Chapter 34
Mobile Application Development by Students to Support Student Learning

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ABSTRACT

The ubiquity of mobile devices, their portability and their unique gesture recognition features make them an apt educational tool, especially in the STEM fields. The traditional pen and paper practice method can be transferred to a digital format and the content can be made available to students anywhere and at any time. In this chapter the authors discuss how mobile application development projects can be used to benefit students in multiple STEM disciplines at the same time by creating a symbiotic, business-like relationship between students enrolled in a software development course and students in other STEM courses (end-users). The authors will discuss the learning needs of students and the details of thoughtful mobile application design incorporating various learning theories. This chapter will also discuss various examples of educational mobile apps created, their usability testing results and their effect on student learning.

INTRODUCTION

In this chapter, we explore the use of electronic learning within three separate classes at an undergraduate liberal arts college. E-learning is the concept that a student's learning experience can be positively enhanced and augmented by harnessing today's various technological advances.

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One of the roadblocks to implementing e-learning in a classroom is the lack of materials supporting e-learning. Instructors may have the desire to teach a concept using a website or mobile application, but are not able to locate anything that best fit the learners' needs. Or sometimes there are plenty of resources from which to choose, but the instructor is at a loss as to how to integrate them into the curriculum and the classroom environment. As we investigated the number of mobile apps available for content at the post-secondary level, we realized that there is very little that has been developed for learners in the undergraduate setting (Shuler, 2012). This was the impetus of our project.

The study described in this chapter was performed at Georgia Gwinnett College (GGC), a midsized liberal arts college offering only bachelor degrees in the state of Georgia in the United States. GGC is an open-access institution with small class sizes (less than 30) and a diverse student population. The population is diverse in both ethnicity and educational background. To investigate and facilitate the use of e-learning in the post-secondary classroom, collaboration was formed between a junior-level information technology software development course and two other courses (Chemistry and Introductory Programming) at our institution. The intent was to give a "real-life" project to the software development students and then provide the non-software development Science, Technology, Engineering and Mathematics (STEM) students a functioning learning tool; a mobile app that helps tutors to teach a certain concept. The project attempted to bring e-learning into the post-secondary classroom and also to extend the impact of e-learning across disciplines and into other classrooms. The primary objective of this project was to increase student engagement in a software development course and to help those students gain valuable work skills by working with an actual client and real end-users. The secondary objective was to provide a mobile app to the other courses to enhance the learning experience of those students as well.

The dearth of students who graduate in information technology (ITEC) and computer science (CS) across the U.S. is causing a real challenge for employers, as there are not enough qualified and trained programmers and developers to meet the ever-growing need as the Technology Age speeds along (Lutz, Naveda, & Valino, 2014). In other STEM fields, we also see a growing decline of graduates who are able to effectively contribute to the work force in these areas. Students usually struggle with content in STEM courses for a variety of reasons, such as: the large amount of content covered in a course, the way in which content builds on itself throughout the course and finally, the need to implement a multitude of problem-solving and critical thinking skills (Lutz, Naveda, & Valino, 2014). Students who do not understand the fundamental concepts at the beginning of a course tend to quickly fall behind as content builds on itself throughout the duration of the course, thus spelling potential failure for later topics and even subsequent courses. Hands-on learning and application of these key fundamental topics play an important role in a student's success in both these disciplines.

In this study, the ITEC students worked with faculty in chemistry and programming to develop mobile apps that address some of the course's fundamental concepts in a new way by helping students generalize and reuse the information. In it was postulated that in practicing these fundamentals repeatedly, using an e-learning based tool, students may better understand and remember the core concepts, but more importantly are provided the environment and "playground" in which to repeatedly practice applying their newly gained knowledge in a variety of different situations. In this chapter, we discuss both the impact of creating the apps upon the ITEC students, and the additional learning support provided to the chemistry and programming students using the new mobile apps. The focus of the study is primarily qualitative rather than quantitative. Specifically, we ask whether the development and use of these mobile apps provided the students with a motivating learning experience that added to their understanding of certain concepts.