

Building Science Literacy in 4-H Youth through Science of Agriculture Challenge



Kendra Flood and Dr. Kevin Curry, Jr.
Department of Agricultural Economics, Sociology, and Education

Introduction

According to Brooks and Loevinsohn (2011), the global effect of climate change on agriculture production has revealed a set of environmental, demographic, social, and economic drivers that are generating food insecurity around the world. To address complex and global issues like climate change, it is essential to have a scientifically literate population who can participate in solving societal problems (National Research Council [NRC], 2007). This study explored how the 4-H Science of Agriculture Challenge impacted the science literacy of its competitors.

Framework

The 4-H Science of Agriculture Challenge is an experimental learning program that challenges youth participants to investigate ways to solve agricultural related issues by working with mentors and agricultural industry leaders (Pennsylvania Extension, 2017). To determine the change in science literacy we utilized the Science Literacy Assessment (SLA) (Fives et al., 2014) that measures motivation, and beliefs in science literacy in addition to the analytical skills of interpreting scientific data present in most measures (Gormally et al., 2012; National Academies of Sciences, Engineering, and Medicine, 2016, Chapter 2).

Methodology

The population of this study was 4-H members who participated in the 2019 Pennsylvania 4-H Science of Agriculture Challenge. Researchers invited all 4-H members who participated in the competition to take part in the study. The 4-H leaders administered the pre-test to participating 4-H members during one of their meetings prior to any preparatory meetings as a team. Immediately after participants presented their project at the 4-H Science of Agriculture Challenge, they completed the science literacy post-test. Both the pre-test and post-test were administered online via Qualtrics. A total of 45 4-H members registered for the event and asked to participate in the study. Each construct of the questionnaire demonstrated reliability (science knowledge: KR-20 = .83, value of science: $\alpha = .80$, self-efficacy for science literacy: $\alpha = .72$, personal epistemology of science: $\alpha = .88$) (Fives et al., 2014). Figure 1 illustrates the four constructs.

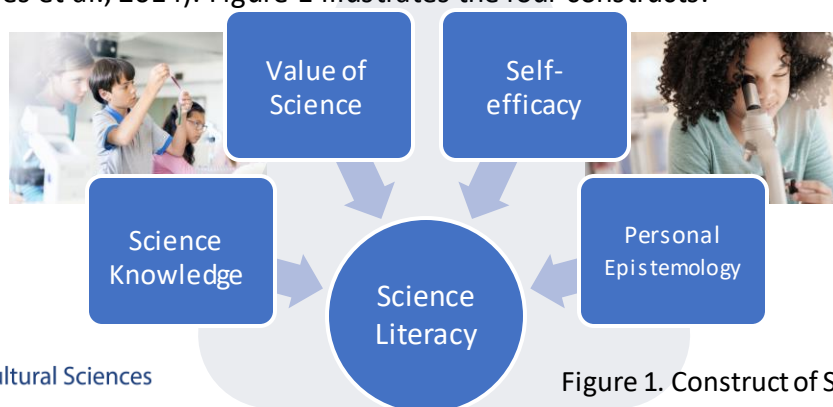


Figure 1. Construct of Science Literacy.

Findings

Knowledge was measured using a score out of 26 on a science content multiple choice questions. Value of science was measured on a 6 item 5-point Likert scale (1=Very boring/not at all useful/not at all important, 5=Very interesting/very useful/very important). Self-efficacy was measured on the 8 item 5-point Likert scale (1=strongly disagree, 5=strongly agree) on the beliefs of what the student thinks they can do in science. Beliefs were measured on the 11 item 5-point Likert scale (1=Strongly Disagree, 5=Strongly Agree) on their beliefs about science. Table 1 shows the scores of each construct.

Table 1. Scores of Each Construct.

Construct	Test Type	M	p-value
Knowledge	Pre-test	0.60	.427
	Post-test	0.59	
Value of Science	Pre-test	4.03	.063
	Post-test	4.20	
Self-Efficacy	Pre-test	4.13	.104
	Post-test	4.28	
Beliefs	Pre-test	3.67	.072
	Post-test	3.85	

Conclusion/Recommendations

By having students participant in pre-and post-test questionnaires, researchers were able to examine participants' science knowledge, value of science, self-efficacy for science literacy, and personal epistemology of science. Our findings show no significant difference in students' literacy skills after completing the challenge. It is recommended:

1. Pennsylvania 4-H study if and how they can modify the training and competition logistics to increase science literacy skills in youth participants
2. Further use qualitative research to probe coaches and competitors for the impact of the competition on science literacy skill development in the quest for a more scientifically literate population

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