

Virtual Scientific Conferences: Benefits and How to Support Underrepresented Students

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Abstract

Ecological conferences provide a unique opportunity for scientists in the field of ecology to develop meaningful connections and exchange research in a rapid, multi-day, in-person format. For students and early-career researchers, especially those from underrepresented backgrounds, in-person conferences are challenging to attend due to the burdens on finances and time. However, as COVID-19 continues to restrict scientific societies' abilities to host large, in-person conferences, virtual conferences have increased in prevalence. For students and early-career researchers, virtual conferences present a multitude of benefits, including reduced attendance costs, increased accessibility to a wider range of conference resources, and reduced levels of anxiety. These factors make virtual conferences more accessible to those historically excluded from science. Further, microcommunities, which we define as a small network of individuals in the same career stage, can provide additional support for students via interacting closely with peers of the same identity, constructing workshops, and fostering belongingness in STEM. In this paper, we discuss the benefits associated with virtual conferences (focusing on students of underrepresented backgrounds), and we suggest methods to continue increasing inclusivity in STEM and scientific conferences as the world continues to adapt in response to the COVID-19 pandemic.

Key words: accessibility; COVID-19; STEM inclusivity; virtual conferences.

Introduction

Due to the COVID-19 pandemic, scientists worldwide are changing how they communicate, work, and live. Before the pandemic, virtually presenting new research to the scientific community was unusual and considered less than ideal. However, shifting to an online platform has opened many doors for budding scientists and has established a path toward inclusivity. For example, virtual conferences and conferencing platforms offer more flexible involvement options and new opportunities for undergraduate students to engage with research professionals without the need for travel. Academic conferences represent an opportunity for students to network, form research collaborations, and explore new fields. Attending conference workshops allows students to build new skills and meet prominent professionals in the field of ecology. Prior to the pandemic, attending a research conference typically required setting

aside days for travel, securing funding for conference expenses, and seeking external support (e.g., childcare). Even students with university funding must often pay for the conference's costs upfront and then be reimbursed, sometimes months later. These inconveniences are usually justified because conferences represent a unique opportunity for researchers and early-career professionals to exchange cutting-edge ideas and results (Harrison 2010, Potter et al. 2010, Hall 2015, Little 2020), but the many barriers associated with attending a scientific conference limit opportunities for engagement, especially for those from historically excluded backgrounds.

Individuals from historically excluded groups (e.g., Black, Indigenous, and people of color [BIPOC]), particularly low-income and first-generation students, lack the resources and financial stability to attend and afford the expenses associated with scientific conferences. Further, in academic spaces, BIPOC face systemic racism, implicit biases, “weed-out” courses, and biased standardized testing, all of which limit the capacity for BIPOC, especially those from lower income backgrounds, to move forward professionally in academia. As a result, non-white academics in the sciences, specifically the natural sciences, are incredibly rare (Evangelista et al. 2020). Dramatic changes to institutional policies, such as changes in tenure and promoting hiring guidelines that focus on valuing community engagement opportunities, will be necessary to increase representation in the STEM workplace (Schell et al. 2020). For instance, training professors and other mentors in anti-racism policies and inclusive actions will provide a template for these mentors to train their graduate students (Schell et al. 2020). These changes will lead to underrepresented students being better served as they become cutting-edge researchers/scientists who ultimately become future mentors and role models in academic spaces.

BIPOC and other underrepresented groups of students and researchers are crucial to moving science forward, as a diverse workplace with a mosaic of ideas leads to more productive and innovative research (Hong and Page 2004, Woolley et al. 2010, Nielsen et al. 2017, AlShebli et al. 2018). However, BIPOC and other historically excluded groups (e.g., LGBTQIA+, first-generation, or low-income groups) in academia do not have sufficient access to, or knowledge of, resources that are geared toward retaining them in academia (such as mentorships, networks, funding, and accessible information) (Schwartz et al. 2016). Gaps in accessibility force these groups to navigate higher education with minimal support or individuals end up dismissing academia as a career path. Because students from underrepresented backgrounds lack the knowledge of, or equal access to, these resources, there must be a substantial increase in the number of opportunities for these students to connect with and learn from experts in their field of interest. As worldwide scientific collaboration becomes more accessible virtually, online conferences present an opportunity for students who are members of underrepresented groups to find mentorship and research opportunities.

