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How Do Science Graduate Students Benefit from Conducting Educational Research?

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Dr. Rebekka Darner Gougis is an Assistant Professor Biology Education in the School of Biological Sciences. The overarching goal of Rebekka's research is to improve the quality of K-16 science education so that students are able to make science-informed decisions in their daily lives and careers. Rebekka is particularly interested in conceptual change regarding ecological and evolutionary ideas and how motivation mediates the connection between such ideas and everyday decision-making. She finds opportunity to investigate these relationships between conceptual understanding, motivation, and decision-making as Director of BSC 101: Fundamental Concepts of Biology, ISU's general education introductory biology course.

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This project engaged two science graduate students as members of an educational research team to examine the progression of their experiences as student-researchers and their ideas about qualitative research. This allows documentation of the progression of science graduate students' ideas about the nature of qualitative educational research and its value to their future careers. Given these students' future careers as science faculty and/or industry scientists who could implement informal science programs, they are well positioned to gain substantial benefit from participation in educational research. Their participation provides a unique context in which we can examine how future science educators come to understand the process and value of educational research, particularly qualitative research. This study can inform future studies that examine how to prepare educators in applying educational research to their practice and ultimately strengthen the quality of post-secondary science education.



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Research Objective

This project engaged two science graduate students as members of an educational research team to examine the progression of their experiences as student-researchers and their ideas about qualitative research. This allows documentation of the progression of science graduate students' ideas about the nature of qualitative educational research and its value to their future careers. Given these students' future careers as science faculty and/or industry scientists who could implement informal science programs, they are well positioned to gain substantial benefit from participation in educational research. Their participation provides a unique context in which we can examine how future science educators come to understand the process and value of educational research, particularly qualitative research. This study can inform future studies that examine how to prepare educators in applying educational research to their practice and ultimately strengthen the quality of post-secondary science education.

Methods

Our research team met weekly to conduct qualitative analysis of open-ended responses questionnaire that probed conceptions of experimental design, sampling, randomness, and statistical variation. These responses were provided by undergraduate and graduate science students across various levels of post-secondary courses, all of whom completed Project EDDIE (www.projecteddiedie.org) environmental science modules. During initial meetings, we discussed relevant literature to the project and qualitative data analysis methods. We collaboratively conducted the qualitative data analysis of students' written responses. Reflection prompts were provided to student-researchers throughout the year they participated as members of the educational research team. Student-researchers consolidated their reflections around three themes:

1. How has your understanding of the nature of educational research changed throughout this experience?
2. What is the value of qualitative research methodologies and have your ideas about this changed throughout this experience?
3. If you were to teach science in an informal or university setting, how likely would you be to apply educational research to your teaching practices, given your experience as an educational researcher?

Education isn't all about the numbers or grades that the students get. The understanding the students gain is just as important. The change in understanding over time is probably even more important than the grades they receive. But that understanding is the trickiest part to measure since it is subjective. I always thought that the researcher's only option was to use the grades the students received to represent their understanding of a subject ... The most likely scenario for me to teach would be in a K-12 classroom or a one-time presentation to a community ... I don't think I would ever use that research to submit to a journal for peer review, instead I would use it to track the impact my teachings may have (for the benefit of the organization I would be working for).

- May 2015

It is interesting to see how an answer for one question helps the others make more sense. And also how the answers correlate with each other ... Watching for correlations can help us create themes to investigate.

- September 2014

I feel the significance of qualitative data lies in the ability to help tell the "why" behind your quantitative data, and many times you can use those personal interviews to help tell a story or illuminate trends within your results.

- October 2014

Going through these various [coding] steps allowed me to see the rigor that should be put into educational research and also its flexibility at the same time ... Qualitative research methodologies allow us to tell a groups' story or narrative, and express points of view. These thoughts may be related to conceptual material or perhaps opinions or views.

- May 2015

Biology graduate student

Geology graduate student

Conclusion

The two science graduate students who spent an academic year conducting educational research gained research skills throughout their experiences, and their ideas about education seemed to shift toward a greater emphasis on understanding and conceptual development and away from over-emphasis on correct answers. While science graduate students may never conduct educational research, these case studies indicate that participating as a team member on an educational research team positively influences their philosophy of education. This is a positive outcome, given likely future careers as post-secondary science educators.

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Gausius is the internal, peer-reviewed scholarship of teaching and learning (SoTL) publication at Illinois State University (ISU). Its purpose is to provide instructors writing about their teaching and learning a local but peer reviewed publication outlet and to offer other instructors and students an accessible publication to read to obtain a sense of, and learn from, some of the scholarly teaching and SoTL projects conducted by their colleagues on our campus. The name, *Gausius* means glad, gladly, or joyful in Latin, as in the Illinois State motto/logo, "Gladly we learn and teach."

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