Undergraduate Perceptions on Attending Interdisciplinary Conferences*

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Abstract

Attending computer science conferences can give students insight into the research process and how academic work is disseminated. This study examines undergraduate student perceptions about attending an interdisciplinary computational biology conference. The study was conducted over four academic years with a mix of participants who attended a conference as part of a course and participants who received an undergraduate travel award. Results from 70 students enrolled in nearly 30 different institutions indicate that attending conferences helped them learn about different careers, gave them a sense of what computational biology research entails, and provided insight into giving an effective oral presentation. We found that students who received a travel award felt more comfortable at the conferences than students who attended as part of a course. Based on these findings, we provide guidance about developing programs for undergraduate conference attendance.

1 Introduction

Computer science research is largely communicated through scientific meetings and conference proceedings. Thus, computer science conferences offer unique

opportunities for students to learn about the research process and the researchers themselves. Previous work has shown that undergraduates who have attended scientific conferences report increased confidence and an increased sense of belonging [15, 4, 5, 6], and guides on how to support undergraduates at conferences exist [2, 4, 8]. However, there have been few studies on how to best plan a conference experience for undergraduates.

As computer science matures as a field, interdisciplinary subfields have emerged. Computational biology has seen tremendous growth in the past few decades, and is a ripe area for undergraduates in biology and computer science to explore [12, 11, 13]. However, interdisciplinary research is rare at the undergraduate level [3], and undergraduate conference attendance is even rarer.

This paper examines undergraduate perceptions about attending an interdisciplinary computational biology conference. Many studies on student perceptions in conference attendance involve students who present research [5, 10], whereas our study includes students who attend conferences without presenting research. This work follows up on a pilot study about undergraduate conference attendance in 2016, which showed promise in integrating a conference experience in a course [7].

We surveyed two types of student experiences over four years: students who attended a conference as part of a course and students who attended a conference with a national travel award. We found that students who attended the conferences as part of a travel award had self-perceived better outcomes than students who attended the conferences as part of a course. In fact, whether a student was a travel awardee or a class participant was the *only* feature that produced statistically significantly different survey responses across demographic groups. This survey provides some guidance for developing programming around undergraduate conference attendance.

2 Conference Experiences and Survey Design

From 2018-2022, we offered two conference experiences to undergraduate students. In the **Class Model**, students enrolled in an upper-level computational biology class at Reed taught by the author and attended a conference as part of the course. Under this model, students attended an in-person conference or a virtual conference (all fully paid for) and completed scaffolded assignments designed to encourage them to network and engage in different aspects of the conference.

In the **Award Model**, the author organized a national undergraduate travel award in partnership with an annual computational biology conference. Undergraduates from any US-based institution were invited to apply and received conference registration and housing if they were selected. The applica-

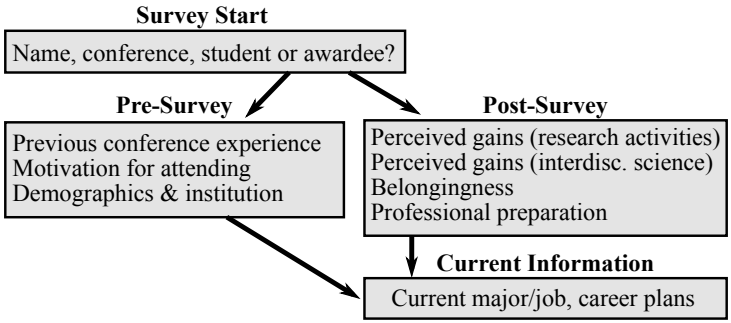

Figure 1: Survey design. The data analyzed in this paper are for pre-post matched surveys.

tion was intentionally short, and we advertised the award to undergraduates at institutions within driving distance to the conference venue.

In both models, there was an emphasis on lowering the barrier for students to attend: any students at Reed with the prerequisites could register for the course and attend the conference, and the travel award prioritized students who hadn't previously attended a conference or had limited resources at their institution for computational biology. In both models, the author attended the conference, met with all the students, and held sessions for the students to get to know each other and learn about conference logistics [8].

