

## **Search for Program Excellence: Orange County 4-H Botany Series**

Melinda Souers, 4-H Youth Development Agent; [msouers@ufl.edu](mailto:msouers@ufl.edu)

Erin Reichel, 4-H Youth Development Agent; [ereichel@udl.edu](mailto:ereichel@udl.edu)

Clarissa Chairez, Master Gardener Coordinator; [clarissachairez@ufl.edu](mailto:clarissachairez@ufl.edu)

Calvin Gardner, Horticulture Agent; [cgardner1@ufl.edu](mailto:cgardner1@ufl.edu)

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### **Section 1: Situation/Objectives/Implementation/Plan of Action**

There are approximately 9,400 students registered as homeschooled in Orange County equivalent to about 4% of the total student population. (FLDOE 2022-23). According to this state data, the number of students being schooled at home has doubled in the last ten years. Current growth is approximately 1.5% per year after increasing by 35% during 2020-21. The high-quality experiential learning opportunities available to youth has made the 4-H program a popular organization for this growing demographic for many years.

In the summer of 2023, an homeschool parent and 4-H volunteer requested that Orange County 4-H organize a science laboratory experience to supplement homeschool education. She was willing to help recruit homeschool families for the program. After consultation with Orange County horticulture agents, we made the decision to offer a 10-part series of lab-oriented lessons in Botany. The series would support several academic subjects including botany, plant science and general biology. Our overall objectives were: (1) For students to become familiar with laboratory procedures including the use of microscopes by providing hands-on science experiences modeling those in traditional classrooms; and (2) For students to increase their knowledge in the selected subject matter topics; and (3) To spark increased interest in science through experiential learning.

Prior to marketing the lab series, ten key botany topics were selected (see references), and the lesson order was created. The series followed a logical sequence and created a scaffolding of concepts. The team of instructors included two 4-H Agents, two horticulture agents and one horticulture professional (herbalist). Instructors each chose one to three topics that were personal strengths, and the six-month schedule was created. A decision was made to charge a fee that would provide approximately \$100 per session for equipment and/or supplies. Several sessions included take home resources for the students. Examples included a plant identification guide, mounted herbarium specimen sample, and jeweler's loupe (magnification lens). A portion of the program fees were used to purchase four classroom style microscopes which were used in several of the lessons. Enrollment was capped at fifteen students to ensure that all participants were fully engaged in all hands-on activities. The program was then marketed to existing 4-H members through 4Honline and to the homeschool community through social media.

## **Section 2: Program Administration and Evaluation**

Program participants were enrolled in 4Honline through the Botany 4-H Club. The youth ranged in age from 12 to 16 (grades 7 through 10). All instructors had previously been level two background screened, and youth protection policies were followed. Parents were allowed to remain if they chose, but in most cases, they were not present during the sessions. Each of the ten sessions were scheduled on Wednesdays from 1:00 p.m. to 3:00 p.m. beginning in September 2023 and finishing in March 2024. Youth participants received a lab notebook, schedule and supporting materials at the first meeting which they were asked to bring to each successive meeting.

Because the youth were not all learning the same material at home, each session included an introduction with background information needed to fully benefit from the lab experience. Following the topic introduction, students would spend approximately 60-75 minutes on the lab activity. This time was frequently split between the garden to observe living specimens and collect samples to then completing a dissection, experiment or station activities. Instructors were asked to provide fill-in lab reports for each lesson that students would add to their lab series notebooks. Finally, 15-30 minutes was used to reflect on the concepts/results and clean up.

Program outcomes included both observation data and survey feedback. Many of the twelve participants (three were not able to finish the series) had no previous experience with microscopes and that opportunity was a highlight for them. They learned how to set slide samples and use the various magnification lenses to observe both very small samples (i.e. pollen) as well as microscopic (i.e. plant cells) ones. Students all learned to use a dichotomous key to identify a plant and how to setup an experiment to compare plant responses to varying stimuli. At the final meeting youth were asked to complete a brief survey assessing their perceived knowledge gain and possible plant science career interest. In retrospect, given the length of time over which students participated it would have been beneficial to measure knowledge gain per session rather than at the end of a six-month period.

Of the twelve that finished the series, eight completed the survey. They were asked to indicate perceptions of knowledge gained for each topic by choosing Learned “a lot”, “some”, “a little” or “none”. Additionally, they were asked if participation helped them better understand their science coursework, if they were interested in learning more about botany/plant science and finally if they were interested in a career involving plant science.

