How Research Experience for Teachers (RET) Affects Pedagogy

Kirsten Salonga, in connection with the Conner Lab 2023-2024

What is RET?

- Research Experiences for Teachers (RET) are **in-depth, authentic research experiences** available to classroom **K-12 teachers** and funded by the **National Science Foundation (NSF).**
- Teachers are **compensated,** and required **weeks** can vary based on the RET.
- Teachers are often paired with a researcher to **assist in an ongoing project** or **complete an independent, co-developed research project**[1].

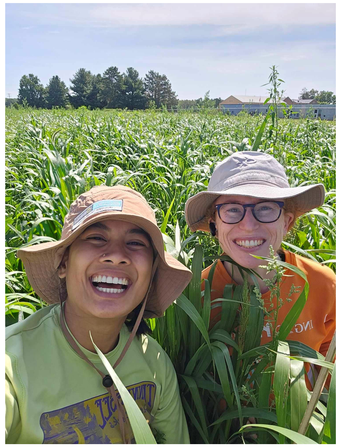


Figure 1. Kirsten and Robin (grad student) in the non-agricultural field

Figure 2. Jan, anther RET, surveying in the agricultural field.

Purpose

Teachers are expected to develop ways to share their experience with students during the school year[1].

- Specifically with KBS, teachers help to **develop educational materials based on their research experience (Data Nugget)**
  - Other options for education materials include **lesson plans** or **teacher professional development sessions**

Figure 3. Photographs of types of stamens found in *Arabidopsis thaliana*

My Experience at KBS

For **10 weeks** at **Kellogg Biological Station**, I:

- Studied **trait evolution** in *Arabidopsis thaliana*, a model plant species
- Gained broad experience in **studying plant evolution in laboratory**, **growth chamber, greenhouse**, and **field** settings
  - Data sampling techniques included:
    - Germination date
    - Specific Leaf Area (determined with oven dry mass)
    - Rosette counts
    - Fruit counts
- Participated in all laboratory activities:
  - Weekly **Laboratory Meetings** (virtual and in-person)
  - Scientist Discussions at KBS

Relevance

- There is ongoing **loss of some pollen-producing stamens in *Arabidopsis thaliana*.**
- Ancestors of *Arabidopsis thaliana* had 6 long stamen, but most plants in the family now have 4 long stamens and 2 short stamens.
- Loss of traits that are no longer functional is common in evolution; the Conner Lab researches specifically how trait loss through natural selection is affected by genes shared with other traits (as well as random genetic changes).
- The evolution of self-pollination in *A. thaliana* made the short stamens nonfunctional.
- KBS compares data gathered in the lab with native habitat through collaborations in Sweden, Italy, and Spain.

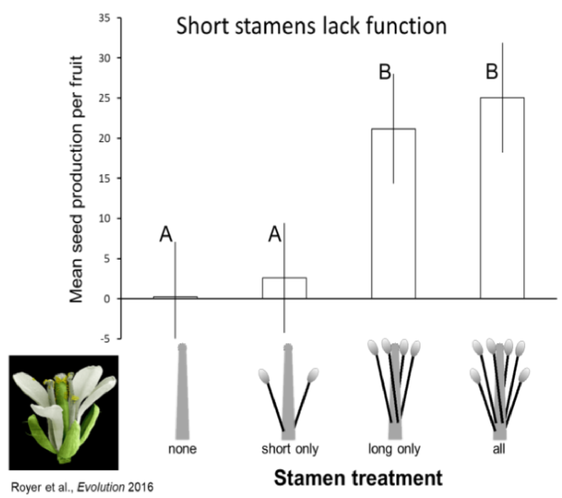


Figure 4. Graph of stamen size and seed production as determined by Royer et al. (2016) and used in Data Nugget.

Figure 5. (above) Photograph of pollinator interacting with stamens

Figure 6. (below) Photograph of *Arabidopsis* from Chamber Common Garden at KBS

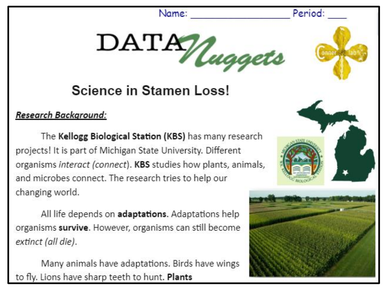
My Classroom

I teach **Multilingual Learner Environmental Science (Self-Contained)** at Justice High School in Falls Church, Virginia.

- **Grades 9-12**
- **Wide variety of languages spoken**
- **Level 1-2 Multilingual Learners**

I created a **Data Nugget for Level 1-2 Multilingual Learners** using past data gathered by the Conner Lab!

- **Open-ended:** students chose which data they would like to graph
- **Topics** covered:
  - **Evolutionary adaptations**
  - Introduction to **botany**
  - **Pollination**
  - **Climate change**
  - **Scientific method:**
    - Hypothesis
    - Independent Variable
    - Dependent Variable
    - Analyzing relevant data to create a graph
    - Interpreting graph data to form a conclusion



Name: _____ Period: ___

DATA Nuggets

Science in Stamen Loss!

Research Background:

The **Kellogg Biological Station (KBS)** has many research projects! It is part of Michigan State University. Different organisms *interact (connect)*. **KBS** studies how plants, animals, and microbes connect. The research tries to help our changing world.

All life depends on **adaptations**. Adaptations help organisms **survive**. However, organisms can still become *extinct (all die)*.

Many animals have adaptations. Birds have wings to fly. Lions have sharp teeth to hunt. **Plants**

Wild radish plants were also observed outside. Scientists watched for pollinators. *Data (information)* from these observations are shown below *(Conner et al. Oecologia 1995)*.

	% Pollen Removed from Long Stamen *each visit*
Honey bees	63
Small bees	40
Syrphid flies	29

	% Pollen Removed from Short Stamen *each visit*
Honey bees	38
Small bees	9
Syrphid flies	17

	Long Stamen	Short Stamen
Pollen production	11,690 *(±510)*	17, 356 *(±858)*

(8) What *data* will you graph to answer the Scientific Question?

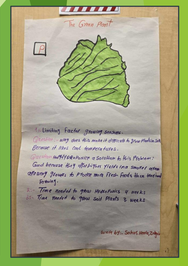
Independent Variable: _____

Dependent Variable: _____

Personal Growth

Because of my experience at KBS:

- Applied for (and received) a classroom grant for ***Hydroponics in Action***!
  - Studied the **importance of agricultural innovation** in food scarcity
- Have a **deeper understanding of scientific research** to better support my kids in hands-on, rigorous experiments!



Figures 7-9. Images of ***Hydroponics in Action!*** Project with my students at Justice High School

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References

1. Unknown. "Research Experiences for Teachers." *Kbs.Msu.Edu*, Michigan State University, www.kbs.msu.edu/education/k-12/ret/. Accessed 13 Oct. 2024.

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Massive thanks to members of the **Conner Lab** for being inclusive and accepting! I was privileged to work with a team of dedicated scientists who not only inspired my activities in science education, but are also now my lifelong friends.

Figure 5. Members of the Conner Lab Summer 2023