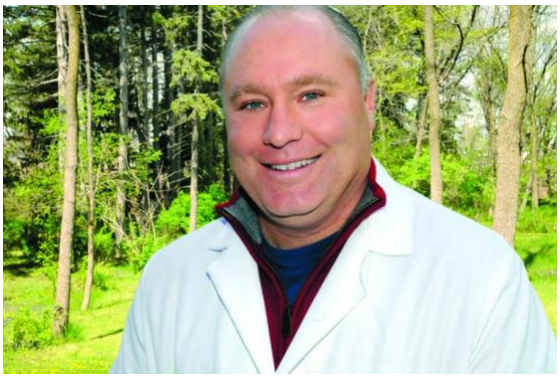

Invited Letter: Primary focus is to work toward embedding opportunities within required courses

Keywords: undergraduate research models, Finger Lakes Community College, CCURI, NSF, ATE

As a quick introduction, my name is Professor James Hewlett. I am a Professor of Biology at Finger Lakes Community College (FLCC) in Canandaigua, NY. In addition, I serve as the Program Coordinator for our A.S. Biotechnology degree program. Outside of my faculty role, I have served as the Executive Director of the Community College Undergraduate Research Initiative (CCURI) since 2007. With over 140 institutional partners, CCURI has focused on a mission of expanding opportunities for community college students to engage in an undergraduate research experience. The primary focus at Finger Lakes Community College is to work toward embedding these opportunities within the required course sequences and then provide additional opportunities for deeper exploration by participating in an active student research group. Although the current CCURI initiatives and efforts at FLCC are now operating at scale, the journey associated with this scaling effort continues to be defined by what can only be described as modest beginnings.

The word that best captures my initial foray into the undergraduate research space would be serendipity. Early in my career, I was approached by a field scientist to collaborate on a project that required various DNA research techniques to answer questions related to the migratory patterns of Eastern Red-tailed hawks. Without hesitation, I found two biotechnology student volunteers, and the three of us embarked on what eventually became a five-year project involving dozens of students. While we were not intentionally measuring student impacts during this time, the observations that I made concerning these metrics convinced me that this experience needed to be employed at scale. Soon after, we expanded our project portfolio and submitted our first National Science Foundation (NSF) proposal to test a novel model for course-based research experiences (CUREs). The awarding of this grant marked the beginning of what would become CCURI. Through this extensive National network of community colleges, we have found opportunities to study the research cultures at our partner institutions and conduct meta-analyses to capture best practices, institutional barriers, and student opportunities. As a Co-PI on the NSF ATE InnovateBIO National Biotechnology Education Center, I am currently working on undergraduate research models that involve industry-relevant projects that often include direct collaboration with an industry partner. The primary goal of this effort is to explore ways in which a research experience builds workplace skills that enhance the employability of students graduating from technology education programs.

The results from our meta-analyses of CCURI institutional partners suggest that any effort to ensure a successful undergraduate research program at a community college should begin with an understanding of how an institutional culture aligns with the ability of that institution to develop and sustain the research opportunities that they hope to provide for their students. Successful CCURI institutional partners have aligned their efforts with institutional priorities, remained connected to internal and external networks, embedded the experiences in coursework, included a faculty development plan, employed a multi-disciplinary approach, and adhered to a shared strategic vision for undergraduate research on their

campus. These institutional characteristics have been shown to be powerful predictors of the ability to scale and sustain research experiences at a community college. From a broader perspective, enabling our nation's community colleges to become full participants in the active practice of research requires having a better understanding of how to drive institutional-level change that can lead to a significant paradigm shift with respect to how we view the role of the community colleges in STEM educational reform efforts. That being said, it has become clear that the growth of community college participation in the undergraduate research community continues despite the many internal and external challenges these institutions face.

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