

Careers in Science:

Summer Training in Environmental and Pharmacological Sciences (STEPS)

The future of scientific research depends on a talented, diverse and inclusive workforce with high scientific proficiency. Undergraduate research experiences have been shown to play a key role in encouraging students, especially those from historically underrepresented groups, to pursue careers in science and healthcare professions. In response to these needs, Professor Hollie Swanson, from the University of Kentucky has developed the Summer Undergraduate Research Fellowship (STEPS), which offers individualised research experiences in different areas of pharmacology and environmental health sciences to undergraduate students from a variety of backgrounds.

The genesis of the STEPS project arose from Professor Hollie Swanson's reflections about her own career goals whereby she sought to align her passion for research with the needs of the scientific community. Swanson's expertise in research pertains to problems relating to environmental health sciences whereas her teaching activities focus on delivering pharmacology related concepts to undergraduate, graduate and professional students. Through her work, Swanson aims to use both her expertise and teaching experience to encourage students from all backgrounds to pursue careers in science and research.

Swanson was keen to develop a program which could offer individualised research experiences to undergraduate students. Funding from the American Society of Pharmacology and Experimental Therapeutics provided initial support

the STEPS project, whereby five undergraduate students were enrolled in a 10-week summer program. Subsequently, Swanson received a second source of funding from the National Institutes for Environmental Health Sciences, which provided support for an additional 12 undergraduate students as well as 12 peer mentors who offered career advice to students. The program is designed to introduce students to the highly interdisciplinary and collaborative nature of environmental health science research, which is focused on solving key global health problems. An additional focus is on preparing underprivileged and under-represented students for successful careers in relevant fields.

RECRUITING STUDENTS

Swanson carefully considered the target audience of the STEPS program. She sought to include students from



Participants engaging in the improvisation workshop.

her local area of Kentucky because of the large numbers from socioeconomically disadvantaged backgrounds whom she wanted to encourage and support. A particularly effective way to recruit onto the program was through obtaining recommendations from other academic staff members. Swanson has developed connections with a number of universities including Eastern Kentucky University and Morehead State University. Both institutions were actively looking for research opportunities for students so were keen to become involved.

Swanson realised that beginning recruiting early was essential in getting sufficient students on board and now begins the recruitment before the students leave for their Christmas break. The University of Kentucky also produced a video to help with recruiting students onto the STEPS project. In addition, as the program has become more established, word of mouth has become a useful way of encouraging more students to apply.

PROGRAM ACTIVITIES

In order to prepare students for the program, they participate in several days of orientation activities. This includes

discussing ethics, lab books as well as the importance of communication in a way that is enjoyable for students. This enables them to get to know both the university campus and each other better. The strong group dynamics developed also help students to optimise their experience of the project.

The students participating in the program spend the majority of their time in their faculty mentor's laboratories. Due to the multidisciplinary nature of environmental health sciences and pharmacology, this includes a wide variety of departments and colleges. Throughout the summer, the students also work on developing

Students are able to interact with these professionals to become aware of the wide variety of careers options available to them.

soft skills, such as interview and oral communication skills.

Weekly activities are organised throughout the program, such as hiking. On one week of the program, a hike at Red River Gorge was arranged through an outdoor centre. Another week, students received a visit from rapper Farmer Brown, who raps about nutrition and

sustainable farming. Students discussed the use of outreach and the importance of using culturally appropriate ways to reach an audience. In addition, on one week students worked with an agriculture extension agent to check stream health by collecting insects and measuring water quality. They discussed runoff and the range of substances that can end up in the water supply.

Careers are a key concern of the students participating so the program also involved lunches where researchers visited and discussed their research and career paths. Students are able to interact with these professionals to become aware of the

wide variety of career options available to them. Shadowing opportunities were also organised for students where they could establish networks to help them progress towards their chosen

career. These activities allow students to see how science is used in their local community whilst also having exposure to different potential career paths.

At the end of the program, the students prepare a poster that describes their research projects and presents them to the faculty and staff of the involved departments. An event with around 50



Professor Swanson and participants of the STEPS program pose at the end-of-program reception celebration.



Student participants presenting their research findings at the end-of-program poster session.

attendees is organised where students can receive feedback on their work from graduate students. This also provides the opportunity for graduate students to gain experience in providing constructive advice. Participating students are also provided with a token as a reminder of their experience in the program. They receive either a pestle and mortar or a

globe, depending on whether they have been engaged in pharmacology or environmental health science-related research.

FEEDBACK FROM STUDENTS

Feedback is obtained from students by administering pre and post program surveys about their expectations and experiences of participating. Preliminary results from these surveys indicate that through participating students gain confidence, a greater understanding of the nature of scientific research, how to formulate a research question, how to work independently and how

to discuss scientific concepts. Receiving this feedback from students has been hugely rewarding for Swanson, who has altered her view of professional success. Through experiencing their talent, zest for learning and continued curiosity, she now feels more confident about the future of society. Particularly significant for Swanson is the feedback from students that she

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has changed their lives and subsequently interacting with them in medical and graduate school classes, taking steps closer towards their future career in scientific research.

THE FUTURE OF THE PROGRAM

Many of the students from the first year of the program stayed in the lab and continued to work on their scientific research. Swanson has been impressed with their continual motivation in their studies. One of the students from the first year of the program has also been

involved in training a new student for the project. Discussions have also started to take place about what phase two of the program may look like. Swanson is considering partnering with other institutions to provide students with different types of research experiences. For example, areas of particular interest would be those focusing on the

relationship between climate change and environmental health. Another area of interest would be a partnership that would provide the students with

insights pertaining to the global nature of science and research. The possibilities for the future are working with non-profit organisations like the Alan Alda Centre for Communicating Science or COMPASS. These are cross-disciplinary organisations which aim to help scientists learn to communicate more effectively with the public. Swanson would also like students to have the opportunity to participate in improvisation activities to allow them to become more confident in their communication skills.



Behind the Research

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Research Objectives

Professor Swanson's Summer Training in Environmental and Pharmacological Sciences (STEPS) aims to enhance student learning and help prepare students from a variety of backgrounds, for successful science-related careers.

Detail

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Bio

The director of the Summer Undergraduate Program in Environmental Health Sciences and Pharmacology, Professor Hollie Swanson received her PhD degree from Purdue University and completed postdoctoral training Michigan State and Northwestern Universities. She is currently Professor of Nutritional Sciences and Pharmacology and directs the Women's Executive Leadership Development program.

Funding

- National Institutes of Environmental Health Sciences (NIEHS)
- American Society of Pharmacology and Experimental Therapeutics (ASPET)



Personal Response

Have you experienced any challenges whilst working on the STEPS project?

“ The biggest challenge has been overcoming my own personal characteristics. I love coming up with new ideas and flying by the seat of my pants. In addition, and like many introverts, I spend most of my life inside my own head. These attributes can translate into poor execution and poor communication. This program involves 50-75 faculty, staff and students during the short 10-week program. This means I need to plan ahead, be specific, align everyone's expectations, get the most out of them and make sure it all runs smoothly. Fortunately, I have a very supportive departmental chair and outstanding staff that I can rely on. It has taken some trial and error, but we now function well as a team developing timetables and effective administrative processes to ensure that the students have the best summer experience possible. ”

What are your future plans for research in this area?

Future plans for research in this area include:

- 1) Understanding the needs of the students with respect to their career progression in STEM.
- 2) understanding how these needs differ amongst different groups (i.e., gender, socio-economic, racial, first generation, etc.).
- 3) Identifying how undergraduate research experiences (like the STEPS program) can be modified to better meet the needs of all the participating students.