Chapter 20

Leveraging Online University Education to Improve K–12 Science Education: The ScienceMaster Case Study

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ABSTRACT

While many K-12 teachers, especially those in elementary education, have extensive academic training and work experience in effective pedagogy, there is a concern that their discipline-specific knowledge may not be as robust as is necessary to address the needs of today’s students in a competitive, global environment. This is especially true in the STEM fields of science, technology, engineering, and math. To address this need, Florida’s Manatee County School District partnered with Embry-Riddle Aeronautical University (ERAU) and Nova Southeastern University (NSU) to develop the ScienceMaster program. The ScienceMaster program leveraged existing university expertise in science-related online education to provide in-service professional development for teachers, especially teachers in low-performing elementary schools. The ScienceMaster program offered full scholarships for online Master’s degrees from ERAU or NSU to competitively-selected K-12 teachers, ad hoc graduate and undergraduate courses for those teachers not selected for full scholarships but who could benefit from an individual course, and just-in-time self-paced Web tutorials on a variety of science subjects. Teachers selected to receive full scholarships were required to commit to completing accelerated programs and serving as mentors in their schools, thus enabling a multiplier effect as a return on the scholarship investment.
INTRODUCTION

Like numerous other states, Florida faces a challenge with many of its K-12 teachers teaching “out of field,” or teaching subjects for which they have no formal academic training. This situation is especially acute in the STEM disciplines of Science, Technology, Engineering, and Mathematics. Exacerbating the situation is the fact that many elementary school teachers specialize in Elementary Education as a discipline without a deep exposure to the content of the individual subjects. As the state’s Florida Comprehensive Assessment Test (FCAT) becomes more and more influential in measuring student achievement and rewarding schools and districts with resources, student success in these specific content areas has become an even higher-stakes enterprise than ever before. Unfortunately, in 2006, the year before the program described in this chapter was proposed, the FCAT Statewide Science Scores (SSS) were unacceptably low (Florida Department of Education, 2006). If the five science achievement levels were classified as “grades”:

- Only 8% of 5th graders earned an A or B while 65% earned a D or F.
- Only 6% of 8th graders earned an A or B while 68% earned a D or F.
- Only 4% of 11th graders earned an A or B while 65% earned a D or F.

Recognizing this clear need in their own district, science curriculum administrators in Manatee County led a coalition of partners to design a multi-pronged approach to improve science education through content knowledge. The science curriculum administration team partnered with the Florida Learning Alliance (FLA), a consortium of the state’s rural K-12 school districts whose needs were the same but whose numbers, individually, were smaller. With Manatee County in the lead and FLA supporting, a professional development program was collaboratively designed with several of the state’s leading private colleges and universities, including Embry-Riddle Aeronautical University in Daytona Beach, Nova Southeastern University in Davie, and Eckerd College in St. Petersburg. The central characteristic of ScienceMaster was the fact that it would be designed and delivered completely online. With the intended program population of K-12 teachers being employed full-time, many with family and other commitments, the flexibility and convenience of online learning was a program requirement.

The ScienceMaster program targeted various district populations, with low-performing elementary schools being the priority. The program was structured into tiers of online offerings, designed to serve the maximum number of participants. All program offerings were made available to selected participants at no cost (including tuition, books, fees, and other expenses).

- Tier 1: Fully online master’s degrees in science disciplines
- Tier 2: Individual online courses in selected science subjects
- Tier 3: Self-paced online learning tutorials in various science subjects

In addition to the professional development tiers, a commercial educational product called Gizmos™ was made available to teachers for hands-on lab activities. Furthermore, an online self-evaluation instrument called the Teaching Skills Assessment Program (TSAP: http://www.eckerd.edu/act/register/register.php) offered participants the opportunity to gauge their teaching knowledge and competencies as related to the state’s twelve accomplished educator practices (Florida Department of Education, n.d.) and included a prescriptive action plan for personal professional development based upon the results.
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