Supporting student skill development in undergraduate research experiences through the development of a self-reflection guide

Michael Hubenthal* - Incorporated Research Institutions for Seismology (IRIS), Washington DC, USA
Michael R. Brudzinski - Miami University of Ohio, Oxford, OH, USA

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Introduction

There has been an increased emphasis on documenting the benefits of participating in undergraduate research opportunities (UROs) and developing an understanding of the factors that influence these benefits. While tools to effectively measure the behavior, attitude, skills, interest, and/ or knowledge (BASIK) that result from UROs have matured, little focus has been placed on developing practical tools and instructional strategies to support students and mentors as they work to develop the BASIK being measured.

Viewed through the lens of constructivism, a URO can be examined as a cognitive apprenticeship (CA) where learning occurs through several key pedagogies described below (Gibson et al., 1998). In a study of UROs at CA, Feldman et al. (2011) found reflecting and refocusing to be the least commonly conducted methods employed by interns and mentors, and concluded, “there is need for professors to be more proactive in helping their students gain intellectual proficiency.” This work seeks to address this gap through the refinement of an intern self-reflection guide (SAMPLE NEXT TO DESIRE) and implementation plan to further improve student skill development.

Pedagogies of a Cognitive Apprenticeship

Modeling - An expert demonstrates a task explicitly so that novices can experience and build a conceptual model of the task at hand.

Coaching - An expert observes a novice’s task performance and offers feedback to transition the novice’s performance toward that of an expert.

Scaffolding - The act of analyzing and assessing student abilities, and then providing strategies and methods to support the student’s learning.

Reflection - Allowing students to compare their own problem-solving processes with those of an expert, another student, and ultimately, an internal cognitive model of expertise. The goal of reflection is for students to look back and analyze their performances with a desire for understanding and improvement towards the behavior of an expert.

Self-reflection Guide Goals:

- Develop a self-reflection rubric that promotes mentoring and reflection pedagogies.
- Increase the extent to which the intern is satisfied with the mentoring relationship.
- Increase the extent to which the mentoring relationship is centered on the intern.
- Enable mentors and interns to feel more effective in monitoring their own/other’s personal/professional growth.

Implementation aligned with Cognitive Apprenticeship Pedagogies

Phases Implementation Coaching Scaffolding Articulation Reflection/Exploration

Objective 1: Training and practice with metaphorical strategies

- Self-reflection guide

- Discussion of self-reflection guide with mentor prior to year

- Intern independently complete self-reflection guide

- Intern reflects on their progress with mentor

- Intern and mentor complete self-reflection guide together

Mentor Perceptions of Guide

Overall I found the Self-reflection Rubric to be a useful resource for the mentoring process.

- I found the mentoring rubric to be a beneficial resource for the mentoring process.

- The mentoring rubric helped identify areas that needed improvement and areas where growth occurred.

- The mentoring rubric helped illuminate areas that needed improvement and areas where growth occurred.

- I felt that the mentoring meetings allowed me to reflect on the mentoring process.

- I looked forward to completing the mentoring rubric and discussing it with my mentor.

- I plan to use the mentoring rubric (or a modified version) with other students in the future.

- The mentoring rubric and rubrics helped me motivate me during the summer.

Intern Perceptions of Abilities to Self-Assess

Self-assessment is an important component of learning and professional development.

- I can easily articulate skills that are important for a scientific researcher to develop.

- I can accurately assess my performance and professional growth.

- I am not sure how to identify a starting point for my professional growth.

- I am not sure how to identify a starting point for my professional growth.

- I have difficulty identifying scientific skills that I possess.

Results

Survey data was collected between 2011 and 2015. Average response rate for interns was 90% and 84% for mentors.

Intern Perceptions of Guide

Strongly Agree Agree Undecided Disagree Strongly Disagree

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Use of Self-Reflection Guide

The self-reflection guide was intended to be used three times each summer to develop new scientific skills and knowledge. The results of the evaluation have been aligned with mentors and interns each year. Overall, this appears to have increased adherence to the protocol as designed.

Conclusions and Future Work

Initial and warrant continued use and evaluation of the self-reflection guide.

- The self-reflection guide appears successful at achieving its goals despite both mentor and intern retention.

- Interns and mentors both described the self-reflection guide as useful for identifying areas needing improvement and where growth occurred. Interns generally reported the guide to be a beneficial resource to a greater extent than did mentors.

- Interns reported satisfaction in the mentoring relationship and the degree to which it is centered on the intern.

- Interns report confidence in monitoring their personal/professional growth.

- Mentor-perceived confidence in their abilities to mentor interns and use tools, such as the self-reflection guide, as part of the process.

- Adherence to the implementation of the self-reflection guide has generally increased over time.

Moving forward, we intend to:

- Incorporate mentoring and qualitative data from 2011 to 2015 to gain additional insight into the impact and use of the self-reflection guide.

- Leverage the URO survey to help measure the impact of the self-reflection guide.

- Incorporate the IRIS pedagogical tool to measure the impact of the self-reflection guide.

- Use the URO rubric to determine the impact of the self-reflection guide.

- Develop an online system to directly monitor and further encourage the use of the guide.