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Research Statement

As a mathematician, my area of expertise is in algebraic topology. My thesis is concerned with rational homotopy types of simply connected topological spaces, but I also undertook various mathematics education research projects during my time as a PhD student at the University of Georgia. Through my experiences and interactions with mathematics education specialists, I have developed a fervent belief in the importance of improving undergraduate mathematics education. Therefore, while I enjoy the topic of my dissertation research, I intend to continue mathematics education research for the remainder of my career. I have two specific directions I would like to pursue in my future research.

Improving Mathematics Courses for Non-Specialists

Mathematics is used by everyone, but is often only easily accessible by specialists. Therefore, I am interested in researching ways to improve the math class experience of non-specialists, especially in developmental courses and courses for pre-service and in-service teachers. I believe that it is important that these courses are focused on the needs of their unique audience. As courses for those students who go on to study or work in fields other than mathematics, it is especially important to implement techniques and styles that differ from the traditional lecture style to increase their interest and retention. Additionally, I believe it is important to develop ready-to-use materials for educators take into their classrooms to increase the adaptation of novel, effective pedagogy.

To put this into practice, I designed a project using Twitter in a pre-service elementary teacher course. Educators have been experimenting with using Twitter both inside[1] and outside[2] their classrooms to enhance student learning. The goal of this project was for students to reflect on mathematical ideas and practice their communication skills in an informal environment. The character limit of Twitter was used to focus students on their wording choices during discussion. Additionally, supplementary readings and articles were provided through a course Twitter account. Preliminary data showed that students believed the use of Twitter improved their mathematical communications skills but overall students were not sure of the overall benefit of using Twitter in the classroom. I am currently collected more data, including which types of tweets students interact with most, and plan to present my findings at the Conference on Research in Undergraduate Mathematics Education this February.

My other ongoing project is developing a video assignment for pre-service teachers. The foundation for this project arose after students asked for genuine teaching experiences during a Number and Operations content course. As the course syllabus was already overfull with material, a video project was proposed so that students could still practice and develop their teaching skills without sacrificing the time necessary for course content. Research has suggested that watching videos of students working promotes teachers' ability to notice when observing students[3]. Additionally, video is a valuable tool in teacher self-reflection. Students found that the video project made them learn more deeply and reflect on their communication skills. This project and the materials produced for it were presented at MAA Mathfest in August. Possible extensions of this project are the development of extra resources and guides for students and seeing if students use their experiences from this project later in their teaching career.

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How Do Teachers Use Technology?

The research projects above also relate to my second area of interest, which is how teachers use technology in the classroom. Almost all teachers are required by their administrators to use technology in their classroom. However, through observations of K-12 classrooms and interactions with in-service teachers, I have found that teachers often do not have training related to technology. This means that teachers have difficulty implementing technology in meaningful ways. They also lack the tools to evaluate the effectiveness of said technology, and can lack an awareness of the different types of interactive and other resources available to them. So, I believe that improving teachers' knowledge of technology can lead to significant improvements in their classroom instruction. As part of this philosophy, I recently added four training lectures on technology to the certification course for in-service elementary teachers I am teaching. The training lectures include games, analysis and display tools, and general manipulative resources like Illuminations, as well as how to evaluate the tools for quality and effectiveness and when such tools can be useful for their classrooms.

In terms of research, my interest is twofold. First, I am interested in the development of technology courses for teachers that give them access to a wide variety of tools as well as ideas of how to apply them. Second, I am interested in how teacher training in technology affects instruction. In other words, does technology experience and training have an effect on practice? Also, how does technology training affect practices of pre-service teachers in the future vs. in-service teachers currently? The quality, types, variety, and frequency of technology used could all be considered. It would be interesting to see if one was more effective than the other, as this information would be useful in tailoring more effective technology training programs. Studies have already demonstrated that in-service and pre-service teachers respond differently to technology[4]. I would like to continue this study to help increase technology training effectiveness and proper technology implementation.

References

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