During the summer of 2020, two prominent ecology organizations, the Ecological Society of America and Animal Behavior Society, transitioned from in-person conferences to an online format due to the COVID-19 pandemic. The sudden rise of virtual conferences, which have effectively transferred the most valuable aspects of in-person conferences into a virtual space, has presented unique challenges both logistically and mentally. The transition to an online conference format can be incredibly overwhelming to undergraduate students and early-career professionals new to these spaces.

This paper explores the participation of ecology students who actively disseminate their results via traditional academic routes as they transition to virtual conferences. We focus on these students'

experiences at the Ecological Society of America (hereafter ESA) and Animal Behavior Society (hereafter ABS) Virtual Conferences. In this article, we discuss the benefits associated with virtual conferences, with the goal of providing recommendations to conference organizers that may result in high-value experiences for underrepresented students.

Virtual conference benefits

Conferences give students a unique opportunity to engage with scientists from different institutions and various fields. Many scientists participate in conferences to promote new research, advertise for or search for jobs, and connect with other professionals. For new student attendees, a conference can provide the opportunity to explore a wide breadth of research topics by engaging with talks and posters. Students can take advantage of beneficial opportunities at conferences such as workshops on topics like science education, science communication, and career trajectories. In addition, many conferences feature an exhibit hall, showcasing the newest books, technologies, and crafts in the field.

Online conferences have many of the same opportunities as in-person conferences, but time-conflicts and travel times between events are significantly reduced. Rather than traveling through a conference venue, the next talk is available at the click of a button, and it is easy to switch between sessions of interest quickly. On an online platform, attendees can fully immerse in the conference, consume the material at their own pace, and engage with presentations via live Q&A sessions and panels.

Costs associated with a four-day conference can easily become incredibly expensive with travel, lodging, food, and registration (Welch et al. 2010). For instance, to attend the ESA 2019 conference in Louisville, Kentucky, one author paid \$1,400 upfront for registration, travel, hotel, and meal costs, which was later reimbursed by their university. For many students and early-career professionals who lack research funding, these expenses must be paid via a scholarship or personal funds. By eliminating or significantly reducing travel expenses, virtual conferences remove this financial barrier for students and early-career professionals and increase the number of potential attendees who can afford to attend both from the United States and internationally. As a result, virtual conferences have seen an increase in participation from international scientists, further increasing the diversity of speakers and attendees (Sarabipour 2020). With more scientists able to participate as a result of the inclusivity of virtual conferences, more exciting research and ideas are exchanged, leading to stronger research discussions and collaborations.

While the limited face-to-face interaction of online conferences may initially seem less engaging, this format allows individuals who may feel uncomfortable or intimidated by in-person meetings to further engage in conversations by posing questions and discussion points in a non-confrontational manner. The format provides space for attendees to contribute more to the conversation (by using the chat and comment features) than a traditional conference format. Additionally, in a virtual setting, presenters are pushed to articulate themselves in new ways (Fig. 1), as traditional 15-minute talks may be reduced to a six-minute talk or a “lightning” three-minute talk. This challenges presenters to refocus their presentation on vital information about the project and sparks interesting questions for discussion. Some presenters have adapted to the virtual format by developing graphical depictions of their research, video content, and interactive features within presentations.

At both ESA and ABS Virtual Conferences, we also observed an increased dependence on Twitter for engagement in virtual conferences. Twitter has been historically used to promote conferences and highlight talks, resulting in a plethora of interactions (Caravaggi and James 2017). A particular function that was used to amplify student presentations during the 2020 ESA and ABS Annual Meeting was Twitter “threads.” Threads allow the user to link tweets together, providing an efficient way to describe slides and other information from their presentation in a digestible manner (Fig. 2). Twitter threads were used to give the story behind students’ research while also sharing transcripts and slides from their conference presentations. This allowed their presentations to reach a larger audience while making it more accessible. While sharing their presentations, students also tagged their collaborators and funding sources and used field-specific hashtags to reach a targeted audience. Additional outcomes from using Twitter included students being able to use these “thread presentations” to network within and beyond the conference attendees by using Twitter’s large platform. Thus, we see more opportunities to engage with the audience, boost presentation publicity, and extend networks and connections with scientists following the conference.

