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Utilizing Tiny Earth in the Undergraduate Microbiology Classroom

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Recent decades have experienced an increase in demonstrated antibiotic resistance. Antibiotic resistance is one of the top health concerns of the 21st century, so it is important that researchers seek to better understand microbial community structure and identify potential sources for new antibiotics. We used the Tiny Earth model to identify, isolate, and identify potentially new sources of antibiotics in rural areas. The Tiny Earth project is a student-sourcing antibiotic discovery community dedicated to the discovery of potential new antimicrobials. Using this model of inquiry-based learning in a general microbiology laboratory has shown greater interest in the subject and deeper learning through an engaged learner. Through a collaboration between the University of Minnesota Crookston campus and the White Earth Tribal Community College, instructors sought to engage general microbiology students through the Tiny Earth model of inquiry-based learning.

In this project, students chose several rural soil samples, including agricultural samples near a commercial cattle operation. These samples were explored for new sources of antibiotics as well as variations in overall community structure. The students worked to develop isolation protocols utilizing different growth media and culturing methods. The student researchers calculated dry weights, isolated, and sub-cultured to pure isolates using standard techniques. Various standard biochemical assays were used in the characterization schemes along with subsequent PCR identification by sequencing of isolated strains. Students hypothesized differences between sample collection sites. As required, the students were exposed to the standard techniques required of a general microbiology laboratory. However, the Tiny Earth model also allowed the students to test their pure isolates against ESKAPE safe relatives. The chemical extracts from the initial positive isolates were then tested again against the same safe relative(s). This application of the Tiny Earth model allowed students to contribute to the ongoing search for potential new antibiotics. Furthermore, students were exposed to various advancements in microbiological laboratory instrumentation, as well as ongoing federal and international collaborative research projects.