The average percentage of youth that indicated learned “a lot” or “some” across the ten lessons was 77.85%. 87.5% said that participating helped them better understand their academic classes and 62.5% said they would be interested in learning more. A smaller number (33.3%) said they would be interested in a career in plant science. Informal feedback from parents was all very positive.

### Section 3: Community Need and Future

There was a clear need for the program having been requested from a member of the homeschool community. Enrollment filled easily and parents indicated a desire for additional programs covering other science subjects. The cost to parents for this program was low in comparison to similar programs that are offered by private schools or for-profit companies. As described in the situation statement above, the homeschool community is growing, and 4-H is poised to provide educational opportunities to meet the needs of homeschool families looking for quality educational experiences to supplement home lessons.

There are currently no specific plans for the next lab series, but there have been conversations regarding topics both popular and at the same time feasible for 4-H and other Agents to support. Possibilities for these topics include environmental science, microbiology, and plant science. The target launch date for this next series would be Fall/Spring 2025-2026.

#### Sample References:

Botany in a Day: The Patterns Method of Plant Identification, Elpel, T.; 2013.

CuriOdyssey. (2024, July 17). *Exploring Transpiration*

Feizi, F., & Mousavi, M. (2016). Facilitate Seed Germination of the Golden Shower Tree (*Cassia fistula*) in vitro Using TiO<sub>2</sub> Nanoparticles and Scarification Treatments. *Journal of Agricultural Science*, 8(9), 168. <https://doi.org/10.5539/jas.v8n9p168>

Fire ecology. (n.d.). Open Learning. <https://www.open.edu/openlearn/science-maths-technology/fire-ecology/content-section-2.4>

Moon, K. (2024, December 19). Hands-on activities to study the plant vascular system - Kristin Moon Science. *Kristin Moon Science*. <https://kristinmoonscience.com/hands-on-activities-study-plant-vascular-system/>

McCullough, A. (2020, June 1). *How to prepare seeds for sowing - Lady Bird Johnson Wildflower Center*. Lady Bird Johnson Wildflower Center. <https://www.wildflower.org/learn/how-to/how-to-prepare-seeds-for-sowing>

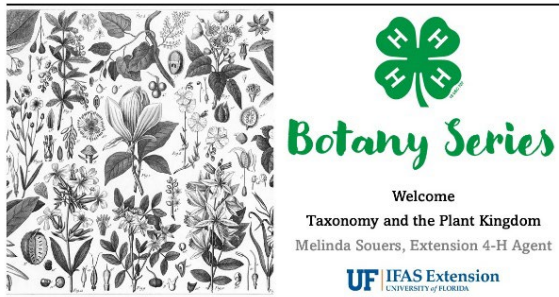
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*Starting from Seed – Gardening Solutions*.

(n.d.). <https://gardeningsolutions.ifas.ufl.edu/care/planting/starting-from-seed.html>



## Supplemental Materials:

[Link to Sample Documents](#)



Far right:  
Students setting  
up slide  
samples for  
microscopic  
observations.  
Near right:  
Students using  
microscopes to  
identify plant  
vascular system  
characteristics.





4-H Botany Lab Series

Fall/Winter 2023-24 Plant Science/Botany Lab Schedule

*There will be background information provided, but the session will not substitute for further study at home.*

Meetings will take place in the Rose Room from 1:00-3:00 p.m.

Schedule:

- 9/13: Introduction to Botany, Plant Kingdom, and Taxonomy - Melinda
- 9/27: Plant Cells and Tissues - Calvin
- 10/11: Flower Anatomy and Pollination - Calvin
- 10/25: Plant Vascular System and Transport - Clarissa
- 11/29: Plant Reproduction - Clarissa
- 12/13: Stems, Roots, and Leaves - Maggie
- 1/10: Fruits and Plant Hormones- Erin
- 1/24: Seed Germination and Structure - Clarissa
- 2/14: Photosynthesis – Calvin
- 3/13: Tropisms/Growth Habits - Maggie

### Botany Series Schedule of Topics



Above left: Students observe botanical examples in the garden and collect samples for lab activities with Erin Reichel. Above: Students observe photosynthesis experiment led by Calvin Gardner.

