Catherine A. DiBenedetto
Clemson University
251 McAdams Hall
Clemson, SC 29634
864-656-0296
cdibene@clemson.edu

Natalie K. Ferand
University of Florida
Graduate Assistant
310 Rolfs Hall
Gainesville, FL
214-517-3335
nferand@ufl.edu

Andrew C. Thoron
Abraham Baldwin Agricultural College
ABAC 8, 2802 Moore Hwy, Tifton, GA 31793
229-391-5280
andrew.thoron@abac.edu

Getting your Floriculture Curriculum to Bloom

Introduction

Throughout the past decade there has been a focus on career preparation in science, technology, engineering and mathematics (STEM) fields because not enough high-school graduates have been pursuing degrees to fill employment gaps. Further, there has been a general need for students to obtain skills relevant and useful in STEM careers (NRC, 1992). School-based agriculture education (SBAE) programs can help meet the need for STEM skills through training and education of students in and about the agricultural industry (Association of Public and Land Grant Universities (APLU), 2009). The topic and importance of STEM integration related to SBAE has been a common line of research in recent years (Rice & Kitchel, 2018; Smith, Rayfield, & McKim, 2015; Stubbs & Meyers, 2015; Stubbs & Myers, 2016). More specifically, plant science curricula have been observed as a method for practical application of scientific concepts and ideas (Rice & Kitchel, 2018); yet students fail to link the science within agriculture and ornamental horticulture when they explore STEM careers. Exposure to topics related to the ornamental horticulture industry may assist students in associating their experiences with the science interconnected in horticulture careers (Marsh, Cotton, Hashem, & Dadson, 2011) and thus help increase the supply of skilled professionals specifically needed in the horticulture industry. Creating opportunities for teachers to experience similar types of scientific inquiry as is expected of their students is important. Accordingly, given the relationship between teacher and student learning, professional development must be grounded in academic content to affect instructional practices and student outcomes (Jeanpierre, Oberhauser, & Freeman, 2005). The STEM it Up Conference was created to train teachers in STEM-rich concepts within the horticulture/floriculture curricula. This innovative idea program addressed Research Priority 3, a "Sufficient Scientific and Professional Workforce that Addresses the Challenges of the 21st Century" (Stripling & Ricketts, 2016, p.29).

How it Works

The goal of the three-day STEM it Up Conference was to help agriscience teachers learn and think about teaching STEM concepts related specifically to the horticulture/floriculture industry in a new way, by highlighting the science that is embedded in the curricula. Agriscience teachers from around the nation were identified by their state leaders in agricultural education for their exemplary floriculture programs. Identified individuals were then invited to complete an application. A total of 16 participants were selected, with 15 individuals then traveling to Clemson University to participate. Participants learned and applied agriscience within the horticulture/floriculture curricula with focus topics including greenhouse electrical and environmental controls; microgreens propagation laboratory investigation; STEM laboratory investigations in floriculture, floral design techniques; plant and environmental science research laboratories; and industry tours. Curricula were delivered through an inquiry-based, hands-on approach for participants to gain full knowledge and complete the lessons as a student, thus having a deeper understanding of the content, context, and pedagogy. Conference instructors spent time during each session to discuss a plan of action for implementation into the participants' current program/curricula. Participants learned from experienced teacher educators and scientists in the fields of plant and environmental science. They interacted with industry experts and spent time touring research laboratories, greenhouses, a botanical garden, a herbarium, and a wholesale florist to gain a deeper understanding of the horticulture/floral

industry. Curricular materials, several meals, transportation to industry tours, and three-night lodging were provided to participants with grant support from the American Floral Endowment (AFE). Participants were responsible for their travel expenses to and from Clemson University. An evaluation of each individual element of the STEM it Up Conference was completed by the participants through survey design.

Results and Implications

Through the 15 agriscience teachers representing 10 states, an estimated 1250 students will be impacted when the information learned at the STEM it Up Conference is taught in their SBAE programs. When participants were asked why they applied to attend the STEM it Up Conference responses included "there's not a lot of PD for teachers in the floral industry, nor in plant science, so it was a great opportunity. I've never seen anything in floral before and was excited to see what this had to offer"; "I am excited to see how I can better my teaching and teach the science in agriculture at a higher level"; and "I wanted to expand my knowledge in STEM. [I am] learning how to incorporate [agricultural] science projects into my lessons." At the conclusion of the conference participants were asked to comment on their experience. Numerous remarks focused on the high quality of the professional development and how they intended to apply what they learned. One participant said, "I am looking forward to implementing STEM-based science experiments into my class this coming up school year. I am realizing how simple it is to tie in science experiments into my floriculture classes/horticulture. [I am] learning that I need to explain to my students why things are done in the floriculture/horticulture industries." Another participant remarked "I feel better with inquiry-based instruction. I feel confident I can do some agriscience fair experiments and classroom experiments. I was able to showcase my experience. I am happy to try my new skills this year." A third participant noted, "This has been really helpful for someone who is trying to teach horticulture, run a greenhouse, and sell floral designs, with little to no experience. It's been a great opportunity to learn from other people rather than trying to teach myself."

Future Plans

Teacher participants are in the process of implementing the curricular resources and materials provided from the training. The first cohort of the STEM it Up Conference participants were invited to participate in continued research within their SBAE programs to collect data on student outcomes and career awareness. Follow-up qualitative interviews will be conducted to determine if and how the participants are implementing what they learned from their experience in their daily teaching practices. Planning for a second cohort of the STEM it Up Conference is currently in progress with hopes to offer the event annually, if funding sources permit.

Resources Needed

Funds for the conference were provided through a grant from AFE. Total costs were $9,340.00, which included curriculum, the lab investigation resources, seminar notebooks, and electronic materials on USB Drive ($500 per participant @ 15 participants = $7500). Transportation for tours and food costs totaled $1,200.00. Cut flowers and consumable material costs were $640. Additional resources included preparation of curricular materials and laboratory investigations; industry professionals who volunteered their time to deliver tours; faculty and graduate students to present current AFE supported research being conducted at Clemson University; a laboratory and teaching greenhouse for practical application of the curricula and laboratory investigations.

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