4-H Volunteer Educators’ Pedagogical Practices in 4-H STEM Projects

What pedagogical practices do adult volunteer educators use to facilitate STEM education and how do they afford and/or constrain youth learning?

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Introduction

Volunteer Educators

Adults fulfilling volunteer positions bring diverse experiences, abilities, and values. Volunteers develop programs, select and adapt curriculum, and facilitate activities; thus their pedagogical practices become primary contributors to program quality and, ultimately, youth outcomes.

Science Inquiry + Engineering Design

Design-based science is a learner-centered pedagogical model that integrates science inquiry with engineering design. This model is used by 4-H Junk Drawer Robotics.

Methods

Case study of three sites
Final data corpus consisted of 17 field notes (with 139 minutes of video and 846 photographs), 7 educator interviews (273 minutes), 3 youth focus groups (130 minutes). Analyzed data for common trends in pedagogical practices and sought to explain these patterns through interviews with the educators.

Findings

6 practices emerged; amount of time varied.
Time spent in design & build: 46% by Site A, 81% by Site B, and 11% by Site C; but contrast with lecture: 7% by Site A, 2% by Site B, and 22% for Site C.

Practices influenced youth learning.
These practices afforded and/or constrained opportunities for youth to learn.

Two primary explanations for the variation.
• adaptations in response to structural and curricular constraints.
• self-identification with a field of engineering.

Lecture
• Learning: STEM content

Demonstration
• Learning: STEM content and tool competency

Learning Activity
• Learning: STEM content and creativity

Group Sharing
• Learning: STEM content, design practices, tool competency, creativity, social connection, and resiliency

Design & Build
• Learning: STEM content, design practices, tool competency, creativity, social connection, and resiliency

Scripted Build
• Learning: tool competency

* Three in green were included in the curriculum, those in blue were not.