There are many benefits to virtual networking (Fig. 3), but having the opportunity to professionally connect with individuals in-person is an unmatched networking opportunity provided by in-person conferences. However, virtual conferences have developed innovative opportunities for networking in an online setting. For example, ESA hosted numerous virtual networking sessions for subsections of the ESA member body, creating smaller, welcoming spaces for conversation between ecologists with similar interests. In addition, the ESA SEEDS Program hosted daily “check-ins” facilitated by the Diversity Programs manager, creating a safe space to connect with fellow ecology students. From our experience, these networking events, along with various virtual workshops, live Q&As, and panels offered by the ESA virtual conference, gave the opportunity for students to generate meaningful professional connections in an online setting (2020 ESA Annual Meeting [August 3–6]).

Establishing microcommunities in a virtual space

Navigating academia can be daunting, particularly for first-generation and BIPOC students. Scientific conferences are vital for early-career scientists and students, allowing them to share their findings and learn about new research. However, new attendees may find them overwhelming. The desire to share research and connect with potential colleagues can be overshadowed by “impostor syndrome,” a condition characterized by anxiety and fear of appearing “unintelligent” to peers and other scientists (Kolligian and Sternberg 1991). These fears that undergraduates and first-time attendees face in these spaces can be alleviated with microcommunities. We define a microcommunity as a small network of individuals who are in a similar career stage and who share the goal of helping each other meet their goals. Microcommunities at conferences provide a space to support, encourage, and guide individuals through the unique challenges of a conference setting. Ideally, microcommunities should aim to satisfy Kelman’s (2006) processes for fully integrating an individual into a community: (1) rule orientation (students are provided with the necessary skills to succeed in science); (2) role orientation (students engage with the microcommunity and maintain these relationships, thus allowing students to see themselves as scientists); and (3) value orientation (students establish a desire to improve science and those that experience it) (Ahern-Dodson et al. 2020). Here, we will discuss how microcommunities within larger organizations (the Ecological Society of America’s Student Section, SEEDS Program, and the Animal Behavior Society’s Charles Turner Program) meet these processes and support scientists from historically excluded backgrounds, especially those in the early stages of their career as they attend their first large conference.

