Abstract: Evolutionary biology is often taught in a large-enrollment, lecture-style format. We have developed 45 student-centered active learning lessons for teaching evolutionary biology. We highlight three tools for measuring the development of learning communities: measuring instructor performance and advancing students’ science process skills. We hope to promote conversation about course transformation in evolution. Our materials and assessment tools are available for download using QR codes.

Quantifying Learning Community Growth

Network Analysis as a Tool For Measuring and Quantifying Learning Communities: Active learning relies on peer interaction and the development of learning communities. Peer instruction in group work is effective because student-student interaction provides opportunities for individuals to meaningfully construct their understanding of the material [1]. Learning communities have repeatedly been shown to promote learning gains and reduce attrition [2]. We used network analysis to quantify the number of peer connections made by each student (“degree”) and how central students became to the “networkedness” and evaluated the relationship between these measures and student performance [3].

Methods: We surveyed students in an upper division Evolution course about their social connections using two web surveys with student photographs from our class roster (with permission). We administered the survey three times: prior to the start of the semester, at 6 weeks into the semester and 12 weeks into the semester (Figure 1). We calculated degree and connectedness using the iGraph and Network packages in R [4].

Results: We found that students increased their number of network connections during the first six weeks of class, but that they did not significantly increase the number of connections during the second six weeks of class (Figure 3). We also found that this class score was correlated with a number of connections gained during (Figure 4a: P=0.01, F=6.52, DF=1) and connectivity (Figure 4b: P=0.02, F=5.62, DF=1).

Measuring Teaching Behaviors

Data Driven Teaching Evaluations: Faculty are increasingly encouraged to adopt active teaching practices to increase student learning and reducing attrition. Yet, instructors in STEM disciplines often lack experience and confidence in using active learning in their courses. Offering objective, data driven feedback can help novice faculty to track the effectiveness of new activities. Our tools measure multiple dimensions of faculty teaching.

Methods: Over the course of two years, we iteratively developed a faculty teaching observation tool (SITAR – Student Interaction and Teaching Activity Report), which is “decorsorbed with modification” from the RTOP [5], TDOP [7], COPUS [8], and the Student Engagement Protocol (Birn Lane, personal communication). This tool is now being used by about 25% of our department’s faculty. In evolutionary biology, we trained a research assistant to collect quantitative data using this tool during each class, and reviewed the automatically visualized data (Figure 6).

Download SITAR for use in your classroom using this QR code

References


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Download our poster rubric using this QR code

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