Chapter 10

A Case Study of Infusing Collaborative STEM Inquiry Learning With Available Technology Into Undergraduate Student Learning: Perceptions, Benefits, and Challenges

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ABSTRACT

This chapter describes the development, launch, and findings of an undergraduate course entitled “Teaching and Learning in the Physical Sciences”. It was a second-year course that introduced students to content commonly taught within a Bachelor of Education program and connected this content to the literature found in the areas of Physics Educational Research and Chemistry Educational Research. It infused inquiry-based STEM learning allowing students to re-examine content and connect to context, while also examining the pedagogical significance and implications. This chapter provides a qualitatively based insight into students’ experiences of the course content and students’ voices of the transferability of content from this course to others citing lessons learned, implications for physical science students and recommendations for the future offering.

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A Case Study of Infusing Collaborative STEM Inquiry Learning

INTRODUCTION

Student engagement, learning and collaboration opportunities, as well as student achievement within a technology infused classrooms have been well documented within the research literature (Apple Education, 2010; MacLeod & Kraglund-Gauthier, 2015; Yerrick, 2010). However, little research exists on how educators, especially at the undergraduate level, infuse available technology and, connected to this, how to shift from a pedagogical standpoint from lecture and direct instruction within an undergraduate course to one that incorporates inquiry into Science, Technology, Engineering and Mathematics (STEM) content. This chapter begins by setting the context and describing the development and launch of a special topics undergraduate course, PHYS 299/CHEM 299: TEACHING AND LEARNING IN THE PHYSICAL SCIENCES. A discussion of how the content of the course connects to the research literature is given. Data collection, analysis, and discussion follows, explaining student perceptions and learning as well as classroom and course observations by the professor are given. From here, recommendation, next steps, and future possibilities are posed.

The purpose of PHYS 299/CHEM 299 was to introduce physical science students to teaching and learning principles as they pertain to 21st century learning within the sciences and rooted within the various connected literatures (physics education, chemistry education and science educational research). This course targeted students in both physics and chemistry who were not academically able to complete an honours program and who were interested in either teaching science as a possible career option or were considering a career in public health where teaching and facilitation skills would be an asset. Therefore, whenever possible, collaborative STEM inquiry lessons were taught to students with available technology, both digital and scientific devices, so that they could examine their own understanding of content and what it means to teach and learn in the physical sciences at both the secondary and post-secondary levels.

Setting the Context

Physics enrollments within the undergraduate program at the particular university where this research was conducted are not as strong today as they have been in the past. The author of this research is currently a professor in the Faculty of Education at this institution and also completed her undergraduate degree in the same Physics Department; therefore, she is familiar with the subject matter and context. In her current role, she prepares future science teachers, many who have commented that they had been inspired to become teachers from former teachers. Others have commented that they did not know what else to do with their degree so they decided
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