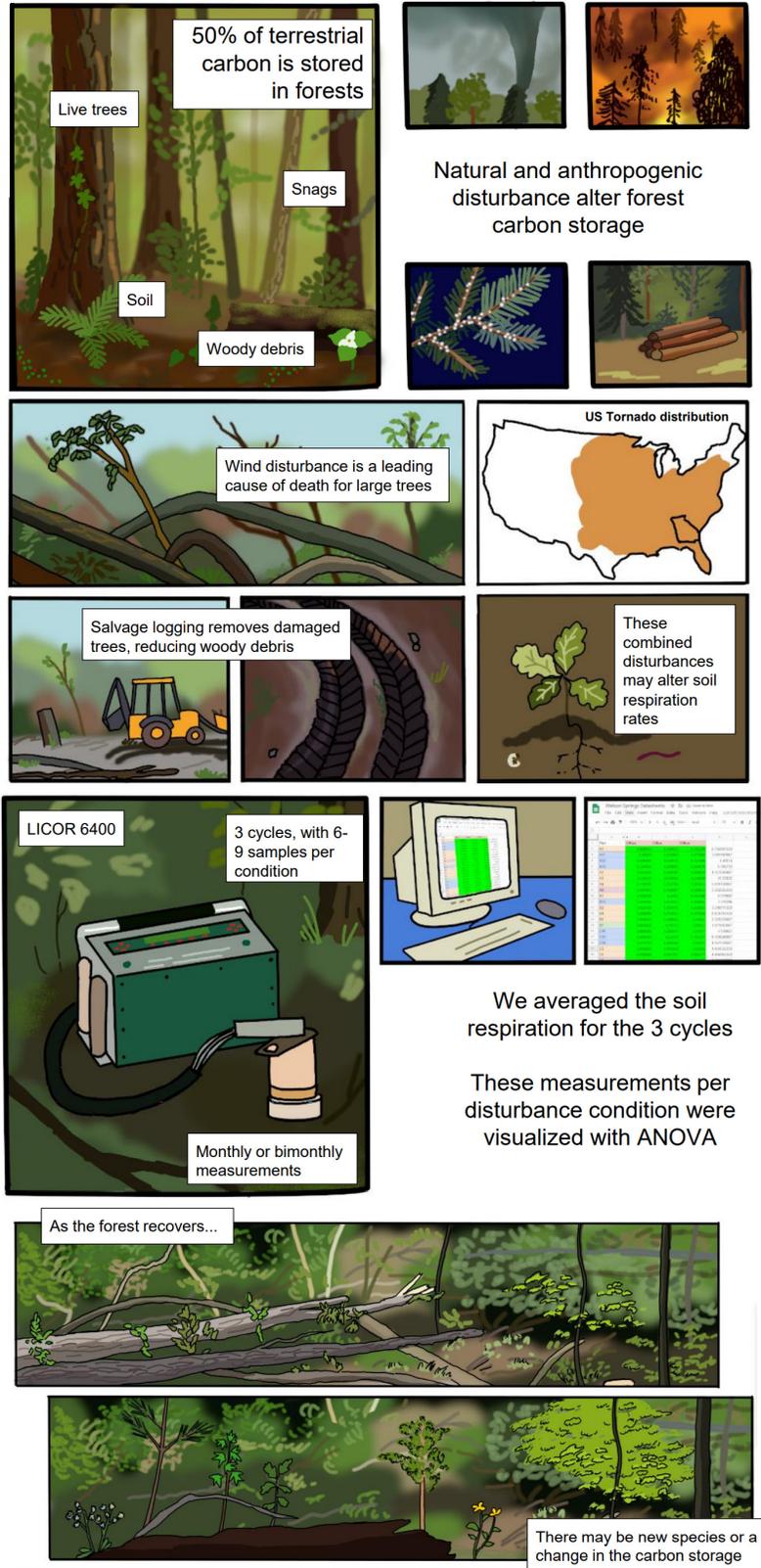


Fig. 1. A graphical illustration of research using comic panels, presented by Callie Oldfield at ESA 2020.

