

# Evaluating Virtual Resources Designed to Enhance Graduate Pedagogy in a High School STEM Program

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**Introduction:** Graduate students in biomedical engineering have few opportunities to learn about pedagogical concepts and subsequently put these concepts into practice. Opportunities to develop teaching and mentorship skills would be particularly meaningful additions to the graduate student experience for trainees interested in pursuing a teaching-focused career after graduation. *Discovery* is a volunteer-based STEM educational initiative in which graduate students partner with high school educators to develop and deliver inquiry-based projects in the context of biomedical engineering to senior science secondary students. Graduate students are involved in all aspects of *Discovery* programming and act either as instructor-mentors to secondary school classes or as discipline leads who develop curriculum materials and oversee instructor-student interactions. We have previously identified that *Discovery* has a positive impact on STEM graduate student skill development. However, we have identified graduate student desire for additional formal pedagogical training. Our aim in this work was to implement pedagogical training materials for graduate student *Discovery* volunteers and evaluate the effectiveness of these resources in improving graduate skill development, especially pertaining to teaching and mentorship.

**Materials and Methods:** To improve the graduate student experience in *Discovery*, we have created modules on pedagogical concepts and a mentor toolbox to formally structure the volunteer training process. Asynchronous virtual training modules were centered around relevant pedagogical topics, such as scaffolding and universal design for learning (UDL). Each module consisted of a PowerPoint presentation, a case study based on previous *Discovery* materials, and a practice section. Post-module completion, graduate students saw sample responses for self-assessment and reflection. A mentor toolbox was also created to provide supplemental resources for instructor-mentors' use during *Discovery* sessions. We launched these pedagogical training resources as a pilot investigation during *Discovery*'s Fall 2021 and Spring 2022 virtual offerings, which had an instructional team of 9 discipline leads and 28 graduate student instructor-mentors. Instructor-mentors were required to complete two modules on problem-based learning and setting learning goals, while discipline leads were required to complete additional modules on curriculum development. After program conclusion in mid-June 2022, we will evaluate the training resources through group structured interviews to assess (i) perceived impact on graduate student skill development, and (ii) perceived utility in improving the instruction of secondary students in *Discovery*. Audio transcripts will be recorded from the interviews, and data will be qualitatively analyzed to identify common themes across participant responses. Participants will also be identified as (i) an instructor-mentor or discipline lead and (ii) a new or returning volunteer to discern differences in perception between these groups.

**Results and Discussion:** We hypothesize that the training modules will be perceived as useful for graduate student learning about teaching practices but additionally appreciate there may be reluctance in completing these modules due to the perceived amount of time required, the lack of formalized feedback, and a lack of understanding regarding utility. We further hypothesize that discipline leads will perceive more value in module completion compared to instructor-mentors due to their direct translation of the concepts in *Discovery* curriculum development. On the other hand, we anticipate the mentor toolbox to receive greater uptake among volunteers, as it comprises of standalone materials for direct use in the *Discovery* setting. Finally, we anticipate there to be a learning curve to understanding the skills that may be the most relevant in the context of *Discovery* instruction. Particularly, new volunteers who have not initially engaged with the training materials may find that, upon reflection at program conclusion, there were resources that they would have found helpful to their mentorship experience. We aim to verify these hypotheses and to uncover other relevant insights from *Discovery* volunteers through these structured interviews.

**Conclusions:** Through feedback obtained from graduate student interviews, we will continue iteration of these pedagogical training resources to support the professional development of graduate students involved in *Discovery*. More broadly, similar pedagogical resources could be developed for graduate students who engage in teaching outside of *Discovery*, such as for those pursuing teaching assistantship or faculty positions.