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H2O to Go! Connecting Youth to Research in Environmental Issues

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Abstract

H2O to Go! is a dynamic residential program in which high school students are immersed in a summer institute of learning that is a highly replicable model. H2O to Go! provides a learning experience focused on studying water-related environmental issues. During a week-long program, students work with scientists and educators in the field of environmental research to learn about the research process and the interconnectedness of South Florida water systems along with the corresponding environmental issues. Connecting students with various research centers and local, state, and governmental agencies that study components of a local watershed (such as the Riverwoods Field Lab on the Kissimmee River) forges an understanding of the system by focusing on the interrelatedness of its parts. H20 to Go! provides a working model for other university, school and environmental center partnerships. The replication possibilities for this model can be applied to any university conducting research on environmental issues. With the increasing competition between universities for quality students, there are significant recruitment gains in opening university opportunities to students contemplating post-secondary education programs. The H2O to Go! presentation will showcase the educational gains and outcomes of the program.

Keywords: *H2O to Go!; environmental research; collaborative partnerships;*

1. Introduction

Water quantity and quality, as in many areas of the world, are two of Florida's most critical environmental issues. The draining of South Florida's fresh water aquifers, the pollution from large agricultural processes such as those involved with citrus and sugar cane farming, and issues associated with septic systems and flooding all contribute to water complexities on which all Floridians should be well versed, but are not adequately addressed in our classrooms [1]. For example, current methods of teaching science generally involve a traditional classroom where students receive often disjointed parcels of pre-packaged content knowledge through direct instruction and planned activities [2]. This approach neglects the need for students to develop a deeper understanding of the practices of science, and how practicing scientists do their work, and often can alienate and disengage students. The challenge lies in finding ways to both build students' environmental literacy and potentially cause shifts in cultural beliefs and practices that may be required if the goals of environmental education are to be realized. Since the mid-1990s, an educational approach called Place-Based Education (PBE) has been attempting to achieve just this by directing at least part of students' school experiences to local phenomena ranging from culture and politics to environmental concerns and the economy. Emphasizing hands-on, real-world learning experiences within a context that students are familiar with, this approach to education increases academic achievement, helps students develop stronger ties to their community, enhances students appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens [3]. Community vitality and environmental quality are improved through the active engagement of local citizens, community organizations, and environmental resources in the life of the school [3]. PBE provides opportunities for students to think independently (inquiry), collect, analyze, synthesize and evaluate information (data), address community concerns (civics) and create knowledge and solution-based ideas (innovation). PBE pedagogy shifts the process of knowledge transfer from a linear process (sage to student) to a team of collaborative learners engaged in inquiry based learning [4]. The internalization of the inquiry process embedded in PBE results in learning how to think as opposed to just learning content or what to think. PBE learning is process based. A process that formulates questions, tests solutions and assesses results.

Recently, Florida Atlantic University's Pine Jog Environmental Education (FAU Pine Jog), one of the oldest environmental education centers in the US, completed a strategic planning process resulting in new program directions. One conceptual shift is the connection of environmental education programs to ongoing environmental research projects. In this shift, a cadre of new programs was created that emphasize strong academic learning, create lasting social relationships and immerse young learners in the natural environment in which environmental research is being conducted. FAU Pine Jog refers to this model of programming as Academic Social Immersion (ASI); a model built on the pedagogy of Place Based Education (PBE). The goal is not only to deliver a strong environmental education program designed to increase environmental literacy and change behavior and attitudes but also to connect participants to each other and to field-based professionals working in E-STEM fields. Research shows that residential EE programs provide greater gains in students' environmental literacy than a classroom experience [5, 6]. The immersion of students in such a program can demystify the college experience and provide opportunities of access to educational avenues previously undiscovered. Most importantly, scientists have the opportunity to share their passion with the next generation, increasing the probability of future interest in the work to which they have dedicated their lives. This model differs from other residential immersion summer camps by combining "fun" outdoor experiences such as kayaking and snorkeling with scientific inquiry activities alongside professionals in the field.

2. The Program

The H2O to Go! Program is a partnership between Pine Jog Environmental Education Center (FAU Pine Jog) with Harbor Branch Oceanographic Institute (HBOI) and the Florida Center for Environmental Studies' Riverwoods Field Laboratory (Riverwoods). The purpose is to provide a unique learning experience in environmental issues investigation for high school aged students from South Florida school districts based on research being conducted in these university research centers. This program looks at connections between fresh and salt water systems and the impact of humans on both. During this week-long residential program, students work side-by-side with scientists who are working in the field of environmental research to learn about the research process, how scientists do their work and the interconnectedness of South Florida water systems and the environmental issues facing them. All of the activities are designed to heighten awareness and provide knowledge as to the complexity of challenges South Florida faces in dealing with the protection of our water resources. This awareness and knowledge serves to inspire more responsible personal behavior as it relates to personal water stewardship and the protection of water resources.