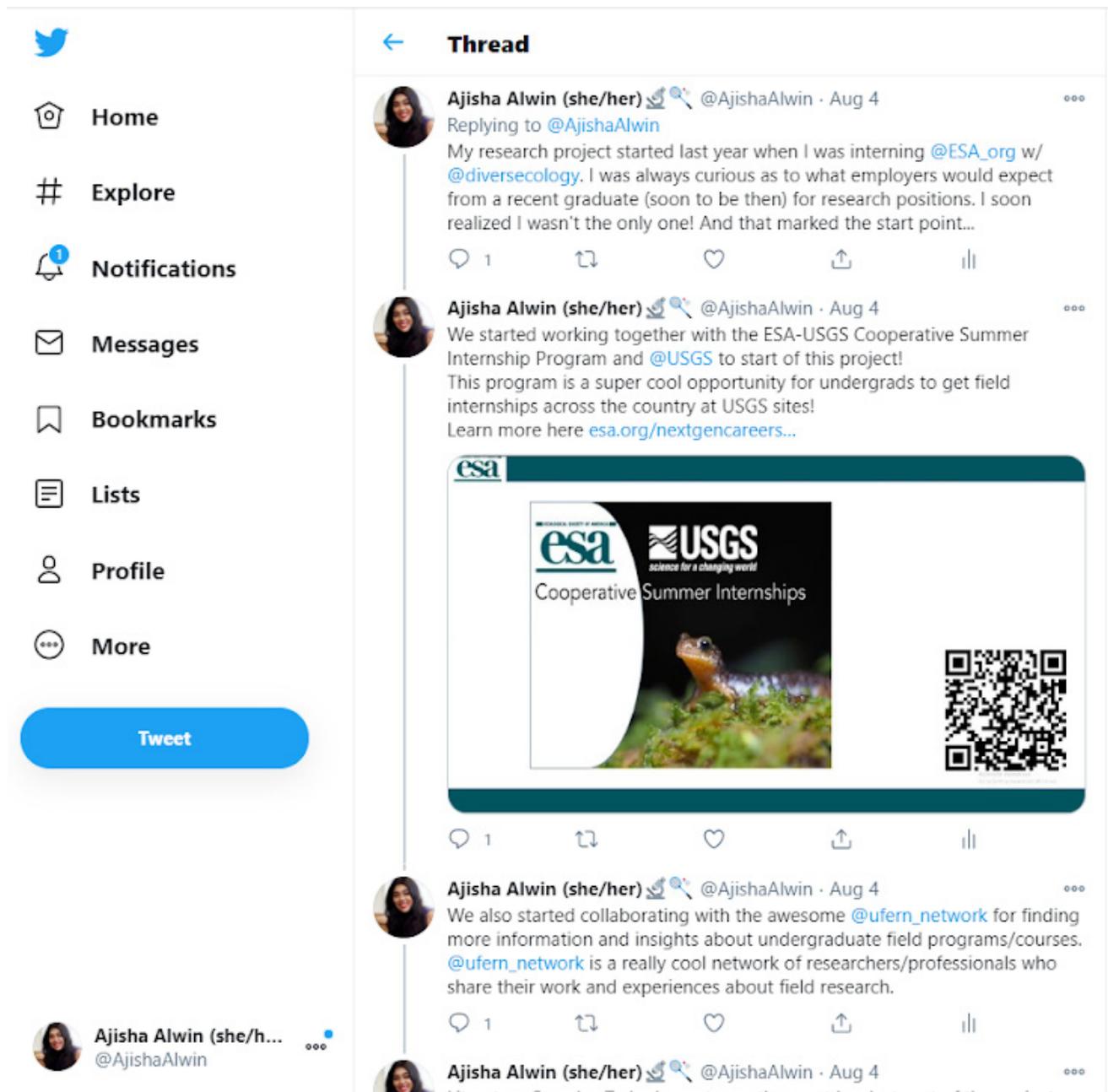


Fig. 2. Example of student twitter thread presentations during the 2020 ESA Annual Meeting. This image shows an excerpt from a thread presentation by contributing presenter Ajisha Alwin for her talk on undergraduate field research programs. Extracted from Twitter: <https://twitter.com/AjishaAlwin/status/1290356429740744705>.

Ecological Society of America Student Section at the 2020 Meeting

The ESA Student Section is the largest section within the society and caters to the needs of the large student community. The Student Section has a long-standing history of supporting the work done by underrepresented students and addressing important student issues in the larger professional society (Boyd et al. 2020). ESA Annual Meetings serves as a large platform where the Student Section hosts

