

Editorial: Two-Year Colleges (TYCs) are Essential in Science Education Research and TYC faculty and Students Should Get Involved

By Apryl Nenortas and Lindsey Fields

The conclusions of well-designed research are often used by college teaching professionals, and we can agree that properly designed research is useful and important. The value of research permeates college classrooms; we see examples of it every day. College faculty frequently turn to education research with the goal of maintaining excellent programs at their respective institutions. Active learning, for example, is commonly used because education research concluded it was a useful teaching method. However, current science education research may be lacking some important pieces. Two-year colleges (TYCs) are frequently overlooked in science education research. At first glance, that may not seem problematic. But on closer examination, the exclusion of TYC populations translates into a big empty space in undergraduate science education research.

Many college students attend TYCs either as visitors or as regular degree-seeking students before transferring to a four-year institution. In fact, 52% of students earning a bachelor's degree in a STEM (science, technology, engineering, and mathematics) field and 46% of

students earning a master's degree in a STEM field complete some undergraduate training at a TYC (National Science Foundation, National Center for Science and Engineering Statistics [NSF, NCSES], 2010). Yet, much of STEM education research literature does not include TYC science students or faculty—especially in biology education research (BER; Schinske et al., 2017).

As education professionals we should pause: Are we ignoring half the college student population in our study of science in higher ed? Let's take a moment to consider how we might view other types of research that excluded half the population. Females make up just over half of the U.S. population, so what value might we give to a study on U.S. residents if it did not include any females? How might we view the conclusions of a nationwide study that overlooked California, Texas, New York, Virginia, Connecticut, Pennsylvania, Illinois, Ohio, Colorado, Iowa, Oregon, Massachusetts, Kansas, Wyoming, and Nevada? Combined, these states account for 50% of the U.S. population (U.S. Census Bureau, 2018a, 2018b, 20018c). Likely, we would consider the conclusions of these studies to be lacking some important pieces

because they exclude so much of their respective populations. College science education research is no different.

The report titled *Barriers and Opportunities for Two-Year and Four-Year STEM Degrees: Systemic Change to Support Students' Diverse Pathways* (Malcom & Feder, 2016) revealed that STEM students typically have complicated and irregular paths to college graduation. Many of those paths involve attending TYCs. In fact, TYCs, as a group, often have more students than four-year institutions. In 2017, TYCs had 26% more students than four-year institutions (12 million vs. 8,838,196 students; Duffin, 2019a, 2019b). Despite these numbers, TYCs are frequently unexamined or uninvolved in undergraduate science education research.

Looking closer we find numerous journal articles with the word *undergraduate* in the title. However, the article's data reveals that four-year faculty and/or students were the focus of the study. A group led by Schinske (2017) found roughly 97% of professional, peer-reviewed journal articles on biology education from 2012 to 2015 did not include TYC faculty or students. In other words, his team found only 3% of

the journal articles included TYCs in some way (either students, faculty, or authorship). The focus of education research on four-year institutions is likely due to a variety of factors. Research subjects are easier to access if they attend the institution leading the research. Four-year faculty typically have contractual research requirements, whereas TYC faculty contracts rarely require research or grant-seeking activities. Education research is more common at four-year institutions where release time is built into faculty contracts, something not commonly found at TYCs. Finally, TYC faculty often express anxiety about engaging in research without the support or resources that are common at four-year institutions. Whatever the reasons, the reality is that TYC populations are largely unexamined when it comes to undergraduate science education research. Fortunately, there are movements toward changing this trend.

Recently, there is increased development of collaborations in science education research between two-year and four-year institutions and targeted support of TYCs. As education professionals, we recognize how these collaborations and supportive programs benefit STEM programs, faculty, and students. Collaboration should be promoted—particularly if the institutions have similar missions and student populations. This very idea was discussed in an article by DeLeone, Price, Sabella, and Van Duzo (2019).

Useful programs that promote TYC inclusion are support networks such as CC Bio INSITES, which is funded by a National Science Foundation grant (<https://qubeshub.org/community/groups/ccbioinsites>). CC Bio INSITES is building a net-

work of BER professionals with the goal of promoting biology education research at community colleges (CCBER) to expand undergraduate biology education research (UBER). The network also supports TYC faculty so they have fewer barriers to engaging in biology education research and have support as they design and implement various research projects. In 2020, the Bean Beetle Microbiome Project at Emory University is exclusively hosting two-year institutions for their annual training (<https://www.beanbeetles.org/workshops>). The 2020 program is designed to support specifically the TYC faculty community. The Society for the Advancement of Biology Education Research (SABER) encourages TYCs and four-year institutions to meet and collaborate (<https://saberbio.wildapricot.org>). And, SABER offers a reduced registration (\$50) to TYC faculty because two-year institutions tend to have fewer professional development funding options.

The bottom line is this: TYC faculty and students must be involved and included in science education research if we want a more complete picture of STEM in higher education. Continuing to overlook the enormous TYC population leads to incomplete data in the very research we turn to as we strive to improve our programs.

This editorial is a call to action for community college STEM faculty and students to jump into the world of education research. All science students and faculty can benefit when we further our understanding of the *full picture* of science education in higher ed. Involving all types of college science students and faculty will only clarify our un-

derstanding and empower our efforts to improve. ■

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