2.1 Survey Design and Data Analysis

Students were prompted to complete a pre-survey before the conference, a post-survey immediately after the conference, and a post-survey annually thereafter. The full study design is available in the Supplementary Information S1 online.[1] for this paper, we focus on the matched pre-survey and post-survey that was completed within 6 months of the conference (Figure 1). The pre-survey asked respondents questions about their prior experience attending conferences, their reasons for attending, their demographics, and their institution and institution type (primarily undergraduate institution or research institution). The Likert-style post-survey questions were selected from Grinnell's Research on the Integrated Science Curriculum (RISC [9]) and CU Boulder's Undergraduate Research Student Self-Assessment (URSSA, [14]), with some additional questions specific to computational biology and interdisciplinary science. The full list of questions and aggregated responses are available as Supplementary Information S2 and S3 online.

[1] See the "Supplementary Information" section for the URL.

The post-survey contains 35 Likert-style questions. When comparing two groups of Likert-style responses, we use the Mann-Whitney U rank test which is used to analyze Likert data [1]. We used Python's `scipy` implementation of the test and used the Benjamini-Hochberg procedure for multiple hypothesis correction.

2.2 Predictions and Confounding Factors

We hypothesized that students in the Class Model would see larger self-perceived gains in research activities, interdisciplinary science, and belongingness due to the additional scaffolded assignments and the dedicated time for reflecting about the experience as a class. We also expected that student experiences would be different along demographic lines (e.g., gender, institution type, whether the student had previously attended a conference), but it was unclear which groups would see larger self-perceived gains.

There are several confounding factors that should be considered when interpreting the results of this study. First, there is a strong selection bias since the participants were not randomly chosen from a population of students. The computational biology course in the Class Model is an elective, so Reed students opt-in to take it. In the Award Model, students chose to apply by completing the travel award application. All students who participated in either model were invited to complete the survey. Second, the survey was administered between fall 2019 and spring 2023, which spanned the virtual/remote conferences during the COVID-19 pandemic. Three of the seven conferences in this study were virtual, which means that many of the answers to questions involving in-person events and networking may not be relevant. On the other hand, the low cost of virtual conferences provided opportunities for more students to attend these meetings. Finally, not all students who went to conferences responded to the survey. Students who had overall better conference experiences might be more willing to complete a follow-up survey years after the conference.

3 Survey Results and Discussion

One hundred and three students attended a conference between 2018-2022 (Figure 2). Seventy of these students (68%) took the survey at least once between fall 2019 and spring 2023. There were a total of 140 survey responses among these 70 individuals.[2] Fifty-two of the respondents (72%) completed the survey two or more times, usually in the immediate pre/post surveys (Supplementary Information S3 online).

[2]We record 71 respondents because one individual attended two different conferences.

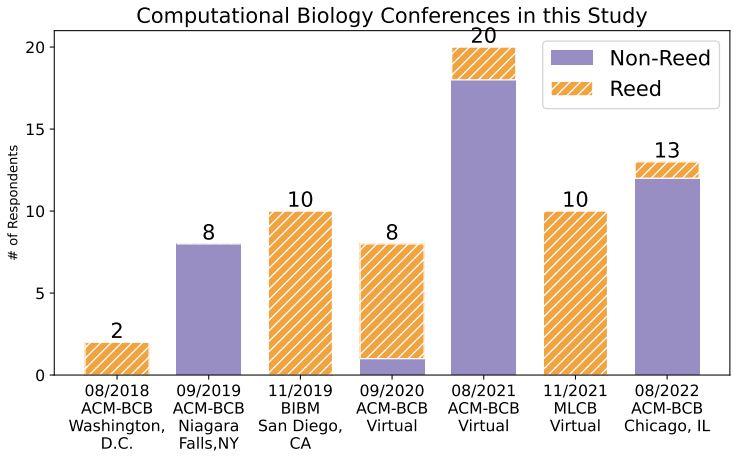

Figure 2: Computational biology conferences in this survey.

The respondents attended one of seven computational biology conferences (Figure 2). Most of the conferences were the ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB). One group of students attended the IEEE Conference on Bioinformatics and Biomedicine (BIBM) and another group of students attended the Machine Learning in Computational Biology (MLCB), which grew out of a NeurIPS workshop. The travel award was administered for ACM-BCB 2019, ACM-BCB 2021, and ACM-BCB 2022, whereas the Reed course took students to BIBM 2019, ACM-BCB 2020, and MLCB 2021. The ACM-BCB 2018 conference was a pilot study.