All students who participate in H20 to Go! earn dual-enrollment credits with FAU. During the five day, four night residential experience, students meet researchers, scientists, professors and educators at the following locations:

FAU MacArthur Campus: Students are based at the FAU MacArthur campus in Jupiter, Florida, where they are introduced to the basics of Everglades Ecosystems and the historical alterations that have affected them. Topics include geology and hydrology, endangered species, chemistry and restoration of this unique watershed. Each day participants are transported to specific Everglades research areas or to relevant university or environmental agency sites.

FAU Riverwoods Field Laboratory: Students are immersed in wetland ecology, learning about the Kissimmee River restoration project and native flora and fauna. Aboard the Kissimmee Explorer, a 20 passenger pontoon boat, students work alongside trained scientists and researchers to participate in educational activities that focus on real life research on the historic and restored river and watershed. Students learn how to test water quality parameters including dissolved oxygen, pH and clarity. They also learn how to identify native and exotic wetland plants. In addition, by conducting diversity and abundance bird surveys, students track and identify native wetland birds that have returned to the restored Kissimmee River.

FAU Harbor Branch Oceanographic Institute: Students work with HBOI research scientists and engineers who are working on coastal ecosystem health research, sea-life, aquaculture, and most recently the production of electricity utilizing electric generators powered by the movement of ocean currents. Topics include research projects on the conservation of land and environmental issues facing the Indian River Lagoon, and an understanding of how to provide solutions to related environmental problems in our community.

Arthur R Marshall Loxahatchee National Wildlife Refuge and Grassy Waters Nature Preserve: Students compare and contrast the aquatic environments while continuing further data collection via

canoe and kayak expeditions. This further develops understanding of this delicate ecosystem in the heart of Florida. Students have the opportunity to meet with lead scientists from the South Florida Water Management District who introduce them to LILA (the Loxahatchee Impoundment Landscape Assessment) Living Laboratory to learn about cutting edge research on wetland systems. During the week, students keep a field journal in order to keep notes and process the information that they have learned each day. As a culminating project, students prepare a 20-30 slide powerpoint presentation on what they have learned, which they are required to present to a local community group or to other students within their school.

3. Results

All students in the program are required to complete a pre-test prior to program implementation and a post-test upon completion of the program. Of the participants in the 2018 program (n=123) only one scored a passing grade (<60%) on the pre-test and the class average was 14%. However, by the program's completion, less than one week later, all but 3 students earned a passing grade. More than half of the students (n=63) scored greater than 90% on the post-test, with a class average of 87%.
In addition to the pre- and post-test, students completed a feedback survey. Survey results suggest that students valued the program as shown by their responses to the survey items listed in Table 2.

Table 2. Sample of feedback from student survey regarding the program (n = 121) where 1 is strongly disagree and 5 is strongly agree.

Item	1	2	3	4	5
I learned valuable information through this course.	0	0	1	26	94
The course topics were facilitated in an interesting and stimulating manner.	0	0	8	49	64
I would recommend H2O to Go! to fellow students.	2	1	5	18	95

In the qualitative section of the survey students indicated that earning college credit and exposure to scientific research were two main motivators for enrolling in the program. Making friends was the next most often reason cited for enrolling. When asked what part of the program they enjoyed the most, common answers were learning about Florida environmental issues and gaining real-life experience with environmental studies.

4. Discussion and Conclusion

One of the main goals of H20 to Go! is to connect student learning to the place in which students live. In 2000, the United States Congress enacted the Comprehensive Everglades Restoration Plan (CERP): the largest hydrologic restoration project undertaken in the United States and possibly the world. CERP will result in a demand for related environmental occupations and researchers. With the Everglades in their backyard, students are making the connections between academics and the world around them.
As was evidenced by the scores on the student pre-tests, students knew very little about the basic workings of Florida's water systems and the environmental issues that face them, prior to participating in the program. The improvement in the scores for the post-tests attest to the success of this program.
This success has led to program replication with additional courses, all of which are fee-based covering both direct and indirect. FAU Pine Jog now offers *H20 to Go! Restoration* in which students focus more on restoration projects underway in South Florida, and *H20 to Go! Sea Level Rise*, in which students learn about the risk that our coastal communities face as a result of rising sea levels due to climate change. While FAU Pine Jog's H20 to Go! programs focus on environmental issues in South Florida, the success of this program illustrates the value of replication to focus on any local environmental or science issues.

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