

Do Students Really Understand the Difference Between Simulation and Remote Labs?

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ABSTRACT

Laboratory experiments play a crucial role in engineering education as they strongly contribute to the development of important skills for the professional practice. This paper addresses a students' understanding gap between simulations and remote labs. These two resources (and namely the remote laboratory VISIR - Virtual Instrument Systems in Reality) have been commonly used on several didactical implementations, along with other didactical resources in different Engineering degrees at the Federal University of Santa Catarina and Polytechnic of Porto School of Engineering. This work, developed in the scope of the VISIR+ Project, intends to evaluate students' perceptions considering simulation and remote lab results. Quantitative and qualitative data were analyzed to better understand how deeply students realize the differences between these resources and their type of data. Preliminary results indicate that a considerable number of student's don't have a clear idea of these differences, even though sometimes they know their definition. Furthermore, this gap does not seem to differ much with the context (country, course, academic year, course content), students' final grades, teacher approach or implemented tasks.

CCS Concepts

• Applied computing → Physical sciences and engineering → education

Keywords

Remote Laboratory; VISIR; Computer Simulation; Contextualization; Learning and Teaching Strategies; Competence Development; Engineering Education.

1 INTRODUCTION

Engineering students need to perform experiments as they allow them to apply theory concepts through the handling of instruments equipment and data, building up and consolidating knowledge and skills, which will be of a vital role after their graduation [1]. These knowledge and competences can be developed not only in traditional laboratories (hands-on), but also using computer simulations and remote laboratories. These on-line resources in addition to allow students to practice some experimental skills activities in a different way, are a stimulus to the younger generations of digital natives [2]. Naturally, students should be aware that they get different experimental results from these resources: real results from remote labs as opposed to computational model results from simulations. A “blended” or “hybrid” approach to laboratory learning - a combination of hands-on labs, simulation and remote labs - seems to be the most effective [3]. Besides the use of manifold techniques and resources may allow teachers to reach more students [4].

Remote labs combine the advantage of both hands-on labs and simulations and they are defined as an educational resource where the user and the instruments are physically apart. The connection between both of them is using the internet and the user interaction with the lab (configuring, controlling and/or monitoring results) is achieved through a computer or smartphone interface [5]. VISIR (Virtual Instrument Systems in Reality) is the most used lab on electric and electronic circuits. Considered, in 2015, the best remote controlled laboratory [6], it started in 2004 by the Blekinge Institute of Technology (BTH). VISIR mimics a typical electric/electronics workbench (Figure 1), with the same instruments and components [7]. By 2015, VISIR systems have been set-up in seven different Higher Education Institutions (HEI), in five different countries [8]. The VISIR Consortium thus created, with the goal of fostering the collaboration within the community and fomenting the dissemination, proposed the VISIR+ Project to EU ERASMUS+ Programme. VISIR+ project intends to spread the knowledge

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