Leveraging Virtual Experiences for International Professional Development Opportunities during the Pandemic and Beyond

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The COVID-19 pandemic has affected all spheres of life, including the world of education. Within no time, once-bustling university classrooms were compelled to move online, leaving educators to rely on virtual engagement tools. This in turn heightened the impact of virtual professional development in higher education, not just nationally but also internationally. As we look toward finding means to engage students in effective classroom instruction, there remain parts of the globe that are making this transition to online instruction without cutting-edge technologies. This article highlights the importance of engaging educators in virtual professional development activities as part of international outreach and details one author’s experience using the Avida-ED platform for a novel international teaching partnership. Traditionally, international outreach activities have been pursued through distinct platforms, like Fulbright programs, sabbaticals, and other international collaborations. The ongoing pandemic presents a unique opportunity to propagate professional development activities on a virtual platform by emphasizing scientific teaching practices as they relate to the STEM fields. If undertaken, these endeavors ultimately benefit educators across the globe by not only equipping them with various pedagogical tools and resources for their online instruction but also by establishing international partnerships and collaborations.

INTRODUCTION

The COVID-19 pandemic has overwhelmed global education systems for over a year. Around the world, universities scrambled to provide students with the best possible education while balancing serious individual and public health concerns. For many institutions, hybrid and/or online classes allowed teaching and learning to continue. In response to the pandemic, many educators in the United States called for opportunities for professional development to enable the transition and transform their curriculum to be effective on a virtual platform. Yet around the globe, lack of digital resources and, most importantly, access to proper technology continue to pose a formidable challenge (1–3).

Prior to the pandemic, several teaching reforms supported by empirical evidence including flipped classrooms (2), active learning (3), and immersive, course-based undergraduate research experiences (4, 5) had been implemented in the United States. A large body of literature shows that these evidence-based practices not only improve content knowledge and engagement but also enhance retention and persistence for all students (2, 3, 5), with these practices especially impacting low-income, first-generation, and underrepresented students (6–9). These reforms are central to scientific teaching, which uses active-learning strategies to engage students in the process of science and employs teaching methods with evidence to support their efficacy for diverse students (10). Scientific teaching continues to be gradually adopted throughout the world (11–13). Other barriers for international educators include limited access to peer-reviewed literature, which is primarily in the English language and often behind expensive paywalls. This may in turn limit access to data on the efficacy of active-learning practices (14) and thus delay its implementation in the classroom. In addition to issues related to access, there may be cultural differences limiting the practice of active learning abroad. For example, in 2020, Fendos surveyed South Korean instructional staff and identified key differences between American and Asian higher education and found that institutional support may be central to the adoption of scientific teaching in some East Asian cultures (15). This type of cultural insight is crucial to successfully integrate evidence-based scientific teaching practices at a global level.

Above all, culturally competent knowledge exchange enables partnerships where instructors across countries can contextualize and optimize the implementation of evidence-based teaching practices developed in one part of the world within their own teaching (16). It is equally important that western...
academics learn from other cultures to teach to a global student base (17, 18). We therefore propose that cross-cultural professional development activities also present themselves as avenues for refining global cultural awareness. This mass pivot to online education has highlighted the opportunities and need for virtual, international professional development.

This article highlights the mechanisms by which virtual professional opportunities can be used for international outreach in the ongoing pandemic and beyond. Furthermore, these endeavors can facilitate the reduction in existing inequities related to the access of professional development opportunities. While Martin et al. discussed the administrative support needed for virtual professional development (19), this article seeks to discuss pedagogical and collaborative virtual professional development. This article culminates with author SR, a native of India, sharing her own experiences related to an in-person international outreach activity focused on the implementation of Avida-ED, a digital platform to teach evolutionary processes. She further highlights how Avida-ED can be adapted and leveraged for an international virtual outreach activity and the development of new, lasting international partnerships.

Professional development in scientific teaching and education is a valuable asset in today’s competitive academic market. For example, the vast majority of higher education faculty, regardless of their tenure status, have some teaching expectation as a part of their position (20). Indeed, faculty applicants are increasingly expressing interest in institutional support for scholarship and support in improving their teaching (21). Both within and beyond the academy, professional development should strengthen skills that are workplace-transferable, such as networking and grant writing (22). Thus, we believe that the resources like those delineated in Table 1, and discussed in more detail below, would be of interest to a diverse audience. This article provides practical recommendations and insights to meet the goal of engaging in the propagation of professional development activities on an international scale.

### Professional Development for Scientific Teaching in the Time of COVID-19 and Beyond

In-person professional development opportunities, described below, are the norm within scientific teaching, but it is important to recognize that some resources and programs have been modified during COVID-19 travel restrictions. They may have been canceled or become virtual programs temporarily but in-person professional development will likely be available moving forward. We acknowledge some inherent barriers associated with these opportunities and suggest low-cost solutions.

