

Aquatic Invasive Species Professional Development Improves Teacher Environmental Attitudes and Perceived Knowledge Long-term

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Introduction

One of the main goals of environmental education is to influence learner awareness and behavior towards the environment in order to protect and improve it (Frantz & Mayer, 2013; Hungerford & Volk, 1990). The importance of environmental education in our nation is well warranted due to increasing environmental degradation and decreasing levels of adolescent contact with nature (Wells & Lekies, 2006). In fact, governmental policies and grass-root movements have increased the recognition of the the importance of environmental literacy in the school system by implementing programs in education such as ‘Agenda 21’ and the ‘No Child Left Inside Act’ (Castleberry, Green, & Larson, 2010). To assist in the creation of good stewards of the environment and natural resources, Priority 4 of *The National Research Agenda in Agricultural Education* calls for the design, development, and assessment of meaningful learning to properly educate citizens of the 21st century (Roberts, Harder, & Brashears, 2016). Professional development can help teachers achieve this goal by creating a paradigm shift in how they educate their students about the environment (Robottom, 1987). Efforts to prepare teachers to develop curriculum that effectively guides students’ critical thinking about environmental issues is essential in shaping positive social and environmental values, behaviors, and attitudes.

Using a long-term follow-up study, this research examines the effectiveness of a week-long teacher workshop in environmental education that has a 10-year history. Specifically, this research attempts to understand the effect of this experience in changing participants’ environmental management attitudes, improving their knowledge of aquatic invasive species, and increasing their integration of available aquatic invasive species curricula.

Theoretical Framework

The Elaboration Likelihood Model (ELM) of Persuasion was used as the framework for this study. According to the ELM, individuals process information through either the central or the peripheral route (Petty & Cacioppo, 1986). Mental processing done through the central route contains in-depth thought and careful consideration of the information presented, impacted by an individual’s knowledge and experience. Central processing leads to long-lasting attitudes over time and is predictive of behavior (Petty & Cacioppo, 1983). Providing individuals with motivation to process a message, and by directly involving them in the message, increases the likelihood that they will use the central processing route. The professional development workshop in this study is designed to provide motivation and engagement in issues regarding invasive plant management, creating lasting knowledge and positive attitudes towards this construct by provoking teacher participants to use central processing in the ELM.

Methodology

The targeted population of this long-term follow-up study was all past participants of the workshop. A convenience sampling method was used through 250 electronic surveys sent to past participant’s emails. Seventy respondents partially completed the questionnaire and 44

individuals responded fully. Participant knowledge of aquatic invasives and management were tested through 25 survey questions consisting of true/false and multiple-choice questions composed by expert external evaluators. Six questions were asked to determine the participant's perceived knowledge of aquatic invasive management before the workshop, immediately after the workshop, and at the time of the survey through a five-point, Likert-type scale (*strongly disagree, disagree, neither agree nor disagree, agree, strongly agree*). Lastly, participants were asked four questions regarding their attitudes towards the use of chemical, mechanical, biological, and physical methods of controlling aquatic invasives before the workshop, immediately after the workshop, and at the time of the survey, using the same five-point, Likert-type scale. Paired *t*-tests were used to determine if significant differences existed between participants' perceived level of knowledge before the workshop, upon completion of the workshop, and at the time of the survey. Paired *t*-tests were also used to determine if significant differences existed between participants' attitudes of using a variety of control methods before the workshop, after the workshop, and at the time of the survey.

Results & Discussion

Knowledge scores indicated that over half of participants ($n=25$) answered 72% or more of the content knowledge questions correctly, demonstrating a moderate performance in participants' actual long-term content knowledge retention. However, significant results were found for after workshop and before workshop variance in participants' perceived knowledge of invasive plant management ($p<.001$). The paired *t*-test showed insignificant results for after workshop and current scores ($p=.529$). A paired *t*-test showed significant results for after workshop and before workshop variance in participants' attitudes towards using a variety of methods to control aquatic invasive plants ($p<.001$). The paired *t*-test showed insignificant results for after workshop and current scores ($p=.385$). The significant pre- and post-workshop results support a change due to the workshop experience, while the insignificant results between post workshop and current scores demonstrated that participants retained their perceived knowledge or attitude from the time they experienced the workshop to the time of the survey. This data supports the ELM theory in which individuals who experience central processing change perceptions and attitudes immediately after the experience and then maintain the perceptions and attitudes long-term.

Conclusions & Implications

The importance of increasing the public's knowledge and shifting attitudes and actions towards the use of best environmental practices is crucial in an effort to stop environmental degradation and to begin to repair environmentally-sensitive ecosystems. K-12 education that includes environmental-based curriculum is one strategy to address this need. Curriculum design similar to this study's workshop that focuses on localized, real-world issues, supported through inquiry-based and problem solving techniques, has been shown to make the largest impacts in student achievement, attitude change, and behavior change (Ernst & Monroe, 2004; Glynn, 2000). It is critical that teachers not only develop the skills to implement this type of curriculum, but also that teachers themselves demonstrate positive attitudes and behaviors in best environmental management practices. In an effort to achieve these goals, continued research on teacher professional development in environmental education must be conducted, particularly research that addresses actual behavior changes.

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