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| Tips and Tools

Community involvement in addressing the antibiotic crisis

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ABSTRACT Increasing student interest and success in STEM education is a top priority for many postsecondary educational institutions. One well-documented approach to both priorities is to have students participate in a Course Undergraduate Research Experience (CURE). Faculty from several technical colleges and universities in Wisconsin teamed up with the Tiny Earth organization to offer a CURE to address the search for new antibiotics. Students enrolled in undergraduate microbiology courses engaged in research and participated in community outreach. To involve the community, faculty from various institutions joined an NFL team, the Green Bay Packers, and created the Tiny Earth in Titletown symposium. Here, students presented their work via scientific posters, to community and industry members, and networked with other scientists from around the region. The Tiny Earth in Titletown symposium started in 2018, was held again in 2019, and returned in 2022 following a 2-year hiatus due to the COVID-19 pandemic. Record attendance in 2022 suggests that community outreach and education may be helping restore trust in science that was lost during the pandemic.

KEYWORDS community, involvement, antibiotic, crisis, CURE, Tiny, Earth, Titletown, Packers

Central themes of ASM Microbe 2023 were the future of science communication with the broader community and restoring trust in science. Throughout the COVID-19 pandemic in the United States, many negative outcomes were linked to misinformation and disinformation (1–9). Trust in science, especially in public health, is at a low point (10–12). It is imperative that scientists at all levels, whether in academia, government, or industry, join to address this problem and restore trust in science. Course Undergraduate Research Experiences (CUREs) have the potential to not only involve students in addressing basic research into problems like the antibiotic crisis but also to mitigate public mistrust in science.

The Tiny Earth organization was initially formed by Dr. Jo Handelsman in 2011 as a course called Microbes to Molecules, eventually developing into a multi-institution collaborative organization called the Tiny Earth organization (13). The mission of Tiny Earth is to involve students in the discovery of new antimicrobials through course-level research experience. Students participate in projects in which they collect soil, isolate bacteria, test for antimicrobial activity against "safe relatives" of the ESKAPE pathogens, and identify isolates (13). In addition to learning microbiology, biochemistry, and genetic techniques, students learn how to collaborate, critically evaluate data, and draw conclusions from their findings (13). As of 2023, the Tiny Earth network has expanded to 40 states in the US and 30 countries around the world. There have been many novel molecules identified that may have promising antimicrobial activity (13).

There are many examples of CUREs in the pedagogical literature, and they are well-known as a high-impact practice that have shown increases in student success (14–20), persistence (15, 18, 21–25), and retention (17, 21, 26, 27), as well as closing achievement gaps for underrepresented populations (18, 19, 28–33). They also represent a way of providing students with authentic research experiences at intuitions that may

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not have traditional research opportunities or funding for such activities (19, 28). While there are many positive outcomes for students and institutions involved in these CUREs, the authors believe there is also an opportunity to involve the community in such activities (34, 35).

PROCEDURE

Prior to 2019, faculty from Green Bay area institutions of higher education were involved in the Tiny Earth CURE. While each faculty member had a presentation or report component at the end of the CURE, these were usually on campus, not open to the public, and attendance was limited to members of the course. While these efforts involved students in a CURE with the goal of addressing the antimicrobial resistance crisis, drug discovery is just one facet of the problem. The general population does not appreciate the scale of the antibiotic crisis or the role they play in the stewardship of the antimicrobials available (36, 37). It was believed that involving the local community in the Tiny Earth CURE would be beneficial to students and help to build community trust in science and institutes of higher education.

In Wisconsin, the Green Bay Packers, an American NFL team, enjoys widespread popularity amongst the general population. Beyond football, the Green Bay Packers are extremely active in community outreach and economic development. Faculty approached the Green Bay Packers organization with the idea of hosting a symposium to present student results at the stadium complex. The idea was well received and supported by the Packers organization as part of their community outreach mission. The faculty on the planning committee decided several guiding principles were needed for a successful symposium: 1. There would be no cost to the students, family members, or public to attend. 2. A joint media campaign would be required to get the information out to the local community. 3. Students would be encouraged to engage the community in sample acquisition.

During the fall 2018 semester, faculty and TE staff met to make decisions on abstract deadlines, event dates and times, poster information and judging, and registration. Many local medical and science-based organizations responded to requests for monetary and human resources to provide support for the space rental, catering, audio/video, poster judging, and setup (Fig. 1). The Tiny Earth organization was also instrumental in providing resources and guidance for this effort. In December 2018, the first "Tiny Earth in Titletown" was run by three colleges and attended by more than 350 people (Fig. 2). Encouraged by this success, a decision was made to attempt an annual event. The second iteration of the Tiny Earth in Titletown symposium took place in December of 2019 and grew substantially with more institutions participating and more community members attending (Fig. 2).

Unfortunately, the COVID pandemic disrupted the annual symposium schedule. Many institutions pivoted to online learning modalities during this time. Public outreach and education were negatively impacted, and the pandemic exacerbated public mistrust in science education, confounded by politics and misinformation (1–5, 7–9). The fall of 2022 represented the next opportunity to bring back Tiny Earth in Titletown symposium. The Green Bay Packers, local health and science organizations, and the participating colleges were able to provide ample support to grow the symposium again. Scientific and community keynote speakers were added, and the media coverage leading up to the event was increased. Over 600 people attended the 2022 symposium (Fig. 2).