### International In-person Professional Development

Across the United States, institutions of higher education are expanding professional development resources through the development of centers for teaching and learning (23). As the funding for these centers can differ dramatically from one institution to another, opportunities...
Virtual professional opportunities are often available at a departmental seminars can invite international speakers to internationally. In addition, network platforms like ROSE or other accessibility-related personal challenges (36, 37). Due to competing demands, limited institutional resources, educators who otherwise may not be able to participate. Furthermore, these networks may lead to opportunities for future collaborations and towards recognition of international attendees but can also serve as a platform to forge international collaborations for future endeavors. In addition to hosting conferences, scientific societies often curate professional development resources. As an example, the American Society for Cell Biology hosts a collection of virtual teaching resources (https://www.ascb.org/career-development/teaching/virtual-teaching-resources/), and the American Society for Microbiology offers a series of webinars called the Teaching Undergraduate Biology Series (https://asm.org/Webinars/Teaching-Undergraduate-Biology-Series). Additionally, since the start of this pandemic,
Due to the expense of in-person professional development, educators at institutions with limited funding may not be able to take advantage of some of the opportunities mentioned above. Legal, financial, and linguistic barriers limit access to peer-reviewed literature, and training opportunities. Corresponding with any of the organizations mentioned above by e-mail may be an ideal way to begin building an international network of scholars. Sharing evidence-based education practices would enable the desired information exchange without requiring a university or an individual to pay for access to many educational journals. Once these bridges are established, educators can collaborate to adapt active-learning strategies to cultures beyond those in which they were developed and strategize ways to evaluate their efficacy in different learning environments (15, 40).

**Lessons learned: A personal perspective bringing Avida-ED to Nagpur, India**

After successfully completing the Active Lens train-the-trainers workshop offered by Avida-ED in 2017, author SR and her colleague Mickie Powell implemented a new module focused on antibiotic resistance in her curriculum. The following year, she applied for an Avida-ED dissemination grant. She used this funding to establish an international professional development activity for graduate students and faculty in the Department of Microbiology at Shivaji Science College in Nagpur, India. Being a native, she was aware of the lack of professional development opportunities available to local educators. She decided to approach one of the faculty members at the college via e-mail about doing this workshop. Thereafter, SR partnered with instructors from Shivaji Science College to develop the much-needed professional development opportunity to meet the evolving demands of these students. As previously mentioned, Avida-ED is a freely available program (http://avida-ed-mirror1.beacon-center.org/avida-ed-application/) that simulates digitally evolving organisms on a virtual platform. The goal of the workshop was to acquaint the participants with Avida-ED via hands-on participation in an antibiotic resistance lesson designed for a typical undergraduate introductory microbiology course. SR acquainted the participants with this digital tool via a tutorial and highlighted the ready-to-go version of the Avida-ED lab book version replete with lesson plans. The lesson plan on “How Antibiotic Resistance Evolves” was distributed in advance as a printed handout. SR further discussed how Avida-ED can be used to learn evolutionary principles and scientific methodologies employed in investigating the evolutionary processes. Thereafter, all the participants were asked to log on to their digital devices and run the Avida-ED platform (41). In this instance, SR trained the Shivaji Science College faculty and graduate students on the Avida-ED software in person. She noted that some participants needed more one-on-one assistance navigating the software whereas others had linguistic challenges requiring further assistance in the native language of the region. This example highlights the need for both pedagogical and cultural competence when it comes to sharing pedagogical resources.

Avida-ED lends itself to being an accessible tool for virtual instruction, not just for teaching evolution but also as an engagement tool to demonstrate the scientific method. Considering this experience, author SR suggests that Avida-ED can be an effective tool for engaging in virtual outreach events. She proposes a similar strategy of approaching faculty at international institutions; contacting them in advance to begin a dialogue on institutional needs and mutual benefits. Following this, the same workshop outlined above could be executed over Zoom. She recommends sharing the handout and a short video of the software platform with all registered participants beforehand. During the synchronous workshop time, after the initial introduction to the software, participants can work together in small groups via Zoom breakout rooms on the lesson plan. The local host of the workshop, and/or collaborating faculty, can visit each breakout room to monitor the progress of each group and offer clarity. Beyond replicating pre-designed lessons, participants can work within the Avida-ED platform to create novel hypotheses to be used in their own courses. While evolutionary theory is not often in substantial theologic conflict with many of the major religions in India, Avida-ED may be a useful tool for educators elsewhere if their students perceive evolution to conflict with their religious beliefs (42).

We hope that other educators can take advantage of similar existing resources for virtual professional development. Furthermore, we are excited that such resources present numerous possibilities for future international collaborations. Today, as the world of higher education has suspended most in-person classes to meet the physical distancing guidelines needed to curb the COVID-19 pandemic, it is even more important to share these online engagement tools and resources internationally.

**CONCLUSION**

Faculty engagement in professional development improves higher education across several metrics including improved self-reported student satisfaction (43) and increased sense of community among faculty (44–47). Furthermore, these trainings improve student and faculty retention by providing them with the tools, incentives, and support to teach using evidence-based methods (46, 48). The
disruption of an educator’s professional development plans is one impact of the COVID-19 pandemic on academia that warrants more discussion. The virtual professional development opportunities we have highlighted are tools that can help educators rebuild their professional development plans for the remainder of the pandemic and beyond.

As scholars and educators act on these recommendations, we advocate for the simultaneous advancement of undergraduate biology education reform and discipline-based education research. Assessments related to international professional development have often been relegated to medical exchange and research fellowships, but not undergraduate education reform. With the growing resources available to some faculty in the United States, we need to build collaborative relationships in partnership with students and faculty to share evidence-based resources both in the United States and abroad.

Furthermore, it is particularly important that those engaging in international professional development do so with a growth mindset and cultural competence that affirms the values, skill, and knowledge of all participants (44). This critical cultural competence can be developed and honed through professional development in culturally diverse, international partnerships.

Finally, the responsibility to continue engaging in professional development endeavors does not rest exclusively with the educators themselves. Institutions must support and train faculty as they incorporate new types of professional development into their curricula. We propose that virtual professional development opportunities are an ideal avenue by which higher education institutions can support their educators as they generate and propagate much-needed undergraduate evidence-based education reform and build impactful, collaborative international relationships. Virtual resources allow faculty to build impactful, collaborative international relationships with the potential to improve.

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