F26.12 Microbiome Science to Optimize Campus Vermicomposting

Overview

We are developing an on-campus vermicomposting living lab on South Campus, near the existing food composting site. The living lab will integrate sustainable waste management strategies to further reduce campus waste streams. Students will help conduct research within a vermicomposting system that uses worms to process food waste. The living lab will serve as an interdisciplinary research and education hub for NAU students across various disciplines by providing hands-on learning opportunities through student-directed research on optimizing composting processes. Students will collect and process samples using high-throughput sequencing techniques to identify key taxa, genes, and enzymes that enhance composting efficiency as well as conduct data analysis using bioinformatics tools such as QIIME 2 which our lab develops and manages. The lab will promote campus-wide outreach, raising awareness of composting through campus workshops, signage, and collaborations with local farms, businesses, and governmental agencies offering students real-world, hands-on experiences to create and contribute to the advancement of scientific research and circular economies through sustainability and waste management.

What the student will DO and LEARN

This internship will provide NAU students with hands-on experience in scientific research, sustainable waste management, and data analysis, fostering academic and career development.

Students will assist in managing and maintaining our vermicomposting system, gaining insight into sustainable waste management and its role in NAU's Climate Action Plan. They will learn about key composting variables and the environmental benefits of vermicomposting, including water conservation, soil health improvement, and nutrient cycling.

During the fall semester, students will develop lab skills through sample collection, data recording, and, depending on lab availability, wet lab techniques such as DNA extraction, microbial culturing, and sample preparation. They will also gain valuable experience in organizing a large-scale scientific study.

In the spring semester, students will work with bioinformatics tools like QIIME 2 to process, analyze, and visualize large datasets, including amplicon and metagenomic data. They will apply their findings by identifying key taxa, genes, and enzymes associated with composting efficiency, exploring their potential for designing or optimizing synthetic microbial communities to enhance decomposition processes.

Additional benefits

Students will gain hands-on experience in composting science and data analysis while working in one of the world's leading microbiome bioinformatics labs. They will collaborate with experts who are not only skilled in coding and bioinformatics but also dedicated to mentorship, fostering valuable professional connections.

The student will be co-advised by two experts: Dr. Jeff Meilander, who has over 20 years of experience teaching and supervising students and recently completed a PhD on microbial succession in composting systems, will provide guidance on compost management and data collection. Chloe Herman, a PhD candidate, expert bioinformatician in the Caporaso Lab, and previous I2S mentor, will lead the student through data analysis using cutting-edge bioinformatics tools. A former I2S scholar, mentored by Chloe,

used QIIME 2 to analyze Jeff's data set and create visualizations. His contributions earned him coauthorship on the composting manuscript and an academic pathway, as he is now pursuing a Ph.D. at the University of Arizona.

This interdisciplinary training will equip the student with a diverse skill set, making them a well-rounded scientist and expanding their professional network. Additionally, students will gain experience in research communication, problem-solving, and applying science to real-world sustainability challenges—enhancing their competitiveness for graduate programs and research careers.

Additional qualifications

motivated, self-directed, good communication

Time commitment

6 hrs/week for 30 weeks