

New e-learning environments for teaching and learning Science

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Summary

Online learning is developing along the lines of integrated learning and combining multiple approaches; but until now, it has very rarely included virtual and remote experimental environments to form a unified body of information and knowledge.

With progress in information technologies, the chance to handle real objects by application of remote and virtual experiments across the Internet has emerged. This chapter will describe how a scientifically exact and problem-solving-oriented remote and virtual science experimental environment might help to build a new strategy for blended science education. The main features of the new strategy are (1) the observations and control of real world phenomena, possibly materialized in data and their processing and evaluation, (2) verification of hypotheses combined with the development of critical thinking, supported by (3) highly sophisticated relevant information search, classification and storing tools and (4) cooperative teamwork, public presentations and the defense of achieved results, all either in real presence or in telepresence. Only then can real understanding of the mathematical formalism of generalized science laws and their consequences be developed.

This blended learning environment, developed by Charles University in Prague, used since 2003, has been offered mainly 1/ to in-service science teachers within the frame of “State Information Policy in Education Program” (2002-2005, app. 500 in service teachers), and to science and ICT teachers within the frame of “New Ways to Science Education” Project (2006-2008, app. 350 teachers).

Although remote and open laboratory use is frequently put forward as a new way of working, the management of complexity, uncertainty, and communication in science education and research, and integrating selected parts of ROL - the remote data acquisition, data processing and process control theme across the curriculum- is not a completely seamless process. That is why the Remote and Open laboratory is offered to students in a parallel way to traditional labs. Mostly students with part or full time jobs, distance students, in-service teachers and both faculty members and students involved in professional training and life long learning use these facilities. Some numbers are presented in Table No. 1.

Total Number of completed experiments data downloads – selected examples (since February 2004 till February 2008)						
Water level control	Meteorology station	Elmg induction	Natural and driven oscillations	Solar energy conversion	Diffraction on microobjects	Σ
3573	2401	2748	1282	1515	862	12 381

Table No. 1