

# Collaborative learning in a web-accessible workbench

J. M. Martins Ferreira<sup>1</sup>, Gustavo R. C. Alves<sup>1</sup>, Ricardo Costa<sup>1</sup>, and Nick Hine<sup>2</sup>

<sup>1</sup>Faculdade de Engenharia da Universidade do Porto (FEUP / DEEC), R. Dr. Roberto Frias,  
4200-465 Porto, Portugal  
{jmf, galves, rjcosta}@fe.up.pt

<sup>2</sup>University of Dundee (Department of Applied Computing, MicroCentre), Park Wynd,  
Dundee DD1 4HN, United Kingdom  
nhine@computing.dundee.ac.uk

**Abstract.** Web-based course management and delivery is regarded by many institutions as a key factor in an increasingly competitive education and training world, but the systems currently available are largely unsatisfactory in terms of supporting collaborative work and access to practical science facilities. These limitations are less important in areas where “pen-and-paper” courseware is the mainstream, but become unacceptably restrictive when student assignments require real-time teamwork and access to laboratory equipment. This paper presents a web-accessible workbench for electronics design and test, which was developed in the scope of an European IST project entitled PEARL, with the aim of supporting two main features: full web access and collaborative learning facilities.

## 1 Introduction

Web-based course management and delivery software packages are widely available on the market and are becoming increasingly popular [1]. Easier access to pedagogical contents and flexible schedules are attractive not only to students but also from the institutional point of view, where a rich catalogue of pedagogical web contents is nowadays of strategic importance [2]. However, and in spite of its fundamental importance for students in practical science domains, effective remote access to laboratory facilities is traditionally ignored in the current generation of web-based education and training frameworks. Moreover, and since teamwork plays an important role in most work assignments, facilities for collaborative learning / work are equally as important and must be able to support real-time communication in the form of audio and video conferencing, besides the traditional text-based chat.

The PEARL (Practical Experimentation by Accessible Remote Learning) project was set up with the objective of overcoming these limitations [3:5]. Funded by the European IST (Information Society Technologies) programme, PEARL is a three-year (2000-2003) project that is being developed to enable practical experimentation for students working together over the Internet or the campus Intranet. The students interact with the remote experiments much as they would in a real teaching laboratory, being able to change parameters and in some cases design experiments. They are also able to observe the results and discuss their actions, using Internet-