Chapter 66
Engaging Students to Learn Physics and Mathematics through Short High Quality M–Learning Resources:
Design and Implementation Recommendations

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ABSTRACT

A methodology to design short high quality M-Learning resources aimed to engage students to learn Physics and Mathematics is proposed. Key characteristics to generate motivating mobile resources are identified and applied to produce educational video-capsules. Audiovisual design elements based on cognitive theory of multimedia learning are incorporated. Short videos covering central topics of Mathematics and Physics undergraduate courses that can be displayed on mobile devices are designed. A study case with first-year engineering students using the mobile resources is performed in order to assess student engagement. The results indicate that most students show a positive perception on the educational videos. A parallel study in order to evaluate the impact of the mobile educational videos on student learning is also presented. From this analysis it is suggested to incorporate the use of mobile resources as part of active learning methodologies. Some recommendations for designing mobile resources are presented, and suggestions for implementation of the resources are also provided.

INTRODUCTION

A new generation of students (Z generation) born after 1995 is arriving at our college and campuses. They have been exposed along their lives to a great variety of information and communication technologies in an unprecedented form and, therefore, the have developed special characteristics that distinguish them from previous generations. Indeed, these students stay connected to the Internet most of their time, adopt technology at high levels and push others to do the same. They approach all aspects of life from a global and visual perspective, crave regular and technology-enhanced learning opportunities and look for educational opportunities that use visually enhanced methods of teaching (Ethan, 2010).

As the generational change of students progresses, teachers face new challenges. They have also to incorporate and take advantage of new technologies at the same pace as students in order to become learning designers, making more effective learning resources and improving the interfaces between the educational content and the use of technology. In this scenario, mobile learning becomes an area of opportunity to engage these new students' generations.

Active learning promotes the use of didactic techniques developed to motivate students to actively participate in building their own knowledge (Grabinger & Dunlap, 1995). Mobile learning (m-learning) emerged as a new concept towards the end of the previous millennium as educators (teachers/lecturers/practitioners) started exploring the use of mobile technologies in teaching and learning environments.

The future of mobile devices is promising. Technology continues to advance very rapidly, and for half of this century a very favorable scenario for mobile learning is expected. As Parson comments (Parsons, 2014) "The old model of educational institutions has withered away, with learning now a life-long, pervasive experience, delivered via the practically invisible devices that I have with me day and night, the personal network that delivers information to my eyes, ears and other senses, the e-glasses, the flexible smart-touch screen that folds into a small case but expands to poster size and will stick to or project onto any surface".

However, m-learning requires different areas of knowledge that must interact and combine efforts and skills from educators to create comprehensive resources aimed at achieving meaningful learning. These resources have to incorporate everyday technologies in order to keep students connected to their learning environments in a straightforward manner, making these devices an additional tool in education.

In addition, the quality of resources and videos that are being displayed on mobile devices still remains as a challenge in several cases. The quality of resources and videos to be displayed in m-learning environments is not always the best. Indeed, there are teachers who simply include homemade records or PowerPoint presentations versions, which do not take advantage of the best of multimedia resources.

There are elements of visual design (colors, animations, audio effects, transitions, zooms, etc.) that are being exploited in the implementation of mobile learning (Pocatilu & Boja, 2009). They can be incorporated into the educational video-capsules for greater motivation of students, and thus promote learning. According to studies by Bradley et al. (2009), mobile learning can achieve great pedagogical richness. It is therefore very important to incorporate instructional methods based on the transmission of knowledge to the production of educational video-capsules, as the methods proposed by Mayer (2009) in the cognitive theory of multimedia learning.

This chapter presents a strategy based on research methods that seeks the improvement in the development of mobile multimedia resources with enriched educational elements, aimed to promote the growth in both the production area and production in education. On the one hand, it provides concise

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