The 70 respondents came from 28 different institutions. Fifty-three (76%) of the respondents were from primarily undergraduate institutions (PUIs), with 31 (44%) from Reed. The remaining 17 were from research institutions. Twenty-six (37%) respondents participated for Reed course credit and 44 (63%) received a travel award (Figure 2). Fifty-two (74%) of the students had never attended a national conference, and thirty-eight (54%) had never attended a poster session or regional conference. Only nine of the respondents presented work at the conferences they attended. Of the individuals who chose to disclose their gender, 33 respondents were gender minorities (47%) and 25 respondents were male (36%). Of the individuals who chose to disclose their race/ethnicity, 32 respondents were White (46%), 19 respondents were Asian (27%), two respondents were Black or African American (3%), and four were multi-racial (6%). Additionally, three respondents were Hispanic/Latino (4%).

3.1 Post-survey trends confirm prior research

We examined the post-surveys for the 47 respondents who completed the survey within six months of the conference being held (Supplementary Information S4 online). Overall, students felt that they gained some experience in making and giving oral presentations (median Likert value 4), which is expected in a conference setting. Students strongly felt that the experience gave them a better sense of what computational biology research entails (median Likert value 5 and no score below 3) and they learned about different scientific careers (median Likert value 4). Regarding questions surrounding conference dynamics and belongingness, the respondents overall felt that the conferences were welcoming, the talks were relevant to their interests, the experience helped them clarify career path, and that it made them more likely to try research (median Likert value 4). Many of these perceived benefits have been noted elsewhere [15, 4, 5, 6]. All 70 respondents indicated they would want to attend another conference in the future. However, some responses were not as positive: students felt that the conference assumed too much prerequisite knowledge (median Likert 4), and there was high variance in whether the respondents felt out of place at the conference.

3.2 Differences between the Class and Award Model participants

We then measured the differences in responses between the 26 students who attended a conference under the Class Model and the 44 students who attend the conference under the Award Model (Supplementary Information S5 online). There were two statistically significant differences between the two groups (Figure 3). First, students in the Class Model felt that the conferences were *less* welcoming than travel awardees (Mann-Whitney U corrected p-value 0.007). Second, students in the Class Model felt *less* comfortable talking with other attendees in a professional networking session (Mann-Whitney U corrected p-value 0.028). Responses to other questions showed similar trends: students in the Class Model felt slightly less confident in their ability to contribute to science, and the conference made them slightly less excited about research and less likely to try research (Figure 3).

These results suggest that the students who attended under the Award Model felt more comfortable at the conferences than students who attended under the Class Model. There are many differences between these two groups, but four potentially contributing factors stick out. First is the motivation for attending the conference in the first place. The students who received a travel award had the interest to apply, whereas the Class Model group opted in by simply enrolling in the class. Second is the sense of community: students who received a travel award met at the conference in an initial awardee dinner,