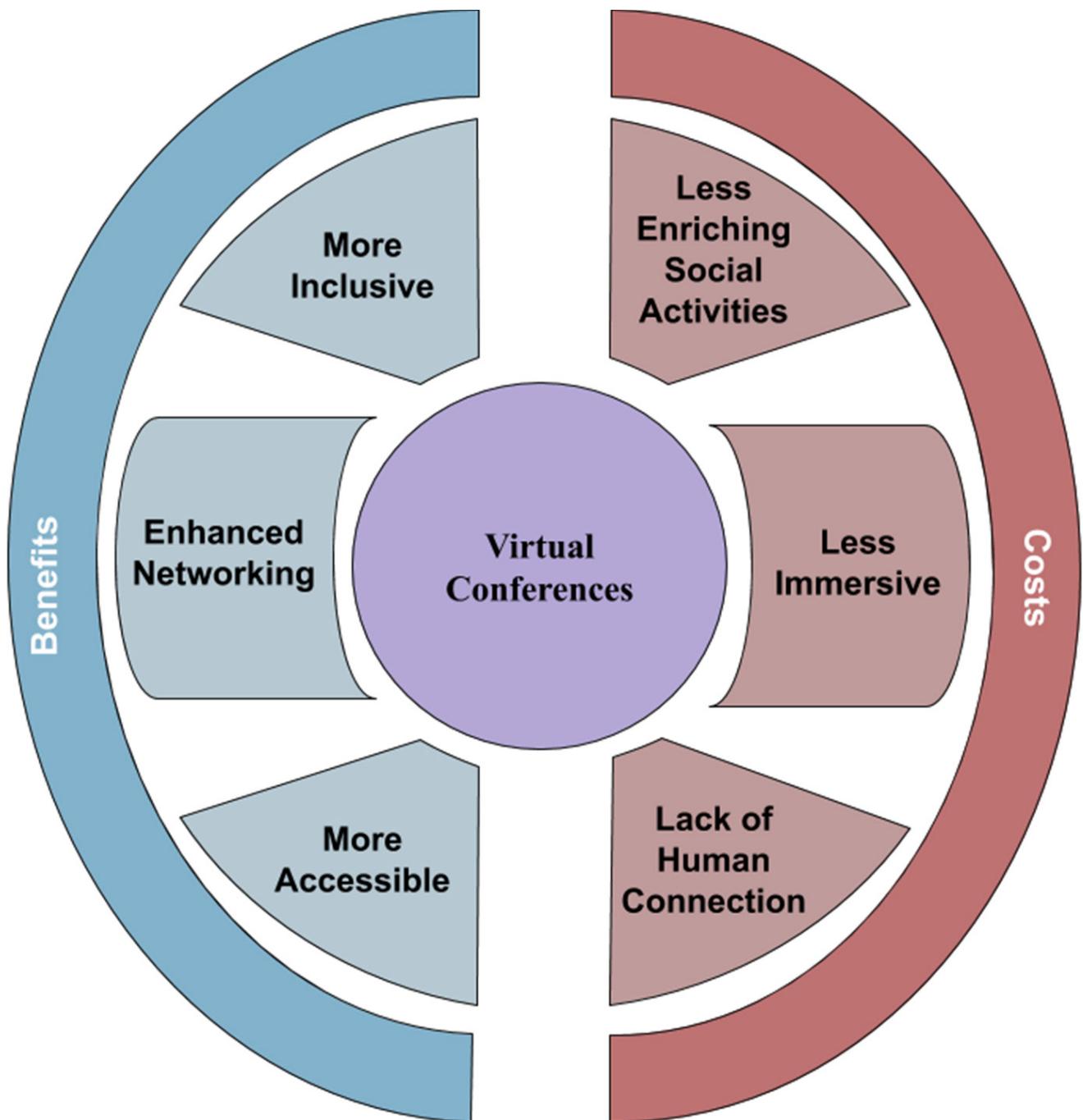


Fig. 3. A conceptual figure on the benefits and costs of virtual conferences.

several events and workshops targeted at helping students succeed in their career paths. The Student Section offers travel grant awards to selected students to offset some costs of attending ESA Annual Meetings. In 2019, the Section was only able to award 21.8% of applicants with travel grants (applicants: 119; recipients: 26). This year, due to lower costs of the virtual conference, the Student Section was able to award all 98 applicants with registration grants. This allowed students from diverse backgrounds, and who would otherwise be unable to attend the conference, to gain the experience of participating in

this large professional meeting. Recipients ranged from high school students to graduate students, and 59.8% were non-members of the Section.

The Student Section also awards extraordinary students in ecology and related fields for their contributions to different areas: research, publication, diversity and outreach, ecology education, and science communication. These Trailblazing Awards come with a registration grant to the conference, membership to ESA, and a cash award. Award applications are shortlisted based on criteria that include a diversity score multiplied by their composite scores from judges. This initiative is meant to enhance the work done by underrepresented students (Boyd et al. 2020). Although this year's Annual Meeting was virtual, the Section continued the tradition of these awards by hosting a virtual award ceremony and highlighting recipients that were unable to present their work at the Meeting.

