



Advances on remote laboratories and e-learning experiences
University of Deusto, Spain
<http://www.deusto.es>
Luís Gomes and Javier García-Zubía (eds.)

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While laboratory experiments form a crucial component of science and engineering education, many schools and universities are reducing their use because labs are complex to manage and maintain. In general, hands-on access to laboratory experiments does not scale well to large numbers of students because they often involve expensive and sometimes dangerous equipment and require specialized facilities and people. By the very nature of the lab experience, these problems cannot be easily mitigated through sharing of labs by different institutions.

Remote laboratories (also know under different aliases) provide access to experiments through the Internet without time and location restrictions. Remote laboratories offer the potential of drastically changing the economics of the lab experience in science and engineering education. This will result in a radical expansion of the number of laboratory experiments that students will carry out as part of their degree program.

In fact, remote laboratories have many unique advantages: higher availability of lab equipment (i.e. a 24/7 basis), more efficient use of time of students and teachers, sharing of hardware and educational content across institutions on a worldwide scale, encouragement of independent work by the students, etc. However, there are not only opportunities but also challenges: technological (can we come up with a software framework for developing reliable and educationally meaningful labs quickly and cheaply?), educational (can we really quantify the educational benefits of remote laboratory experiences?), management (can remote laboratories be easily managed if used in a large scale across the Internet?), accessibility (should accessibility of remote laboratories be enforced, in attention to people with special needs? How to deal with access from developing countries where bandwidth is scarce and compute access is limited?), security (do remote laboratories pose security problems, such as open ports, plug-ins, etc?), web 2.0 (can remote laboratories be developed as simple web services?), collaborative work (do remote laboratories promote or support collaborative work? Is remote tutoring possible?), etc. Besides these opportunities and challenges, there are several actors involved in remote laboratories (students, teachers, researchers, institutions, foundations, companies, countries, etc), which increase the overall complexity of designing, implementing and sustaining a remote laboratory. These are some of the questions that remote laboratories bring up to our consideration if we want to really take advantage of their unique educational possibilities.

The book “Advances on remote laboratories and e-learning experiences” provides a comprehensive overview of important aspects of remote laboratory development and usage, and their potential impact in the teaching and learning process. It analyses them as multifaceted system with technological, educational and psychological elements. This book is entirely dedicated to remote labs and has been written by a group of authors active in this topic since the year 2000, edited by Luís Gomes and Javier García-Zubía and published by the University of Deusto, Spain (<http://www.deusto.es>, <http://weblab.deusto.es>).

From my point of view, this book represents an excellent opportunity to learn about the new concept of remote laboratories, their challenges and opportunities.

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