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STEM in Library

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STEM in an Elementary Library: Does it impact student interest?

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Introduction

In today's 21st century global economy, the United States must be a leader in scientific and technological innovations. "STEM" is an acronym for science, technology, engineering, and mathematics. Students need to develop their capabilities in science, technology, engineering, and mathematics (STEM) education to levels far beyond what was considered acceptable in the past (National Science Board, 2007). The problem is there is a shortage in STEM graduates, especially among women and minorities. Numerous attempts have been made to increase student interest at various educational levels.

Educators at all levels agree that a library makerspace can be an ideal base for STEM explorations (Meyer, 2017). In 2011, three goals established by the National Academy of Sciences include expanding the number of students who pursue advanced degrees and careers in STEM fields, expand the STEM-capable workforce, and increasing participation of women and minorities in the STEM workforce. The library is in the perfect position to target all students, not just those who will pursue postsecondary education or careers in STEM or STEM-related fields. By targeting all students, our society will better prepare citizens to face the challenges of a science and technology driven society (National Research Council, 2011).

The following research question will guide this investigation of the impact STEM education has on student interest.

1. For students participating in STEM activities in the library, does interest in STEM change over the course of the school year?

   a. Is there more of an interest change in female students?

   b. Is there more of an interest change in African American and Hispanic

Review of Literature

Numerous studies have been conducted to determine a common definition of STEM and identify barriers educators face with STEM integration. Researchers believe that a common definition will assist policy makers with implementing STEM in education. In 2012, a study was conducted by Breiner, Harkness, Johnson, and Koehler, asking the research questions, "What is STEM?" and researchers concluded that "whatever the solution is to this dilemma, time is rapidly progressing, and we, as a nation, are falling behind our global counterparts so all discussions among stakeholders related to STEM are worthwhile (p. 10)."

A case study on STEM integration identified frequent challenges in implementing STEM education, including staffing/qualified teachers, funding, training/professional development, and curriculum (Roehrig, Moore, Wang & Park, 2012). Gaining deeper insight on the additional benefits of STEM education may encourage educators and policy makers to implement STEM education in K-12 schools (Berry, Reed, & Ritz, 2004).

Researchers need to move on from trying to find a universal definition of the term STEM and focus on STEM integration. Past studies on STEM integration have been conducted with small pilot programs or after school programs. Little research has been conducted to separate K-5 education from K-12 grade levels. Ultimately, the implementation of STEM education at the elementary level may be the catalyst needed to prepare students for the 21st century workforce and catapult America back to the top of the global innovative and technological market (Tolliver, 2016).

Librarians continually search for ways to engage students in thinking, creating, sharing, and growing; therefore, the partnership of the science educator and librarian to encourage these skills is quite powerful (Julian & Parrott, 2017). There is a growing need for school library professionals to define their roles in promoting STEM in library and information sciences, education, and STEM learning (Subramaniam, Ahn, Fleischmann, & Druin (2012).

Proposed Study

The purpose of this quasi-experimental study is to examine the impact of STEM activities on student interest level in STEM. The independent variable in this study is introducing hands-on STEM activities in the library. Each marking period a STEM unit will be taught in the 45 minute 5th grade library resource rotation.

Subjects: The subjects in this study will be students from two different K-5 elementary schools located in suburban Virginia. Both schools consist of similar demographics, number of total students and are located within two miles of each other.

Instrumentation: A Likert scale questionnaire created by Dr. Masoni is the instrument used in the study. Answers will be converted to their numerical equivalents using a five-point scale (Masoni, 2015).

Procedures: A pre-test, post-test control group design will be used in this study and the intervention will take place over the course of the school year. The intervention will be STEM activities in library lessons. The librarian participating in the intervention will attend STEM training on professional development days. Parent permission forms and student assent forms will be sent home. The participants in both the control and intervention groups will be administered a pre & post-test questionnaire to collect data. There are minimal risks associated with the questionnaire.

Data Analysis: Results of the student survey will be analyzed by standard data analysis. This study will assess the effectiveness of the intervention by using a pre-test and post-test design with a main goal to explore cause and effect.

Limitations identified include the small number of participants from one elementary school. Also this will be the first time the librarian will be teaching the STEM lessons after only one day of training. Other factors such as socioeconomic status or the cultural vocabulary used in the questionnaire, anticipated low return rate of permission forms, student absence on instructional days and mid-year student transfer to or from another school could all could impact the data.

Future Research

Future research should be conducted that samples a greater population, track the progress of students over the course of several years to see how students' STEM interest changes over time, and examines the effects of early STEM integration. Additional qualitative studies should be conducted to identify the factors that enable a lack of interest in STEM in females, African American, and Hispanic students. Future research is needed to understand how best to connect young people to library resources around STEM content areas.

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