

Chapter 22

A Remote Mobile Experiment in Brazilian Public Basic Education

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ABSTRACT

The STEM subjects (Science, Technology, Engineering, and Mathematics) are very important for education, but the lack of experimental laboratories for these subjects in a school might decrease the interest of its students in STEM fields. This chapter explores these issues in the Brazilian context where, in order to address this issue, remote experiments are used to share real experiments manipulated through the Internet. Teachers and students can use remote laboratories, equipped with real experiments, to put in practice theoretical concepts learned in class. This chapter presents a report on a pilot project that aims to explore the use of Mobile Remote Experimentation (MRE) by teachers and students of public high schools in Brazil. It involves the use of mobile devices to access remote experiments in STEM subjects through the Internet. The report demonstrates the effectiveness of using such educational resources to improve pedagogical results by applying the TPACK (Technological Pedagogical Content Knowledge) model to measure the impact of MRE by STEM teachers.

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INTRODUCTION

The current educational processes are subject to continuous changes, resulted from the complexity and diversity of contemporary societies, in which technological evolution has allowed new ways of building knowledge. The integration of Information and Communication Technologies (ICT) in activities of daily life has implications for education, leading to new forms of teaching and learning (J. Silva & Salinas, 2014). Thus, the scope of pedagogy should offer effective educational responses and introduce varied and flexible methodologies, in order to overcome the new training challenges of the twenty-first-century students.

The profile of students who join Basic Education pushes teachers and educational administrators to create new teaching methods. They use learning environments that are compatible with the way in which the students learn new concepts in their daily routine. This is a new reality that must be transposed into the educational environment since the students are heterogeneous regarding their capabilities, motivations, interests, cultural background, and social and individual subjectivity. Considering that the students present a diversity of learning requirements, they also need to individualize their education process and access the knowledge through various and specific teaching methods, according to their particular way of learning.

Therefore, it is essential to extend this technology perspective not only to the classroom but also to the school, and provide the opportunity for thinking as a process of action (doing) and the creation of knowledge (knowing). It is also important to pay attention to feedback, from both students and teachers, allowing customization to create more effective connections among classrooms and a global and dynamic environment. In this context, the production of educational content for digital platforms is an important aspect to be considered to hold students' attention and achieve meaningful teaching and learning goals. Thus, when talking about education, there must be reflections on the use of digital and interactive platforms, such as forums, chat rooms, use of explanatory videos, and video conferencing. Further, there must be the use of mobile learning, virtual and remote laboratories, and other resources to support teachers in their teaching methods.

Among the many forms of innovation in the educational process, the Mobile Learning stands out in the current scenario. Corroborating with this statement, UNESCO (United Nations Educational, Scientific and Cultural Organization) stresses that the use of mobile technologies leverages new educational opportunities. Its use is also justified by the increasing use of such devices by students and teachers, making the process of teaching and learning simple and ubiquitous (Unesco, 2014). It is worth mentioning that mobile devices, which are already in common use by teachers and students, allow the study, the experimentation, and the interaction exceeds the classrooms, libraries, and laboratories.

Mobile Learning and other trends, such as cloud computing and the virtual and remote laboratories, are pointed out in the editions of 2013 and 2014 of the Horizon Report: K-12 Edition (Johnson, Adams Becker, Estrada, & Freeman, 2014). All these technologies turn to mobile learning since they rely on devices that are already in the routine of students and teachers, such as mobile phones or tablets, encouraging them to bring their own devices to the educational environment.

When bringing these concepts to the Brazilian reality, the scholars can make the following question: "To what extent the Brazilian teachers are prepared to use these mobile technologies in their teaching routine effectively?" On the one hand, there are students with good technology skills, stimulated by the use of the devices to study more diligently. However, the teachers are considered unprepared to take advantage of this technology, featuring a major challenge for effective use of ICTs.

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