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Evidence in Action

A K20 Center Research Brief

Career Exploration through Experiential Learning - Forensics

Yanowitz, K. L.
2016

Introduction

The study examines how a short, 2-day forensic science summer camp influenced middle and high school students approximately one year after participation. The author designed the research in informal science education (ISE), noting that ISE experiences "grab learners' attention, provoke emotional responses, and support direct experience" (p. 916) and can complement school-based science, which is often constrained by curriculum and testing.

The camp was implemented in rural communities, where often there is a lack of access to science museums or other ISE settings. The article highlights that "many rural children are not exposed to the [various] ways in which STEM is practiced in the world" (p. 917). The camp aimed to fill this gap by providing hands-on, inquiry-based STEM experiences to students from predominantly high-poverty, rural districts.

The study addresses a key gap in the literature: limited research on long-term impacts of short-term, non-selective science camps, especially in rural contexts. The purpose was to determine whether a brief, intensive camp could influence students' science self-efficacy and continued engagement in STEM activities over the following year.

Methodology

Research Design:

The study used a pre-post-follow-up design. Students who participated completed surveys before the camp, immediately after, and again approximately one year later. Measures included science self-efficacy, continued STEM engagement, and open-ended responses about lasting impact. No control group was used.

Sample:

Total participants: 124 students across two summers (66 in year one; 58 in year two).

"Over the course of two summers, 124 students participated in the program" (p. 921).

Follow-up respondents: 66 students (53% response rate).

Grade levels: 7th-12th grade, with most in grades 7-10.

Demographics: 67% female, 33% male; 73% White, 18% African American, 6% Asian.

Setting: Students came from 27 school districts in a rural, high-poverty state.



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Intervention Descriptions:

The intervention was a 2-day forensic science summer camp delivered on a university campus.

What students did

Students worked in small groups to solve four crime scenarios using hands-on STEM investigations. Activities included:

- Fingerprint analysis
- Soil composition testing
- Forensic entomology
- Microbiology and bacterial staining
- DNA extraction and PCR
- Robotics and coding

Students developed hypotheses, collected and analyzed evidence, and presented conclusions based on their research.

Academic focus

The camp integrated multiple STEM domains—biology, chemistry, physical sciences, environmental science, and technology—through an inquiry-based forensic science context.

How the intervention was delivered

- Small groups of 10 students per classroom
- 3-4 teachers per classroom
- Inquiry-based, student-centered instruction
- Hands-on laboratory modules
- Social, collaborative learning

Who implemented the intervention

- Middle and high school teachers who had completed professional development, supported by university STEM faculty.

Dosage:

Students participated in 4 crime-solving modules lasting a total of 14 hours. This suggests that each module was about 3.5 hours in length.

Total Dosage summary:

- 4 instructional modules
- 14 total hours of hands-on STEM learning



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Data Analysis:

Quantitative: Repeated-measures ANOVA for self-efficacy; one-sample t-test for STEM engagement.

Qualitative: Inductive content analysis of open-ended responses, with high inter-rater reliability ($\kappa = .8-1.0$).

Results

Self-Efficacy

Self-efficacy increased significantly from pre-camp ($M = 4.2$) to post-camp ($M = 4.5$). This increase was maintained one year later ($M = 4.5$).

Continued STEM Engagement

Students attributed engaging in an average of 2.1 additional informal STEM activities during the academic year to attending the camp. Activities included reading science books, visiting museums, watching science shows, and seeking out other STEM opportunities.

Perceived Long-Term Impact

88% of students reported the camp had a lasting impact.

Qualitative themes included:

- Increased STEM knowledge (45%)
- Enjoyment/fun (31%)
- Influence on future plans (22%)
- Greater interest in STEM (16%)
- Social benefits (14%)
- Increased self-confidence (10%)

Application into Practice

Schools and districts can use this model to provide high-impact STEM enrichment—especially in rural or high-poverty contexts.

Action Steps for Implementation

1. Use an engaging, real-world theme (e.g., forensic science) to anchor interdisciplinary STEM learning.
2. Structure learning around inquiry and problem-solving, allowing students to generate hypotheses and analyze evidence.
3. Organize students into small groups (3-4 students) to promote collaboration and peer learning.
4. Provide hands-on laboratory experiences across multiple STEM domains.
5. Train teachers beforehand so they can confidently facilitate inquiry-based modules.
6. Plan for 14 hours of STEM engagement.



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7. Prepare self-contained modules so that students can rotate through multiple STEM experiences.

Work Cited

Yanowitz, K. L. (2016). Students' perceptions of the long-term impact of attending a "CSI science camp." *Journal of Science Education and Technology, 25*(6), 916-928.