# Using Citizen Science to Facilitate Authentic K-12 STEM Experiences for Pollinator Conservation

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## Background

**Insect biodiversity is essential for functioning ecosystems**

- Play vital roles as pollinators, predators, prey, and herbivores
- Recent studies have noted a 75% decrease in insect biomass and dramatic pollinator declines[1,2]
- Insects are valuable citizen science subjects- they are:
  - Ubiquitous & diverse
  - Easily collected and observed
  - Inexpensive to study

**People want to know how they can help pollinators**

- Citizen science projects can organize concerns into action
- Attitude of the youth toward conservation initiatives is greatly enhanced by outdoor experiences[3]
- The **Kids in the Garden Program** (UNC-Pembroke) is a grant funded summer camp and weekend program, focused on pollinator conservation

## Objectives

**Program Goals:**

Nurture minority and disadvantaged middle and high school students' interest, enthusiasm, and identity in the sciences

**Used citizen science to engage 7th-12th grade students in:**

- Pollinator conservation
- STEM (Science Tech. Engineering & Math) experiences
- Scientific practices as outlined by NGSS
- The out-of-doors and sustainable practices
- Scientific research based on the students' own interests

## Methods

**Participants**

- 20 students aged 12-18, 83% minority
- Robeson Co. and vicinity- rural, high poverty, food insecurity

**Venue**

- Kids in the Garden Summer Camp (2 weeks)
- UNCP Campus Garden and Apiary (Fig. 1 & Fig. 2)

**Camp includes:**

- **Citizen science activities** (Center and Right Panels)
- Plant anatomy, Palynology, and microscope experiences
- Pollinator games, honeybee hives, and native bee houses
- American Indian oral tradition, medicinal plants, gourd art
- Outdoor hikes and kayaking, visits to other Universities

Figure 1. UNCP Campus Garden and Apiary - comprised of 50+ garden beds and 9 hives

Figure 2. Towering Sunflower bed in bloom- a favorite for bees

## Citizen Science Projects

### Great Pumpkin Project (NC State University)[4]

- *Project goals:* Document insects (beneficial/harmful) and microbes on cucurbits
- *Camp goals:* Awareness of pollinator diversity, plant structures, scientific observations, and data collection methods (photography, Fig. 3, 4 and digital records, Fig. 5)

Figure 3. Students observe pollinators visiting buttercup squash flowers in the garden

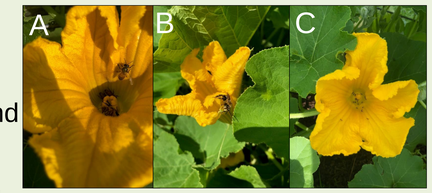


Figure 4. Sample photographs of pollinators submitted on iNaturalist for the project A) Honeybees, B) Male squash bee, C) ants

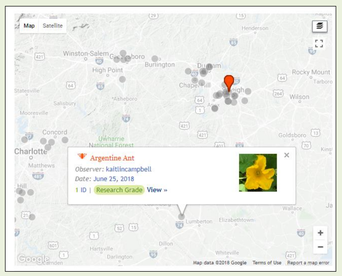


Figure 5. Sample digital record submitted to The Great Pumpkin Project on the iNaturalist site

### Great Sunflower Project (NC State University)[5]

- *Project goals:* Record floral visits by pollinators across US
- *Camp goals:* Understand pollinator specificity and diversity, conduct scientific observations and data collection (Fig. 6)


Figure 6. Students observe pollinators A) on Cosmos, B) Sunflowers, and C) African Basil

## Citizen Science Projects

### Crown Bees Native Bee Network (Woodinville, WA)[6]

- *Project goals:* Find, identify and raise twig nesting bees, support sustainable agriculture
- *Camp goals:* Use GPS & compass, learn about pollinator lifecycles, pollen, and solitary bees (Fig. 7, 8)

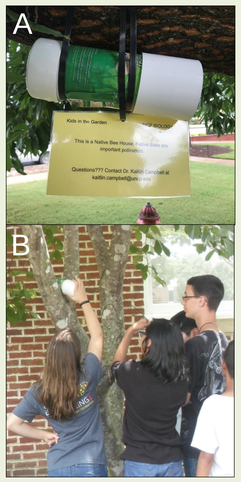


Figure 7. A) Twig nesting bee house hanging on branch, B) Students hang bee house and take GPS and compass reading


Figure 8. Bee cocoons after removal from cardboard twigs for winter protection and parasite removal. Cocoons of A) Mason bees, B) Unknown bees, C) Resin bees.

## Conclusions and Significance

**Incorporating the citizen science component in our summer camp was valuable because it:**

- Demystified the scientific method
- Made science personal and individual actions powerful
- Engaged the students in active conservation efforts
- Encouraged inquiry and scientific literacy
- Connected students with scientists online and face to face

## Future Directions

- Add additional projects, for example, Bumblebee Watch
- Have students create own accounts with projects to enter and track own data – e.g. native bee houses at home
- Analyze data we collect and compare to larger data set

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