# Urban Middle School Student Learning of Local Tree Diversity & Common Ancestry



## **Goals and Research Questions**

**Goal:** To use *Leafsnap*, a tree identification app, & developed curricular resources to engage urban middle school students in **local biodiversity** in an **evolutionary** context.

### **Research Questions:**

- How do these resources enhance students' abilities to **notice** and **organize** local tree diversity?
- What trees can students ID? What **characteristics** students notice to **identify** street trees?
- What characteristics students use to group trees by relatedness?
- What is student understanding of plant reproductive characteristics?
- 2. How does noticing and organizing the similarities and differences amongst local tree species help students to contextualize biodiversity into an evolutionary framework?
- What do students think it means to be **related**?



# **Curricular Resources and Research Methods**

Two part curriculum: Fall: Focus on leaves, fruits & common ancestry Spring: Focus on flowers & common ancestry





(b) Results

collection for future reference, and (e) a map view showing where that leaf was collected.



(c) Verification

descriptions of one of the results to confirm it as the right match, (d) showing the addition of that leaf to the user's



(d) Collection

the manual verification stage as the user explores the images and textual



o educational games, (b) the returned identification results, in sorted order, calculated

the Leafsnap app: Leafsnap avoids the pitfalls of the other experts for identification, it uses pattern recognition software to identify plants of interest by their leaf shape. Users snap and upload a photo of a leaf and *Leafsnap* uses the leaf shape to provide candidate species for identification Methods

Mart -



School science night highlighting



Middle school students using Leafsnap

assessment interpretation

Results based on matched written assessments from 260 students. Controls based on assessments of 262 demographically similar students administered at the end of the school year. Overall scores calculated based on points assigned to ranked responses. Points per category vary by number of questions & total levels in each category.

# What is student understanding of plant reproductive characteristics?



**Representative Reproduction Questions:** 



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# Background

### Plant blindness

• The failure to notice plant life on a day-to-day basis is a recurring theme of plant educational literature.

• An urban context where students walk by trees daily is ideal setting Everyday and scientific observation are different • To become expert, students must change four features of practice. They are

noticing, expectations, observation records & dispositions. As they improve, disciplinary content knowledge & scientific thinking will also improve (Eberbach & Crowley 2009).

### Placing life into the context of evolutionary history

• Incorporating evolution into biodiversity is important for extracting the intrinsic value of each individual species (Leopold 1949).

• Many street trees share fruit, flower, and leaf structures that are evidence of common descent. They can help students discover the **centrality of common** ancestry to the diversification of life.

### Learning Progressions

• We interpreted student understanding using the Biodiversity LP framework, extending it to explore students' ideas related to local tree diversity and common ancestry.



- Curriculum implemented in classrooms of 12 NYC middle school teachers.
- 1 Manhattan (6<sup>th</sup> grade) 2 Queens (6<sup>th</sup> & 7<sup>th</sup> grade)
- 1 Brooklyn (8<sup>th</sup> grade)
  2 South Bronx (6<sup>th</sup>, 7<sup>th</sup>, & 8<sup>th</sup> grades)
- Teachers attended a week long summer PD with a botanist; one day Spring flower PD; and Fall & Spring focus groups.
- Students completed written assessments at 4 time points: pre and post Fall
- implementation and pre and post Spring implementation. 19 students were interviewed pre and post fall and post spring implementation and used to validate written