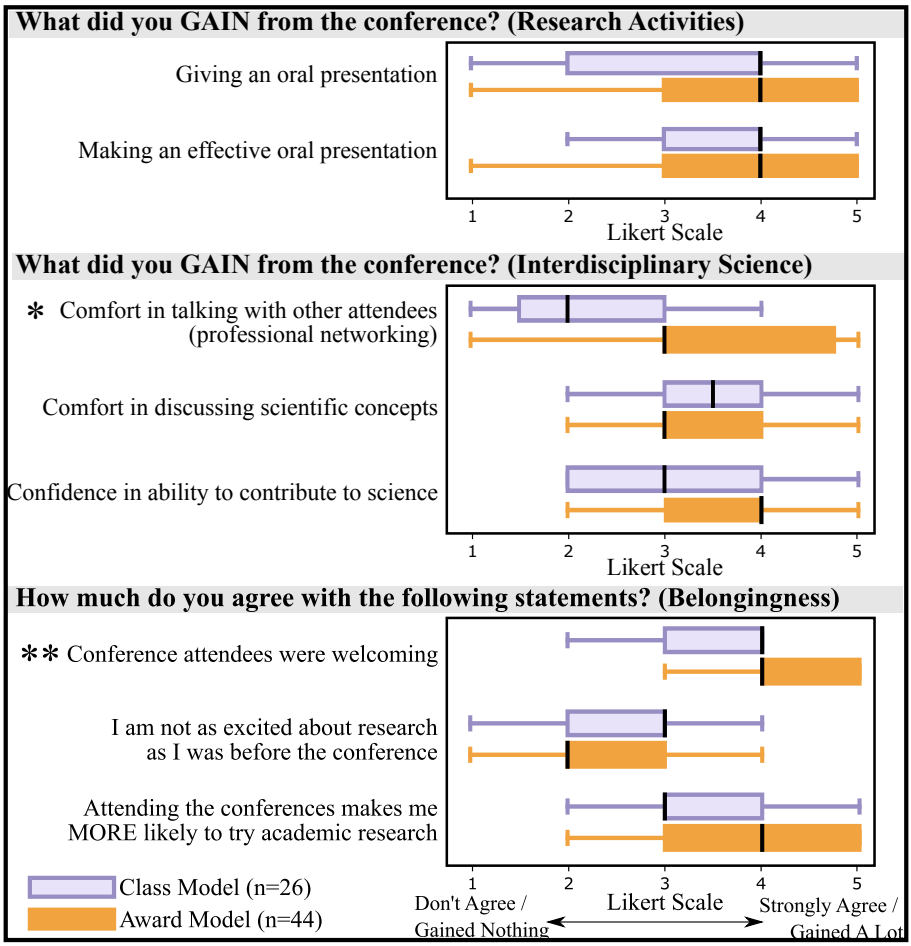

Figure 3: Select responses for students with course credit vs. travel award. Boxes indicate median and quartile ranges and the whiskers indicate 1.5 times the interquartile range. $*$: Mann-Whitney U corrected p-value< 0.05; $**$: corrected p-value< 0.01.

which offered built-in networking with a new group of people before the conference even began. Third, the two groups prepared very differently: travel awardees received information specific to the conference and attended new attendee sessions. Students in the course, on the other hand, had scaffolded assignments to prepare them for the meeting (and ultimately earned a grade in

the course). Finally, the response rate for the two groups is also dramatically different. Students in the Class Model had a 100% response rate, since they saw the instructor after the conference and were given many in person reminders. Travel awardees did not have a similar pressure to complete the survey, so those who would have reported negative experiences may have chosen to not participate in the survey.

3.3 Demographic groups did not differ in responses

While our study focused on evaluating the differences between the Class Model and the Award Model, it is possible that a response may be due to a student's experience and background (such as prior interests, demographics, and motivation for attending). We found no significant differences in responses for gender minorities vs. men, White students vs. non-White students, students from PUIs vs. students from R1 institutions, and students who had previously attended a conference vs. students who had never attended a conference before (Supplementary Information S5 online). Some of the groups have small sample sizes; however, these results are reassuring in that students with different preparation, affiliations, and interests generally had similar conference experiences, according to the responses.

4 Conclusions and Recommendations

This paper presents a four-year survey about undergraduate perceptions of conference attendance, with respondents representing a broad range of undergraduates by institution type, gender, race, and motivation for attending a conference. Based on the survey responses, students who received a travel award felt more comfortable at the conferences than students who attended as part of a course. While it is challenging to draw additional conclusions from data, attending the conferences clearly helped some respondents clarify their career paths and gain a better understanding of computational biology as an interdisciplinary field.

The Award Model may foster belongingness in a way that is absent from the Class Model. Students who apply for and receive travel funds might already feel more included in the community, even if the travel award process is quite short. The Award Model also sets different expectations than the Class Model: travel awardees met a dozen other students from different schools in a professional setting, compared to traveling to a meeting with classmates. Tying the conference experience to a course grade in the Class Model may have decreased the motivation of students to explore options on their own; more work could be done to improve the scaffolded conference experience in the classroom to make students feel better prepared for the conference. This study suggests that

developing a program that incentivizes students to opt-in to conference attendance will be a good first step towards community building through conference experiences. For example, providing department funds for students to attend conferences might be a better approach than offering it as a class assignment.

Some limitations of the study makes it hard to understand the impact of conference attendance. The survey included optional open-ended responses, but did not provide enough information to compare the two models properly (Supplementary Information S6 online). There was a longitudinal component to the survey to determine how conference attendance might impact career choice, but again there was limited data to draw larger inferences. Disaggregating the survey results by virtual vs. in-person conferences may help untangle the benefits of those experiences, specifically the balance between professional development opportunities for in-person conferences and the lower cost more accessible environment for virtual conferences.

Regardless of the model, preparing students through pre-conference sessions and helping them navigate travel or professional networking is critical to help them feel like they belong at the conference. Connecting undergraduates with each other early on in the conference helps them navigate the experience with peers. Finally, it is important to encourage students early in their time in college to take advantage of these opportunities, even before they might have had formal research experience.

Supplementary Information: Information about the full study design, survey questions, aggregated responses, and a full set of all results can be found as Supplementary Information S1-S6 online at `https://www.reed.edu/biology/ritz/ccsc-supplementary-info.html`.

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