

STEM for Southeast American Indian Youth: Kids in the Garden Program

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Nature Study and STEM



- Structured use of the local environment including flora, fauna, interrelationships, and interactions
- Historically, nature was the focus of K-12 science
Handbook of Nature Study - Anna Comstock
The School and Society - John Dewey
- Gardening related projects linked to positive academic gains, improved environmental stewardship or “eco-literacy”, increased motivation and engagement, increased community engagement, and improved health and wellness benefits (Berezowitz et al., 2015; Blair, 2009; Bowker & Tearle, 2007; Johnson, 2013; Laurie, Faber, Malebana, & Van Den Heever, 2012; Lekies & Sheavly, 2007; McFadyen, 2004; Vandermaas-Peeler & McClain, 2015; Waliczek, Bradley, Lineberger, & Zalick, 2000; Wistoft, 2013)

Southeast AI and STEM



- All minority groups are underrepresented in STEM careers.
- AI/ANs are numerically and systematically underrepresented.
- Only one in 150 students who graduate with a Bachelor's degree in science and engineering is AI/AN (National Science Foundation, 2010 and 2011).
- In 2012 only 48 doctorates in the engineering and science fields were awarded to AI/AN doctoral students. The numbers are decreasing (0.3% to 0.5% previous 20 years).
- To advance changes in employment in the United States and in Native Nations, more AI/AN students will have to go into STEM fields.

Barriers to AI and STEM



- (1) Students not seeing science as relevant to them (Brayboy and Castagno, 2008);
- (2) Marginalization of Native Science (Yatchmeneff, 2015);
- (3) Racism and oppression (Welsh, 2008);
- (4) School practices that do not promote contexts for identity transformation (Carlone et al., 2014); and
- (5) Inadequate science and science learning settings (Carlone et al., 2014; Wood et al., 2013).

Recommendations from the Literature



- Native Science must be part of STEM education for AI students
- Project based learning that includes Elders and other community members works best
- Projects that the community needs or wants can benefit learning and appreciation of STEM fields
- Traditional Ecological Knowledge (TEK) and Indigenous Foodways needs to cross pollinate with STEM!

Kids in the Garden Program



- (1) Grant – funded program by Burroughs-Wellcome Student Science Enrichment Program (SSEP) for three years (two years completed so far).
- (2) Goals of program are to encourage minority youth to
 - 1) learn science content, 2) see themselves as scientists, and
 - 3) to pursue science careers.
- (3) Kids in the Garden program focuses on the study of plants, pollen, pollination, and bees for grades 7 -12.
- (4) Two week summer “bee camp” the last two weeks in June and an academic year program on Saturday mornings from 9:30 AM – 12:30 PM in fall and spring. Academic year program focuses on individual science research and presentations and competitions. Research is conducted in teams of faculty, undergraduate students, and middle and high school students.

UNCP Campus Garden and Apiary



- 1/3 of an acre at the Pine Cottage facility on campus
- 9 bee hives of three types
- 4 native bee house – crown bee community garden project, two from gourds
- 40 raised garden beds – 18 beds for vegetables
- Herb garden
- 3 compost bins
- Gourd/pumpkin/squash trellis
- Pollinator garden
- Managed meadow
- Blueberry/strawberry/blackberries
- Tree/shrub border
- Weather station



Research – Education - Outreach

UNCP Campus Garden and Apiary *Partnerships*



- Duke Energy – pollinator gardens in Bladen County, Cumberland Co., and at Robeson Community College/Early College
- UNCP faculty members in Biology, Geology/Geography, Physics, & School Counseling
- Undergraduate students – RISE, Student Social Belonging grant
- Farm Bureau of Robeson Co.
- Bayer Bee Care in RTP
- Greener Coalition – campus club
- Science teachers and graduate science education students



Kids in the Garden and STEM Connections



- Direct observation of natural ecosystems
- Engage students in inquiry learning experiences in natural settings
- Establish learning communities
- Individual research
- Science journals
- Science equipment
- Visit other universities
- Embedded college and career program
- Field trips to other natural areas
- Science presentations and competitions

Results



- Fifty-one students – 45% female and 55% male
- 84% were minority students with 18% African American, 35% Hispanic, 25% American Indian, 5% multi-racial, and 1% Asian
- Higher interest in STEM careers and attending a four-year University
- Enjoy the lab work as well as the field trips
- Creating connections to the community is key



Bees and SE Amer Indians



- Our next steps for Kids in the Garden is to learn more about Lumbee Elder's knowledge about bees and bee keeping
- Learn about the ways that Lumbee families use honey and the honey comb and how that can be incorporated into the Kids in the Garden program
- Encourage more Kids to become interested in bee keeping because bees pollinate collards, cucumbers, strawberries, squash and other foods that Lumbees like to grow and eat (one out of every three bites of food is thanks to a bee).
- Encourage Lumbees to understand that their Traditional Ecological Knowledge about food IS Native Science
- Native Science is part of STEM learning



Next Steps



- Link the Kids in the Garden program to other AI STEM projects at UNCP
- Link the Kids in the Garden program to other gardening programs
- Link with the Lumbee community such as their community garden at the Lumbee Cultural Center
- Develop science kits for schools and families around Traditional Ways of Knowing AND STEM content
- Continue to develop the Campus Garden & Apiary as a community resource that combines research, education, and outreach
- Start a citizen science project around Native bees AND Native Science to educate and involve the public



Gourd necklaces
and native bee
houses from gourds
with Joan Blackwell



Assertions



1. In order for AI/AN students to “see” themselves in STEM careers, traditional knowledge must be acknowledged and honored THE SAME as Western science.
2. Personal science connections are important for ALL students.
3. You need a caring committed team of individuals in STEM AND strong Native community participation (elders, parents, and community resources).
4. Focus on Native Science and teach Western formal science so that students become well versed in both. This may be the key to creating more interest in STEM fields and STEM careers within AI/AN communities.

In Conclusion...



- People need plants, pollen and pollinators. They provide valuable ecosystem services.
- SE American Indians valued native bees long before the honeybee arrived in N. Amer. – tell the stories.
- Once the honeybee arrived, SE American Indians cultivated these bees too.
- Bees need our help as they are declining globally.
- Lumbee Traditional Knowledge about bees and beekeeping as well traditional food creates a bridge between Native Science and STEM.

QUESTIONS?



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