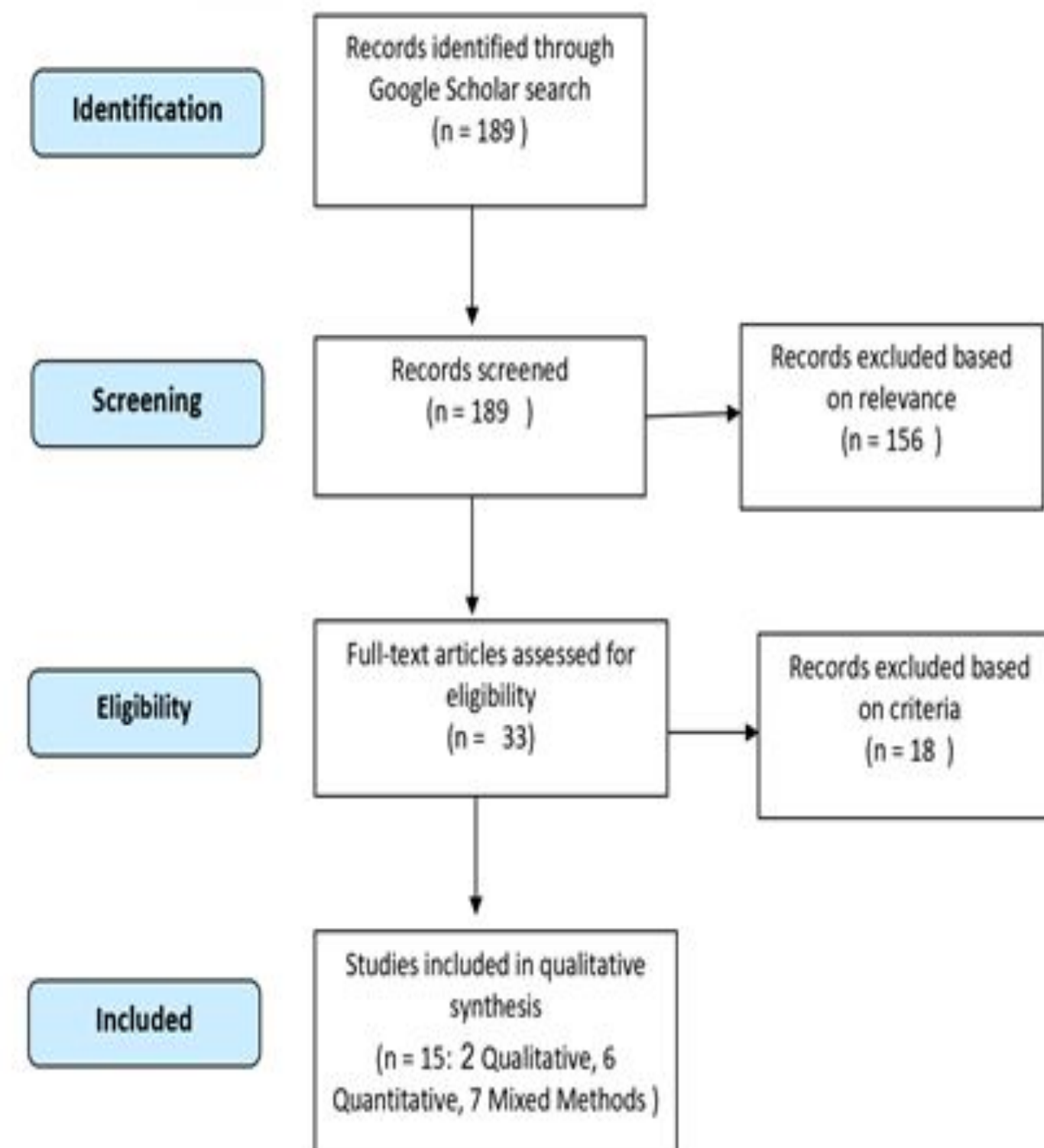
Nicole Svetlov



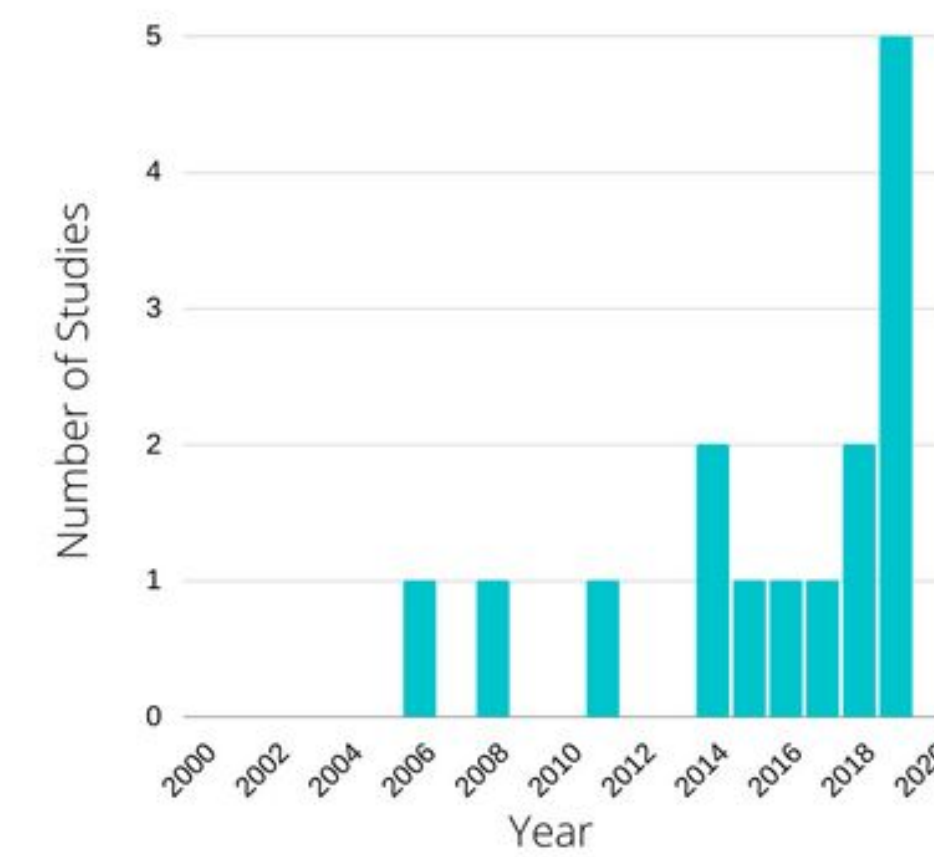
Abstract

By sixth grade, students are beginning to form early professional identities that will help them make career choices. At this stage, academic interventions to prepare students for rigorous higher- and post-secondary learning paths have shown to help middle schoolers to enter high school better prepared to graduate on time and with good grades. In this work in progress paper, we present preliminary results of a systematic literature review on the effects of out-of-school STEAM activities on sixth-grade students. We used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method to record our literature search results. Our initial search resulted in 189 articles. Through our inclusion/exclusion criteria we restricted the results to articles published in the English language during or after the year 2000. Also, we were only interested in articles that were published in peer-reviewed journals, appeared in conference proceedings, or were committee approved master's or Doctoral theses. After the initial screening, we identified 19 quantitative articles, 3 qualitative articles, and 12 mixed-methods articles. Full-text analysis of the 33 articles resulted in the exclusion of 13 quantitative articles, 1 qualitative article, and 4 mixed-methods articles. After inter-rater discussion, we identified 15 articles to be included in the final analyses. The preliminary results from this work in progress, systematic literature review indicate that out-of-school learning environments create more possibilities for applied, hands-on learning that is more impactful and motivating than traditional in-class teaching methods.

