

The Impacts of Implementation Frequency on Youth Science Literacy in 4-H Club Settings

UC ANR Strategic Initiative: Increase Scientific Literacy

Introduction

There is a well-recognized need for improved science literacy among K-12 youth in the United States. Nonformal science education programs like 4-H can complement school-based education in helping to achieve this desired outcome. Theoretically, there are several factors that contribute to the success of nonformal science education programs including:

1. Well-designed curricula
2. Effective professional development
3. Research-based pedagogical methods
4. Delivery dosage (frequency, duration, intensity)

Various studies have demonstrated the impacts of the first 3 factors on program success, however, relatively little is known about how best to schedule and deliver programming to maximize positive impacts on science literacy among young people.

To better understand the impacts of programming dosage, it is necessary to use an iterative approach to parse out contributing variables and test their individual and combined effects on outcomes of interest.

For the purposes of this pilot project, we addressed one component of programming dosage: intra-meeting interval length (or time between exposures) as a measure of frequency. We hypothesized that differences in intra-meeting interval length would impact changes in outcomes related to science literacy, however, this hypothesis was non-directional.

Project Aim

The intent of this pilot research project is to examine the impacts of differing intra-meeting interval lengths in nonformal science programming on science content knowledge, science process skills, and attitudes toward science among 4-H youth participants.

Methods

Recruitment for the project focused on 4-H community club members in grades 4th through 6th and adult volunteers from the central coast Counties of Santa Cruz, Monterey and San Benito California.

Five project groups were formed from enrolled youth. Of these, three groups (18 youth total) were assigned to the three-week sequence and two groups (22 youth total) were assigned to the one-week sequence. The one-week sequence groups met weekly for 6 sessions of programming over 6 weeks. The three-week sequence groups met every three weeks for 6 sessions of programming over 18 weeks.

Programming content was consistent between groups. Each group completed the Youth Development through Veterinary Science curriculum. Duration of sessions was also held constant between groups. Program facilitation was also held constant by providing consistent professional development and frequent assessment of volunteer leaders (see side bar). Pre-program and Post-program assessments were collected from all youth. Only data from youth who attended all 6 program sessions will be included in analyses.

Results

Data are currently being analyzed by the project team. The results from this effort will be used to inform further research that will, ultimately, help inform the development of recommendations for effective science programming in nonformal education settings. See table for details on the quantitative and qualitative data collection tools utilized:

Tool	Description	Outcome
Content Survey: Pre-Post	Free-response.	Scored using a rubric designed to measure youths' understanding of key concepts.
Test of Basic Science Processes (BAPS): Pre-Post	Multiple-choice.	Measures application of science process skills.
Common Instrument: Pre-Post	Multiple-choice.	Measures interest and opinions regarding science/ technology.
Object Description: Pre-Post	Free-response. Written descriptions of novel objects.	Measures observations, comparisons and inferences.
Integrated Veterinary Science Tool: Post	Scenario-based problem solving tool.	Measures application of curriculum concepts, recording and reasoning skills.
Focus Group Interviews	Post-project interviews with all participants.	Qualitative data

4-H Volunteers

One of the goals of the project was to insure that program implementation was as consistent as possible across treatment groups. To accomplish this, several methods were employed:

1. Volunteers attended three professional development meetings during the course of the project where they received instruction on the use of inquiry, reflective practice, and curriculum content.
2. Volunteers used self-report tools at the end of each meeting to operationalize reflective practice.
3. All program sessions were observed to track program fidelity. The observer tracked whether the inquiry based and hands on learning components of the curriculum were being implemented according to protocol as well as levels of youth engagement and youth participation.
3. Program fidelity was assessed by adding up scores for the various program components to yield a total fidelity score for each volunteer. Overall program fidelity ranged from 75% to 95%.

Conclusions

Professional development is enhanced with tools for reflective practice and a schedule that facilitates such practice over time. Capturing program fidelity, something that is seldom emphasized in evaluating youth programs, is vital to assess whether the program is actually being delivered as intended.

Quotes from Participating Volunteers:

"The professional development helped us to know how to work on our open ended questions... that was a whole different way of relating to the kids."

"So what made this different, was the actual training. Showing us constructivism vs what is memorized....The tools you gave us, I use them for everything. I see how those tools can be used throughout our 4-H group, and that was critical in understanding how we can make each meeting better."



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