

Project Proposal: Developing Future Ready Students Through the Maker Movement: Examining
the Role of Science in Elementary Education, Past and Present

Patrick Holness

New Jersey City University

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Description

Going beyond what has always been done within a school requires changing the way that teaching and learning occur (Fullan, 2011; Scharmer, 2009; Senge et al., 2010). Makerspace and the maker movement represent a shift in teaching and learning. Makerspaces can be seen outside of the classroom however their presence within the K-12 education setting is being used as a means of engaging students in science, technology, engineering, art, and math (STEAM) (Martin, 2015). The purpose of this study is to explore the contributions of a Makerspace curriculum on teaching and learning in an elementary setting. This study will qualitatively measure teaching and learning through the use of open-ended surveys.

Participant Selection, Contact, and Issues

This study will use purposive sampling to select a site and participants. The population for this study is teachers and students from a small suburban New Jersey School district. This small New Jersey school district is comprised of three elementary schools, one middle school, and one high school. Fifth-grade students across the three elementary schools within this district have been using a packaged Maker Education Program for one year. There are 225 fifth grade students across the three sites. NIH guidelines for recruitment will be strictly adhered to, and recruitment won't begin until Institutional Review (IRB) approval. Student participants must be given consent from their parents before participation. Staff surveys will be sent electronically through email and students with permission will access the survey through their district email sent from their science teacher.

Fifth-grade students participating in this study are going into their second year of using the purchased Maker Program. Currently, students are being taught through the use of Next Generation Science Standards (NGSS). The before mentioned may have a potential impact on student responses. This issue will be addressed during data analysis. A potential problem that may arise during this study is the possibility of a limited number of student participants.

Research Questions

1. Does a Maker Education program impact a student's ability to problem solve, think creatively, and critically?
2. What is the effect of Maker Education on students' attainment of STEM skills?
3. How does NGSS impact student's perception of STEM and maker activities?
4. How do elementary teachers describe their contributions to makerspace on teaching and learning?

Need of the Study

There is a national outcry to produce a national STEM-ready workforce in America, and its development begins within the K-12 setting (Olson & Riordan, 2012). American students across the socioeconomic spectrum are struggling in math and science. Of the 35 countries that are members of the Organisation for Economic Co-operation and Development (OECD) whose students participate in the Program for International Student Assessment (PISA) American students rank 30th in math and 19th in science (Desilver, 2017). Low student engagement in STEM has led to a decline in students pursuing postsecondary STEM education and careers. Legislation has been enacted to counter the decline in STEM-related education and careers. This is supported by the development of the Next Generation Science Standards (NGSS). The idea behind the STEM Education Act of 2015 is to increase STEM capacity within our schools.

Research Design

To address the research questions the researcher has chosen a qualitative approach. According to Creswell, (2014) multiple case studies allow for the use of observations, surveys, and interviews. A survey will be administered electronically through Qualtrics and distributed by the fifth-grade science teachers. Teachers will be sent the survey through their district email. A quantitative study would not allow the researcher to delve into the inquiry of teaching and learning in an elementary Makerspace. Therefore a qualitative approach is most appropriate in answering the “who & why.”

Description of Questions

Participant responses to the open-ended survey questions will be coded.

Examples of questions:

1. Describe some of the activities/projects that you have completed over the past year through the Maker Program?
2. Describe some of the challenges that you faced while completing a project?
 - a. If there were challenges how did you overcome them?
3. What are some of the tangible skills that you are gaining from participating in the Maker Program?
4. What if any 21st Century Skills have you learned through the Maker Program?
5. How has the adoption of NGSS impacted your approach to teaching?
6. What are the primary STEM skills that your students are being taught?
7. Are students expressing more interest in STEM careers?
 - a. If yes which ones?

References

- Creswell, J. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4 ed.). Thousand Oaks, CA: SAGE Publications, Inc. .
- Desilver, D. (2017). U.S. students' academic achievement still lags that of their peers in many other countries. *Fact Tank News in Numbers* . Retrieved from <http://www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/>
- Fullan, M. (2011). *Change Leader: Learning to Do What Matters Most* . Hoboken, NJ: Jossey-Bass.
- Martin , L. (2015). The Promise of the Maker Movement for Education . *Journal of Pre-College Engineering Education Research (J-PEER)*, 5. <http://dx.doi.org/doi:10.7771/2157-9288.1099>
- Olson, S., & Riordan, D. G. (2012). Engage to excel: Producing one million additional college graduates with degrees in Science, Technology, Engineering, and Mathematics. *Report to the President. Executive office of the President* .
- Scharmer, C. O. (2009). *Theory U: Learning from the future as it emerges*. Oakland, C.A.: Berrett-Koehler Publishers.
- Senge, P. M., Smith, B., Kruschwitz, N., Laur, J., & Schley, S. (2010). *The necessary revolution: working together to create a sustainable world* . New York, N.Y. : Broadway Books.