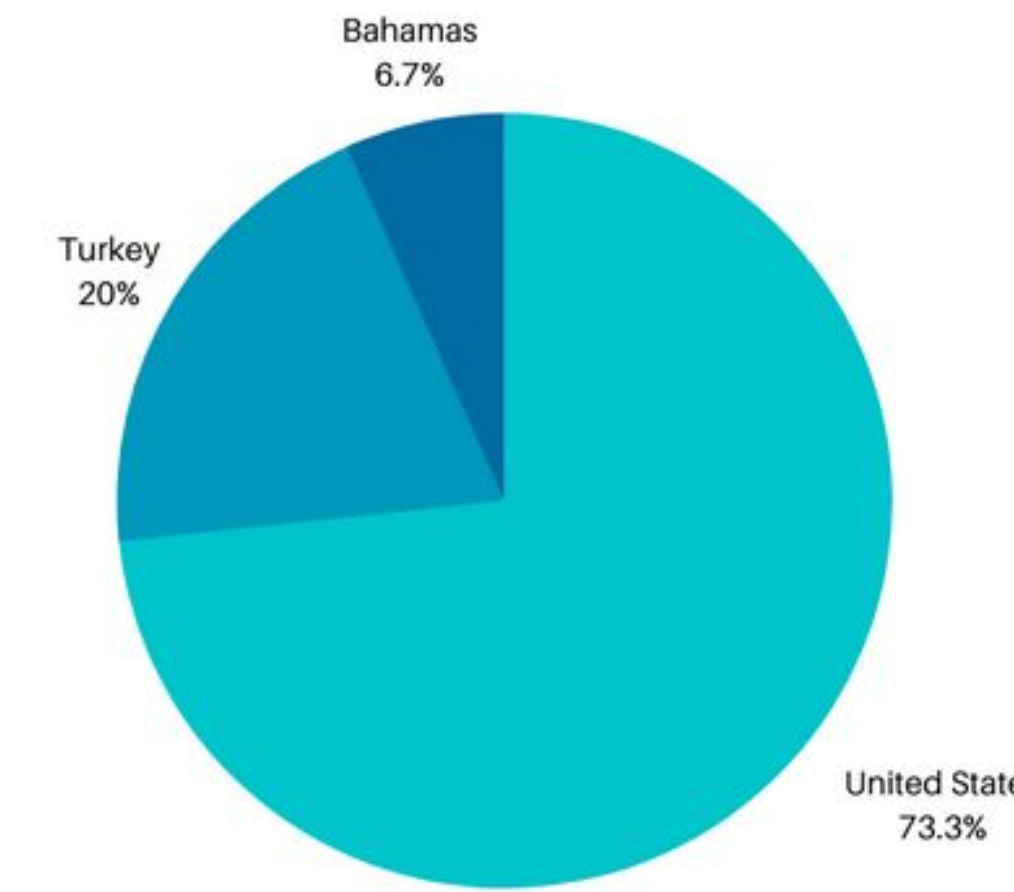
Literature Search



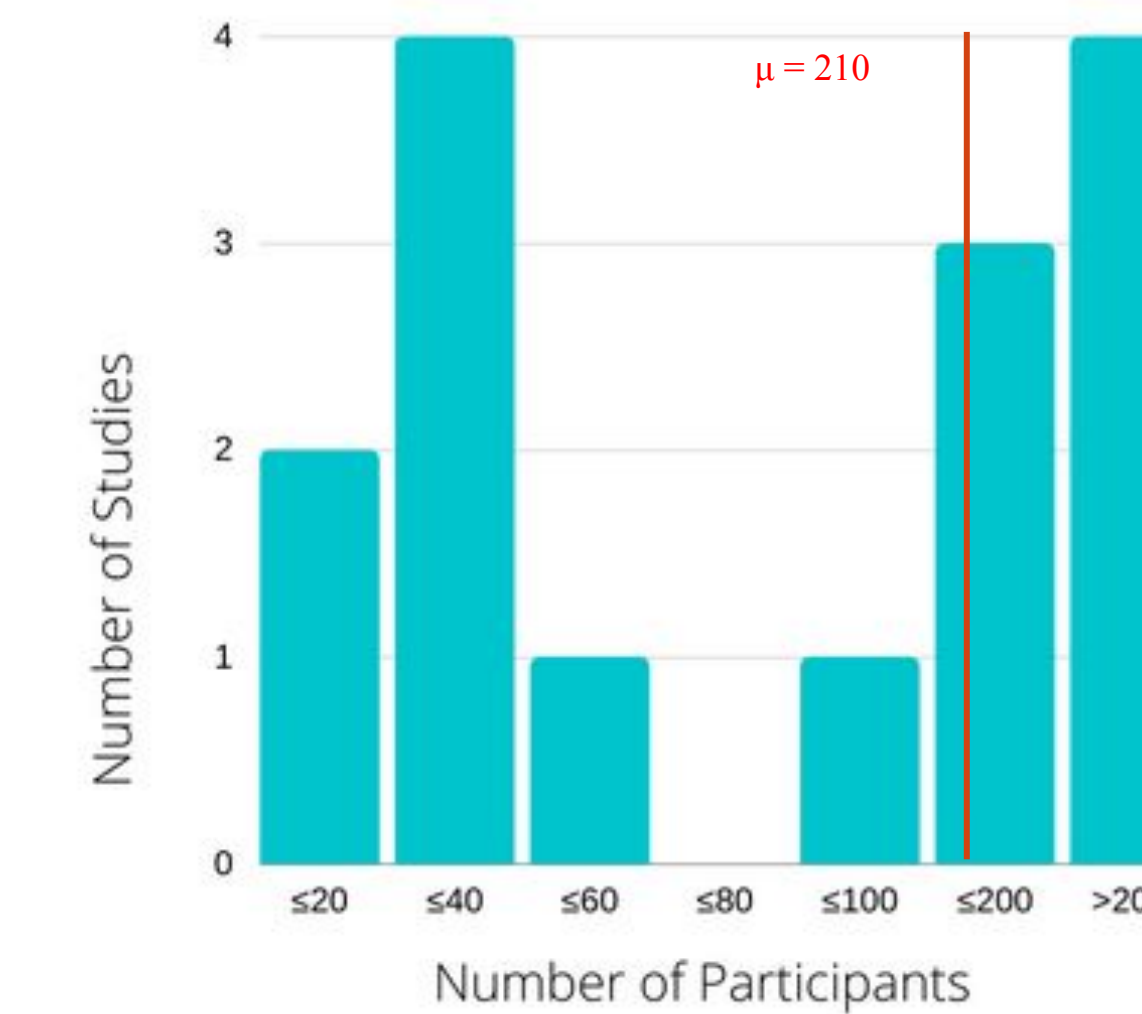
Publication Year



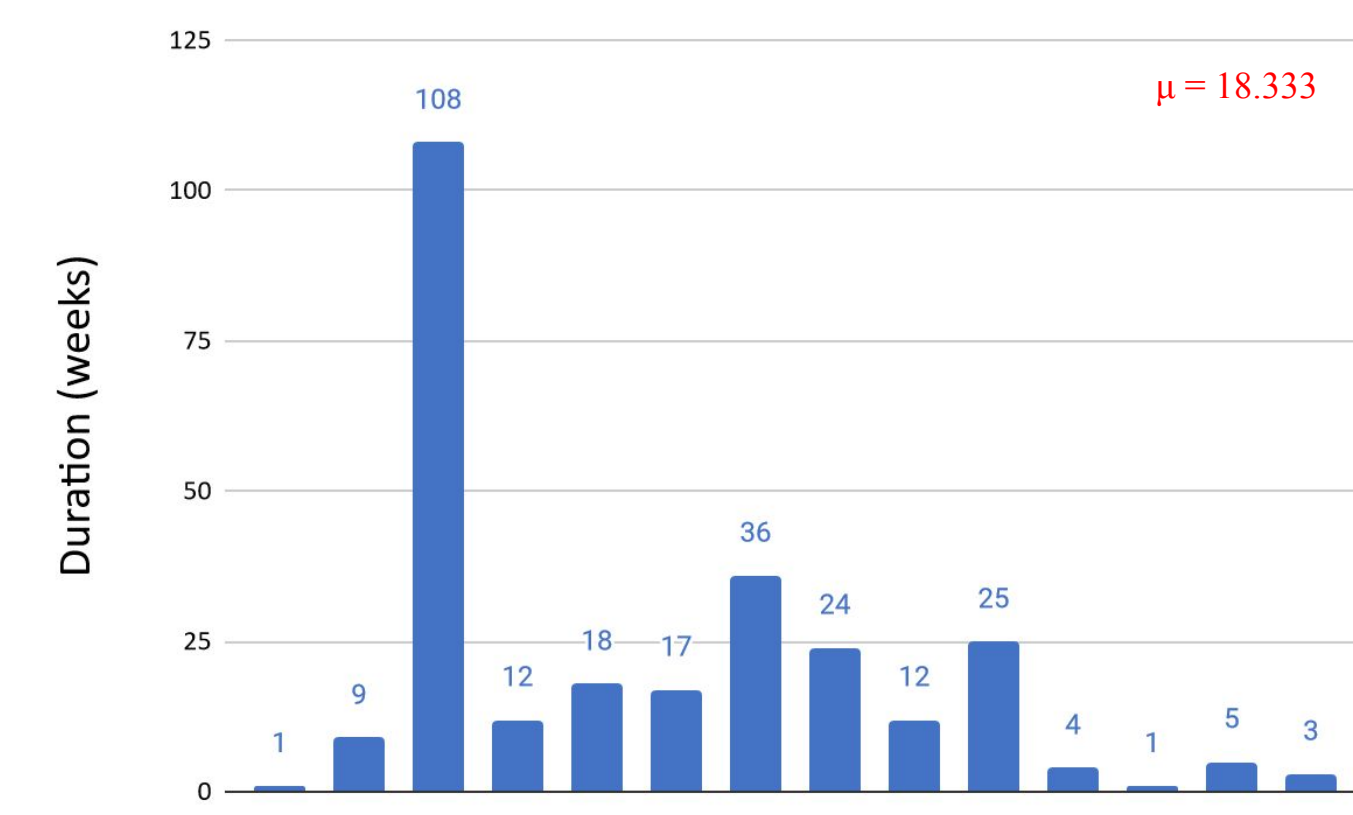
Country of Publication



Sample Size



Duration



Findings

■ Positive Correlation
■ No Correlation or Negative Correlation

Authors & Year	Publication Type	Research Design	Country	Sample Size	Duration of Study	Setting	Main Results
Altan et al., 2019	Journal	Pre/Post	Turkey	n = 24	1 week	Afterschool	The STEM career interest survey showed that the IOS education program “positively” affected the participant’s STEM awareness
Mouza et al., 2015	Journal	Pre/Post	United States	n = 52	9 weeks	Afterschool	The findings of this study indicate that as a result of the IOS program, girls had “stronger attitudes” towards gender equity
Cutucache, 2018	Master’s Theses	Pre/Post	United States	n= 1,103	108 weeks	Afterschool	This study observed “statistically significant gains” in STEM content knowledge.
Gallegos, 2019	Dissertation	Pre/Post	United States	n = 23	12 weeks	Afterschool	The participants’ Career Interests Survey post score average was lower than the Pre survey average.
