

Chapter 27

Leveraging Technology to Develop Pre-Service Teachers' TPACK in Mathematics and Science Methods Courses

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EXECUTIVE SUMMARY

These two cases address issues related to using technology as a tool to develop pre-service teachers' Technological Pedagogical and Content Knowledge (TPACK) in mathematics and science methods courses. The chapter assumes the following scenario and overarching case study question:

You and your colleagues are the course instructors of a mathematics and a science methods course. Your pre-service teachers typically lack content knowledge in mathematics and science. Further, you must also address pedagogies and how to use technology as a tool to support student learning of mathematics and science concepts. What activities can you create to simultaneously develop knowledge of content, pedagogies, and how to teach with technology?

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BACKGROUND INFORMATION

This case focuses on the Elementary Education Graduate Certificate in Teaching (GCT) program at a large university in the southeastern United States. The university has approximately 25,000 students. The program recommends approximately 350 students for their Elementary Education (Grades K-6) license each year; 100 of those are post-baccalaureate students in the GCT program. During the 2009-2010 year, the program underwent major 're-visioning', as the State Board of Education mandated that all teacher education programs reform their courses to integrate 21st Century Skills such as technology use, collaboration, problem solving, and critical thinking. The GCT program comprises 27 credits, including two courses about teaching mathematics and one course related to teaching science. This case addresses issues related to integrating technology into both the science course (taught by the first author) and the second mathematics course (taught by the second author).

Setting the Stage

The GCT program prepares candidates to earn a North Carolina teaching license for Grades K-6. Since the program's inception in the 1980's, the coursework has focused on in depth exposure to child development instruction. Prior to 2006, students in the GCT program only worked with technology during their first six credits which focused on child development, instructional design, diverse learners, and technology integration. Technology integration content focused primarily on the Microsoft Office suite and how to integrate tools such as PowerPoint presentations or word processing into the processes of teaching and learning. Most of the technology-based activities focused on teacher use of technology, and did not explore student uses. There was no technology integrated into the mathematics or science methods course prior to the implementation of these projects.

Following are the two case studies organized by introduction to the topic, technology concerns needing to be addressed, and the technology components integrated to meet those concerns.

CASE ONE DESCRIPTION: TEACHING AND INTEGRATING ELEMENTARY SCIENCE METHODS

Teaching and Integrating Science is a one semester course in which students learn about science pedagogy for the elementary classroom setting. Though not explicitly a content course, most students enrolled in the course have little preparation in science; therefore a large amount of content information is conveyed along with pedagogical

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