CONCLUSION

Public trust in science is low for a multitude of reasons, including mis- and dis-information, exacerbated by the pandemic. The American Society of Microbiology has declared the reestablishment of public trust a top priority for the organization. As scientists, educators, clinicians, and community members, we have a unique responsibility and a great opportunity to regain trust at the community level. To this end, the authors

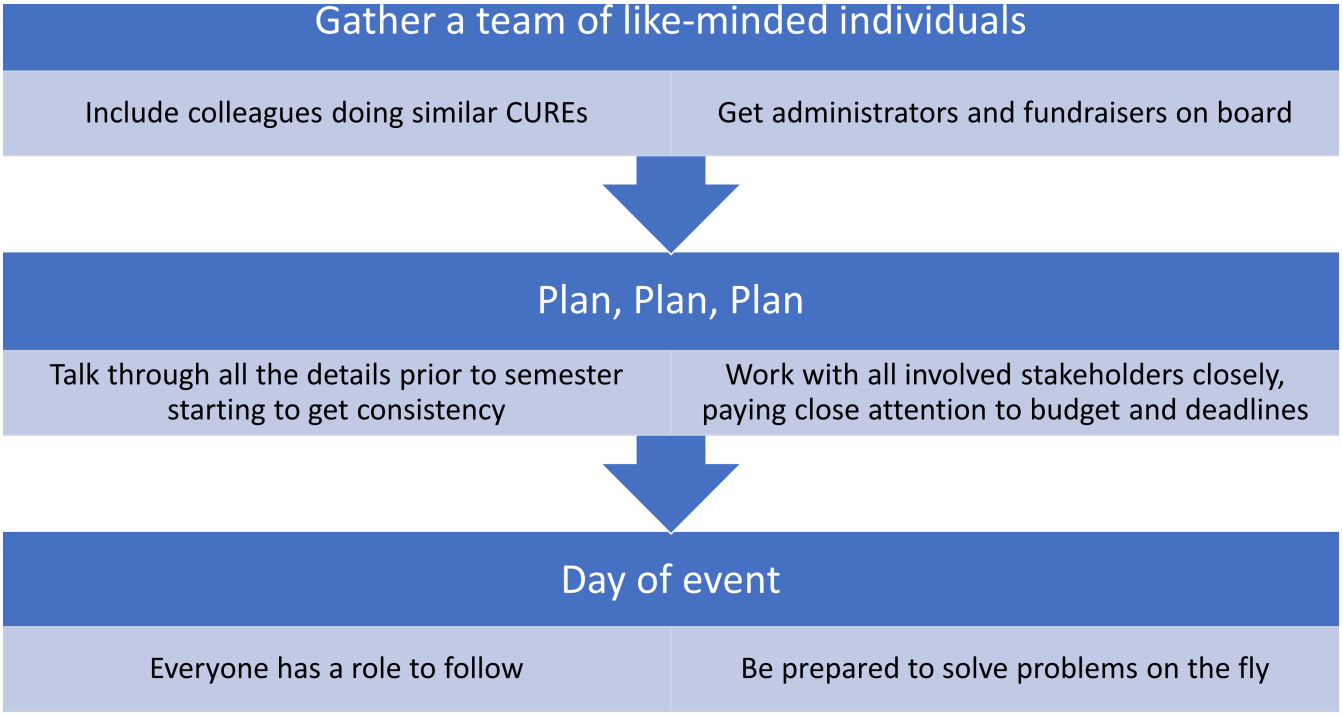

FIG 1 Basic guidlines to planning community symposia.

suggest that positive interactions made between students and the community represent a powerful mechanism to regain the connection between science and the public.

Several features of the Tiny Earth in Titletown event lend themselves to broadening the CURE to include community outreach. The mix of regional public, private liberal arts, technical, and tribal colleges provide a diverse mix of students, including first generation and those from underrepresented groups, with scientific communication practice to a large, diverse audience. The use of soil as the basis for Tiny Earth grounds the research in the region and the land, which is particularly important to indigenous communities. Antibiotics are a common and relatable application of science and Lambeau Field is a popular and impressive venue, providing a draw for community partners and providing a positive experience with scientific research to the families of student presenters. Taken together, these attributes provide a potentially important opportunity to build student confidence in speaking with the general public, encourage networking among students

December Symposia	Posters	Schools	Attendees
2018 at Lambeau Field Club Space	5	3	350
2019 at Lambeau Field Atrium	87	6	550
2020-2021 Virtual International	NA	NA	NA
*2022 at Lambeau Atrium	85	5	600+

*First symposium without Tiny Earth HQ participation, financial support.

FIG 2 Growth of the Tiny Earth in Titletown symposia over time.

of diverse backgrounds, and forge connections with the broader community, all while working to address the growing problem of antibiotic resistance (37, 38).

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