The Section revised its Student Highlight Program, which is meant to amplify excellent student presentations and other student-run events. This year's highlighted students included recipients of Trailblazing Awards. The events were conducted as virtual interviews that were streamed live on the Student Section's Facebook page. The Section also used its social media platforms to provide virtual spaces for networking with other attendees at the conference and to highlight student presentations. This allowed students a larger platform to share their work and helped other attendees find students' presentations. Daily live Q&A sessions were also conducted to assist students as they navigated the conference and provided a space to share interesting sessions and to network.

SEEDS Virtual Cohort within the Ecological Society of America's 2020 Meeting

At the 2020 Virtual ESA Annual Meeting, the Strategies for Ecology Education, Diversity, and Sustainability (SEEDS) Program allowed 50 students to virtually attend the conference, forming a microcommunity with mentoring built in. The SEEDS Program aims to diversify ecology by providing mentorship and presenting underrepresented groups with diverse opportunities they would typically not have access to, including fully funded REU opportunities through their SPUR (SEEDS Partnership for Undergraduate Research) fellowship opportunities (Mourad et al. 2018). These are accessible to all students enrolled in US institutions, and they help students from underrepresented and low-income backgrounds gain valuable research experiences integral to their training as scientists. At the ESA Annual Meetings, SEEDS students are given an exclusive, all-paid experience and the opportunity to work with a mentor to help them navigate the meeting and plan their conference experience to further their career. Another highlight of the SEEDS Program is that it provides its students with safe spaces and other regular check-in style networking events to cater to its diverse student body. These networking opportunities also allow students to meet other mentors and professionals from a diverse range of fields, which ultimately aids in the students' career development. SEEDS student presentations are further amplified during the conference through other sections within ESA, particularly the ESA Student Section. These sections highlight student events and presentations through their social media platforms. At this year's meeting, two SEEDS SPUR fellowship recipients were selected and interviewed as part of the ESA Student Section's Highlight Program. The interviews were uploaded on the Student Section's YouTube channel.

When asked how the SEEDS Program supported the 2020 cohort as individuals and scientists, participants said:

Overall, SEEDS was especially helpful in facilitating networking. I definitely feel more confident about my place as a scientist in the ESA, having developed a stronger network of connections with other scientists. The mentorship program was especially helpful in that regard. SEEDS made me feel safer in conference spaces by demonstrating that administration in ESA cared about DEIJ [diversity, equity, inclusion, and justice] issues in a meaningful and less superficial way. By frequently having admins and committee members in SEEDS calls, I got the feeling that if an issue did arise in which I felt unsafe, I would have the support of the society.

I was not anticipating to have such an amazing personality and enthusiasm match with my mentor. She has been so invested in my success and growth, even after only knowing me for a week. I felt very comfortable expressing my fears and insecurities regarding grad school/ecology/science.

Charles H. Turner Award within the Animal Behavior Society

Every year, ABS offers undergraduate students and recently graduated individuals the chance to “become a Turner.” The Turner Award was created in memoriam of Charles H. Turner, one of the first African-American researchers in animal behavior and a pioneer in physiology, animal behavior, and entomology (Lee 2020). A Turner Fellow receives financial support to attend the conference and become a part of a Turner cohort for that year. This program, and the resulting cohort, further supports students, fostering “belongingness” and encouraging individuals to see themselves as scientists. Turner fellows attend professional and identity-centered workshops comprised of development activities. Additionally, each Turner awardee is assigned a mentor to meet one-on-one to discuss graduate school, career development, and conference content.

In addition to providing resources that are often difficult to locate as an underrepresented individual, this award also provides individuals with a group of supportive peers. Following the annual meeting, awardees are encouraged to stay connected to their peers in virtual peer-mentoring groups, facilitated by the ABS diversity committee. In these groups, a safe and supportive space is created for individuals to receive feedback on ongoing projects and discuss career prospects, academia, and the difficulties within it.

The setting and space created in this microcommunity allow for optimal identity expression in spaces (e.g., conferences) that were not always welcoming.