Smith, 2006	Dissertation	Quasi Experimental	United States	n = 500	18 weeks	Afterschool	There is a “positive correlation” between tutes and higher test scores.
Reynolds, 2008	Dissertation	Quasi Experimental	United States	n = 17	17 weeks	Afterschool	Student participation “enhanced the participants’ attitudes” towards the activities and skills incorporated in the IOS program.
Gates, 2014	Dissertation	Quasi Experimental	United States	n = 112	36 weeks	Afterschool	The <u>IOS program</u> caused a “positive change” in the participants’ perceptions of their own math self-efficacy.
Wortel, 2019	Dissertation	Quasi Experimental	United States	n = 80	24 weeks	Afterschool	Increased exposure to IOS programs and activities can “help students strengthen” their interests.
Sahin et al., 2014	Journal	Case Study	United States	n = 146	12 weeks	Afterschool	The findings provide indicators that IOS programs have the “potential to foster student interest” in STEM fields.
Rolle, 2018	Journal	Pre/Post	The Bahamas	n = 37	25 weeks	Afterschool	Rolle states that IOS programs, such as the one conducted in their study, can shift students’ negative views of STEM and help them to “build healthy perceptions” of the STEM fields.
Weese, 2017	Dissertation	Pre/Post	United States	n = 91	4 weeks	Summer	According to the study’s attitude survey, the student’s confidence levels dropped from pretest to post test. Weese attributes this to students feeling overconfident in their abilities pre survey.
Yalcin, 2016	Journal	Quasi Experimental	Turkey	n = 17	1 week	Summer	The observational results indicate that IOS activities “improve” students’ <u>cognitive</u> processes toward scientific issues.
Iver & Iver, 2019	Journal	Quasi Experimental	United States	n = 652	5 weeks	Summer	The findings of the study suggest that high STEM interest rates can “help maintain student engagement” in school.
Baran et al., 2019	Journal	Pre/Post	Turkey	n = 40	3 weeks	Weekends	Analysis of a Pre and Post Test attitude survey reveals “significant differences” on students’ attitudes towards the personal implications of STEM.
Dell et al., 2011	Journal	Pre/Post	United States	n = 259	1 day	Afterschool	Statistical <u>analysis</u> of the data shows that students who identified science as being ‘always fun’ were “more willing to consider careers in STEM.”

Acknowledgments

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