NIBLSE
Bioinformatics in Life Sciences Education

The Network for Integrating Bioinformatics into Life Sciences Education (NIBLSE): Barriers to Integration

460A

Anne G. Rosenwald[1], Elizabeth Dinsdale[2], William Morgan[3], Mark A. Pauley[4], William Tapprich[5], Eric Triplett[6], Jason Williams[7], and Members of NIBLSE

[1]Georgetown University, [2]San Diego State University, [3]College of Wooster, [4]National Science Foundation, [5]University of Nebraska at Omaha, [6]University of Florida, [7]Cold Spring Harbor Laboratory

Abstract

The Network for Integrating Bioinformatics into Life Sciences Education (NIBLSE) seeks to promote the use of bioinformatics and data science as a way to teach biology. Just as molecular biology revolutionized the way faculty and students viewed biology in the 1980s, we believe a similar revolution with respect to bioinformatics is due. Thus far, the network has contributed two significant publications bioinformatics education literature, one detailing a set of bioinformatics core competencies for undergraduate biologists (Wilson Sayres et al., 2018, PLoS One, https://doi.org/10.1371/journal.pone.0196878), and a second documenting barriers to integrating bioinformatics into life sciences education (Williams et al., 2019, PLoS One https://doi.org/10.1371/journal.pone.0224288).

To explore the extent to which bioinformatics is currently taught in the US, we conducted a study of US life sciences faculty. A survey was deployed to more than 10,000 faculty. From the more than 1,200 responses we were able to document the barriers that limit bioinformatics instruction. Faculty training was cited as the most common barrier. Two ways in which NIBLSE is alleviating this issue is through online training (see the poster by Kleinschmit et al.) and the development of a collection of bioinformatics learning resources (see the poster by Morgan et al.). In addition to lack of faculty training, there were a number of other interesting findings that we plan to explore more thoroughly, including the observation that junior faculty members, who have the most formal training in bioinformatics, teach bioinformatics less frequently than more senior faculty. In addition, faculty who are members of recognized minorities themselves report barriers at higher frequencies than majority faculty. We plan to conduct focused interviews with faculty, chairs, and administrators based on these findings in efforts to develop strategies to alleviate these barriers.

Methods

The survey was developed by the NIBLSE Core Competencies Working Group, approved by UNO's IRB, and sent to more than 11,000 life sciences faculty in Spring 2016 using a mailing list (http://schooldata.com) and the existing networks of NIBLSE participants. The survey included several open-ended questions asking respondents about perceived barriers to the integration of bioinformatics instruction. The survey responses were subjected to keyword analysis by two groups independently (one at Georgetown and one at Florida). Both sets of analyses gave similar results. The Florida analysis was used for the results presented here which were derived from one of the open-ended questions.
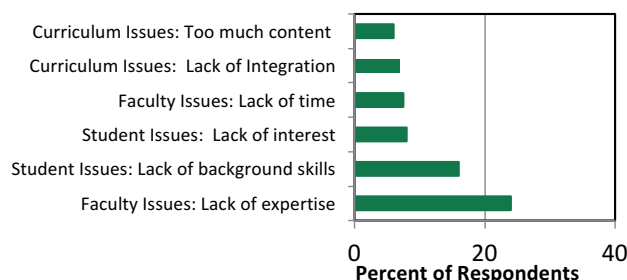
Results

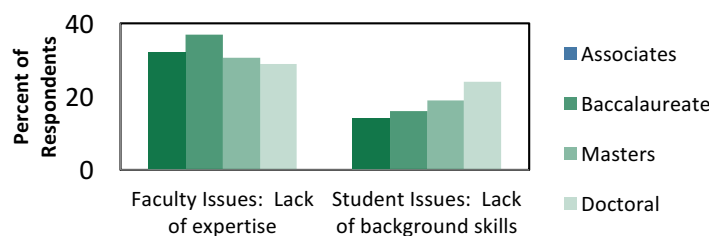**Figure 1: Percent of Respondents Reporting Specific Barriers**

Figure 2: Percent of Respondents Citing Specific Barriers by Carnegie Classification

Faculty training and expertise was the number one barrier reported (Figure 1). This result held when data were parsed by demographic variables, including Carnegie Classification (**Figure 2)**, size of school, sex of respondent, and whether the school was a minority-serving institution.

For more info: contact anne.rosenwald@georgetown.edu

Results/Next Steps

Given that **lack of expertise** was the most common issue, we plan to
- serve as a clearinghouse for existing training opportunities
- develop new training opportunities (see our poster: *Integration of bioinformatics into life science curricula: Community development, dissemination, and assessment of a NIBLSE learning resource* (459C) Kleinschmit et al.)
- develop a collection of learning resources (see our poster: *Incubators: Building community networks and developing open educational resources to integrate bioinformatics into life science education* (464B) Morgan et al.)

Faculty underrepresented in STEM reported lack of expertise at higher levels than majority faculty, although the number of underrepresented faculty was quite small (n = 81). We plan to
- perform a targeted survey of faculty under-represented in STEM.

The youngest cohort of faculty (earning terminal degrees between 2010 and 2016) were less likely to be teaching a dedicated bioinformatics course than other cohorts, despite the fact that these individuals were more likely to have formal bioinformatics training. We suggest
- a broad restructuring of teaching duties for new faculty, one that plays to their expertise in more current trends in biological research.

Associates-granting institutions are the least likely to engage in bioinformatics instruction although skills in big data analysis are important for workforce readiness. We plan to target 2-year college faculty.