Turner Program participants said:

The Turner program allowed me to learn more about my identity within STEM and how crucial it was for me to incorporate every part of me into my work in order to help those that come after me. The level of support I received from my Turner mentor and fellow cohort on knowledge about graduate school and fellowship applications is something I wouldn't have received elsewhere. The program made me feel included in science, stronger as a scientist, reassured me that I can become a scientist in a field that doesn't reflect my identity.

Participating in the ABS Turner Program made attending a virtual conference less overwhelming by providing guidance on how to make the most of the meeting. The program created a support network of people with backgrounds and career goals similar to mine. The challenges I faced as an URM [underrepresented minority] were not only my struggles but that of my peers and mentors. I felt comfortable asking the “obvious” questions and voicing my thoughts on the science presented.

Conclusion

Although some individuals may cultivate an interest in the sciences before attending college, access to research opportunities and conferences is key to stimulating interests in this career path. These opportunities, and the skills developed from them, are crucial for students to see themselves as confident researchers who can succeed in ecology (Little 2020). Further, conferences provide a myriad of opportunities that can lead to graduate, post-doctoral, and faculty positions (Sarabipour 2020). In a study conducted with African-American students in the ESA SEEDS Program, Armstrong et al. (2007) noted that research experience was a prominent factor in a student’s decision to pursue a career in ecology. Additional contributing factors included family support, early exposure to the natural environment and ecology professionals, and a positive view of ecology (Armstrong et al. 2007). These factors can become particularly important for reassuring belongingness during conferences typically dominated by individuals who do not reflect any of their identities.

Despite non-ideal conditions, virtual conferences are a big step toward increasing inclusivity in STEM. Additionally, virtual conferences reduce the environmental repercussions associated with an in-person conference (e.g., reduction in carbon footprint) and are significantly cheaper, increasing the number of attendees via lower registration costs (Sarabipour 2020). Virtual conferences, especially those that have constructed microcommunities for student attendees, allow undergraduate students and early-career scientists to feel safe, confident, seen, and respected. Microcommunities, like SEEDS and the Turner Program, give individuals from underrepresented backgrounds the opportunity to connect with others from similar backgrounds and discuss hardships, aspirations, and how they envision the future of their field.

A virtual platform pushes scientists to think further about inclusivity and critically evaluate past conferences. Previously, those attending in-person conferences were limited by time, financial, and geographic barriers. We observed virtual conferences dissolve many of these barriers and show us the potential for virtual professional events. Hence, we see a strong case being made for a transition toward hybrid conferences. Hybrid conferences, having both an in-person and online component, will increase the visibility of those actively working and pursuing science, thereby improving inclusivity and representation. Opportunities for people of all backgrounds to engage in conferences are crucial to diversifying and making STEM more inclusive.

Future directions

Virtual conferences have been successful amidst the COVID-19 pandemic despite having little preparation time. While these conferences have dissolved many of the barriers associated with traditional scientific conferences, we push scientists and organizers to critically think about how these spaces can be further inclusive. We must ask how scientific societies can offer more inclusive options for professional development, research opportunities, and broadly accessing science. For example, all talks

given at conferences can be recorded and uploaded to society websites with provided closed captions to accommodate those that are hard-of-hearing.

With the potential for the COVID-19 pandemic to have lasting effects on the ability to host large public gatherings, hybrid conferences will likely continue to be encouraged and perhaps become the new norm. For ecology and STEM as a whole, to continue moving forward with innovative ideas and novel perspectives, we must continue to diversify the field and create equitable opportunities. Hybrid conferences have a unique opportunity to contribute to this goal and reach all scientists interested in presenting and/or attending the conferences. In order to maximize this potential for fostering inclusivity, we propose: (1) Creating microcommunities for undergraduate students/early-career researchers that satisfy the three processes outlined by Kelman (2006); (2) Diverting money saved on conference costs to hire JEDI (justice, equity, diversity, and inclusion) professionals for panels and workshops; (3) Including closed captions on all presentations and hiring American Sign Language translators for all major keynote speakers; (4) Strongly encouraging all speakers to upload their talks to an accessible platform (e.g., YouTube); and (5) Conducting a pre- and post- conference surveys to receive anonymous feedback in order to improve the attendee experience.

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