Rain Garden Curriculum in School Based Agricultural Education

Introduction

With the host of environmental challenges our planet faces in providing for the estimated 9 billion people by 2050, it is now more important than ever to have an environmentally literate population. Hollweg et al. (2011) defined an environmentally literate individual as one who, “both individually and together with others, makes informed decisions concerning the environment; is willing to act on these decisions to improve the well-being of other individuals, societies, and the global environment; and participates in civic life” (p. 2). More specifically, authors characterize environmental literacy (EL) in four components: ecological knowledge, affect (environmental attitudes and sensitivity), cognitive skills (issue identification and action planning), and behavior (McBeth, Hungerford, Marcinkowski, Volk, & Cifranick, 2011; Stevenson, Peterson, Bondell, Mertig, & Moore, 2013). Agricultural education is no stranger to EL principles. In [state], high school agricultural education programs include a diverse range of environmental science concepts in its curriculum offerings. From forestry to soil science, and from aquaculture to wildlife management, agricultural education can be an effective tool to expose students to environmental issues, and improve their EL.

Theoretical/Conceptual Framework

Hungerford and Volk (1990) argue knowledge alone is not enough to produce environmentally responsible citizens, but that educators must impact three additional variables to affect behavioral change. These variables are summarized in the Environmental Behavior Model, the theoretical frame for the present study. Aspects of this model are reflected in contemporary definitions of EL, which include environmental knowledge, affect (sensitivity and attitudes), cognitive skills (issue analysis and action planning), as well as behavior (Stevenson et al., 2013).

Methods

The present research measured the outcomes of a unique vehicle to teach the importance of managing storm water in urban/suburban environments. Utilizing project based learning, each student had the opportunity to install a rain garden on their school grounds, and offered summer work for the [county] soil and water conservation district installing rain gardens during the summer all across the city. During the spring of 2017, students in four classes (Earth Science, Horticulture, Agri-science, and Applied Science) from teachers in four different schools in [county, state] were exposed to a five-day rain garden educational unit. To measure the impact of the intervention in deepening student understanding and invoking changes in environmental perceptions, a measure of EL was captured pre-and post-intervention. This is a well-researched construct in environmental education (Hollweg et al., 2011), and the present study aimed to contribute with agricultural education as an audience. This research addresses priority five of the AAAE National Research Agenda: Efficient and Effective Agricultural Education Programs. Specifically, it answers the call for the evaluation methods, models, and practices effective in determining the impacts of educational programs in agriculture and natural resources (Roberts, Harder, & Brashears, 2016).

Findings

The rain garden curriculum intervention was implemented across four different courses with a total sample of n = 75 students. The sample was diverse (35% Black, 29% Hispanic/Latino, 12% Caucasian), and mostly underclassmen (42% Freshman, 30% Sophomore). Out of a possible 17 points, students reported higher knowledge scores at posttest (9.90) than at pretest (7.63). The gain scores in attitudes (3.89-pre, 3.95-post), cognitive skills (7.59-pre, 6.7-post), and behavior (environmental 3.78-pre, 3.74-post; activities 1.97-pre, 2.01-post) were negligible. A paired samples t-test revealed a statistically significant difference (t = 5.45, p < .00) between pre and posttest with regard to content knowledge (see Table 1), with a mean increase of 2.51 points (15%) on the curriculum assessment. No other significant increases were found for the additional constructs of EL (affect, cognitive skills, or behavior).

Table 1
Paired samples differences between pre/post assessment

	df	*M*	*SD*	*t*
Knowledge	40	2.51	2.95	5.45*
Affect	47	-.03	.60	-.37
Cognitive Skills	33	-.69	3.51	-1.15
Environmental Behavior	46	-.02	.62	-.19
Activities Behavior	46	.01	.54	.17

Note: *$p < .05$

Implications

This study investigated the effectiveness of the [rain garden] curriculum on the EL of high school students. Although the curriculum clearly worked in significantly improving the content knowledge of students with regard to rain gardens, the same was not the case for other critical aspects of environmental literacy. It should be noted post assessments were completed at the end of the academic year, and not upon completion of a sustained summer work experience. Perhaps a five day curriculum intervention is not potent enough to move the needle on behaviors and the affective domain of EL. Further exploration with a larger sample of teachers/content areas is warranted to determine differences between SBAE and general science audiences. Additional inquiry with qualitative methods would also yield insight into the lack of increase in attitudes, cognitive skills, and behaviors.

References

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