OSU Life Sciences Freshman Research Scholars Program: Increasing retention by involving students in research during their introductory experience

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Overview

- The LSFRS program is part of a Howard Hughes Medical Institute grant to increase persistence in life-sciences via **authentic research experiences**.

- The program spans their **freshman year** and includes a research seminar, research experience, and poster symposium.

- We found a **direct effect** of program participation on university retention and persistence in their target major.
**STEM persistence through Authentic Research**

- **Goal:** Increase persistence among students in the life-sciences
- **Focus:** Through involvement in authentic research during their introductory experiences
- Funded by a grant to OSU from the Howard Hughes Medical Institute through the Science Education Program
Collaborating Science Departments

- Biochemistry & Molecular Biology,
- Chemistry,
- Integrative Biology,
- Microbiology & Molecular Genetics,
- Plant Biology, Ecology, & Evolution
What is Authentic?

- Use of scientific practices
- Discovery
- Collaborative
- Iteration
- Broadly relevant or important work

Auchincloss et al. CBE – Life Sciences Education 13: 29-40
What is an Authentic Research Experience?

One in which students:

- **read** scientific literature.
- **design** some aspect of the project
- **work independently** (of faculty) with an opportunity to work on a team (of peers)
- establish a mentoring **partnership** between student and faculty.
- feel **ownership** of the project (with increased independence)
- **master** using careful and reproducible lab techniques
- have an opportunity for oral and/or written **communication**
- have a meaningful or focused **research question**
- be given some **structure** to the experience by faculty
- strive to **produce a significant finding**

(Lopatto 2003)
What are the benefits of UREs?  

- Increased content knowledge
- Increased analytical skills
- Increased self-efficacy
- External validation from a science community
- Persistence in science
- Career clarification
- Increased project ownership
- Increased communication skills
- Increased motivation in science
- Increased collaboration skills
- Increased tolerance for obstacles
- Increased sense of belonging to a larger community
- Enhanced science identity
- Increased positive interaction with peers
- Increased access to faculty interaction
- Increased access to mentoring functions
- Enhanced understanding of the nature of science
- Development of self-authorship

(Corwin, Graham, and Dolan, 2014)
Life Sciences Freshman Research Scholars

- We recruit incoming OSU Freshmen during spring recruitment if they show interest in a Life Science major.
- Students apply in the summer and are accepted before their first fall semester.
- 1 year program - Fall & Spring semesters.
- Limited recruitment for Spring semester only through intro courses.
Life Sciences Freshman Research Scholars

- **Fall semester:**
  - Find mentor; submit research proposal
Life Science Freshman Research Scholars

- Spring semester:
  - Conduct research with faculty mentor
  - Individual or in groups
  - Present poster at LSFRS (or other) symposium
  - Submit results for publication in LSFRS Research Reports

- Enticements
  - $1000 scholarship for completing program
  - Travel scholarships and symposium awards
Research Question

- How does participation in the LSFRS program affect...
  - university retention?
  - persistence in students’ target major?
  - course performance?
Methodology

- We collected quantitative and qualitative data
  - **Quantitative** - IRIM office
    - Students’ high school GPA, ACT scores, enrollment & major status each semester, and cumulative GPA
  - **Qualitative** - empirical data collected from student participants as part of the HHMI research process
Methodology

- Quantitative
  - Created matched sample pairs \( n = 98 \) between LSFRS participants and comparable non-participants
  - All life-science majors
  - Performed multiple paired sample t-tests and chi-square tests on students’
    - undergraduate GPA
    - university retention
    - persistence in target major
n = 98  
$p < 0.001$  
$\Phi = 0.25$

n = 98  
$p < 0.001$  
$\Phi = 0.27$

n = 72  
$p < 0.001$  
$\Phi = 0.33$

n = 72  
$p < 0.001$  
$\Phi = 0.34$
Methodology

- Qualitative
  - Performed one-on-one interviews with program participants during program and after program completion
  - Student testimonials
  - Observed end of year poster presentations
Qualitative Findings

Emergent themes:

- **Advantage** and **Value** of learning how to write scientific proposals/manuscript and developing communication skills with faculty
- Catalytic effect on their development of research skills
- Opened pathways to additional research opportunities

“It provided the tools and opportunity for me to establish a lasting relationship with several professors that I would likely have never interacted with if I had not participated in the program.”

“...it was scary at first, but it turned out great!”
Qualitative Findings

- “This program welcomed me to the science community and I would not have considered a future in research without its influence. From freshman to senior, my research experience has been shaped and sculpted by my experiences writing, working in the lab, apply my research skills, and making connections in the science community.”

- “The future, at times, seems daunting to a college student, but thanks to LSFRS and the other research opportunities I’ve gotten due to this program’s initial influence, I’m excited for my future career because I know I have what I need to excel. If I am hired at a university, someday I will absolutely try to find a way to reach freshman interested in research because having those skills taught to you early on is vital. LSFRS is the ideal opportunity and I’m very proud to say I was a part of it.”
Implications

- Student participation in UREs **yields higher returning university enrollment and retention in target majors**

- Participating has **no lasting effect** on GPA
  - Non-participants switching majors to match their skills
  - LSFRS participants focus on research more than GPA
Future Directions

- **Cohort effect** - do cohorts play a role?
  - Past participants are still socializing with their cohort members

- **Campus and science identities**
  - Past LSFRS participants often serve as introductory biology TAs
  - Working around graduate students and other scientists
Conclusion

- We recommend *continued encouragement* for discipline-specific introductory research programs

**Benefits**

- Student - research and professional development
- Faculty - research productivity, retention in major
- University - increased institution retention
QUESTIONS?