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Part I
Mobile Technologies in Engineering Education (II)

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Applications of mobile technologies for engineering education can be found in the literature, but, many of the reported applications are aimed at the online (wirelessly), on-campus, synchronous and proximal use of mobile technologies. Mobile technologies in engineering education can encompass more than the proximal teaching and learning environment—they can be offline, asynchronous and at a distance from the classroom. This paper reports on the initial application of 'podcasting' in a wholly online engineering study unit. It presents the rationale for, technical development details of, and, limited evaluation of this initial podcasting trial.

Keywords:

In a Digital Signal Processing course, students received two different types of instructional delivery messages (online text only and text along with a simulation tool: MATLAB) via two different types of instructional delivery media (desktop PC and personal digital assistant (PDA)). An experimental study was designed to investigate the potential main effects and the interaction of these two independent variables: instructional delivery message and instructional delivery media. Results showed that students expressed a significantly higher intention to learn in a desktop PC environment than in a PDA environment ($F[1,21]=17.31$, $p < 0.05$). We also found that students who used a MATLAB simulation tool performed significantly better on an achievement test than those who did not use it ($F[1,21]=10.96$, $p < 0.05$).

Keywords: Mobile learning; digital filter design; instructional science; multimedia learning; e-learning

To meet the learning needs of various types of students, various adaptivity features are being implemented in computer-based learning systems to personalize education for every student. Recent developments in mobile technology have made the computer-based learning systems also accessible through mobile devices such as mobile phones. It is, therefore, becoming necessary that the students can also receive personalized learning through mobile devices. This research looks into various student preferences on different devices and how these preferences change when students move from one device to another to access learning content. Two surveys have been conducted in this research to investigate difference in various preferences of students while using personal computers (PCs) and mobile phones. A prototype computer-based educational system, accessible both from PCs and mobile phones, was also developed for this study to provide real experience of both type of interaction to the participants of the surveys. A student profile template is then designed on the basis of survey findings, which resulted in the student profile transformation framework. The framework is the first step towards content development guidelines to serve students on different types of learning devices.

Keywords: adaptivity; learning styles; mobile learning; profile transformation; user model

Part II
Contributions in: Control Engineering, Hydrologic Engineering, Telecommunications, Assessment, Humanitarian Engineering, University-Industry Cooperation, Manufacturing

This educational contribution introduces the sensitivity peak beside the complementary sensitivity peak as indices of relative stability in the loop-shaping approach design of SISO control systems, through the use of an Extended Nichols Chart (ENC) which displays constant magnitude loci *of the sensitivity function along with the well-assessed constant magnitude* loci *of the complementary sensitivity. The advantages of using the ENC in an educational context will be shown in the control design of an unstable laboratory process.*

Keywords: control education; control system design; frequency-response methods; Nichols chart

Predictive uncertainty is an important concept that civil engineering students should understand. The students need to realize that uncertainty is inevitable in spite of the efforts made to make models, algorithms, and analysis techniques as accurate as possible. In this paper, the issue of uncertainty is addressed through an illustrative example from the field of surface water quality management. The example demonstrates that simple probabilistic analysis can be effective for both walking the students through the issue of uncertainty and realistically quantifying the uncertainty for real-life civil engineering applications.

Keywords: uncertainty; probabilistic analysis; hydrologic engineering; design accuracy; water quality management

We present a virtual educational laboratory that allows the simulation of communication systems, equipment, devices, and measuring instruments, developed by using the software environment LabVIEW™ from National Instruments. The system, which fulfills the need for a flexible and low-cost educational tool for laboratory practice, is being used in the Laboratory of Telecommunications and Applied Electromagnetics of the Engineering College of the University of Pisa, Italy.

Keywords: Communication engineering education; e-learning; virtual laboratories

The operational aspects of an assessment strategy for an Engineering Problem-Based Learning (PBL) course initially involved an audit of existing and varied student skills and competence to facilitate their effective deployment into well-balanced teams. This balance encourages effective mentoring within and between teams. The strategy included summative and formative assessment, the former being tailored to individual students' existing skill levels. Throughout, the emphasis is on advancement of skills and competence rather than simply achieving a minimum standard. The strategy provides the flexibility for equitable assessment of students with different initial skills and competency, which proves particularly relevant to students studying in the distance mode who may have considerable professional experience and advanced skills and competence in some areas. By tracking progress, students develop an individual portfolio of achievements that can be continued throughout their study programmes and professional lives.

Keywords: problem-based learning; engineering education

The Humanitarian Engineering program at the Colorado School of Mines seeks to prepare engineering students for careers that will interface with and benefit the underserved global community. Through an interdisciplinary collaboration, a sequence of courses has been designed and implemented to support engineering students in developing an understanding of the ethical, cultural, historical and technical dimensions of engineering work applied to community development in the United States and abroad. This article discusses the analysis of several indicators of the local and global impacts of the program and the sustainability of this project beyond the period of funding.

Keywords: global engineering; humanitarian engineering; undergraduate curriculum

This article describes a partnership between a US institution, a German institution, and several German industries for the purpose of teaching an interdisciplinary, international course which emphasizes sustainability, globalization, and different cultures and their integration into the engineering and engineering technology curriculum. The course, entitled GO GREEN (Green Organizations: Global Responsibility for Environmental and Economic Necessity), employs experiential learning activities that would be impossible if not for the cooperation and generosity of the German industry partners. A conceptual framework for the course is presented; reasons for involving German industry partners in teaching sustainability and globalization are explained; course development and planning processes are discussed; delivery and implementation strategies are highlighted; and the evaluation framework is articulated. Issues and considerations for course replication are included at the conclusion of the article.

Keywords: International; industry-education cooperation; globalization; multicultural; sustainability; undergraduate research

Little is known about the program outcome assessment processes and requirements for new engineering programs. Traditional assessment techniques do not consider the unique situation of newly created engineering programs: the lack of historic assessment data, the need for implementation of improvements in a very short time, the lack of faculty in place at the start of the program, and the administrative issues are some of the factors that influence the assessment plan of a new engineering program. This paper presents a systematic and structured assessment plan for a new civil engineering program that addresses these challenges. Lessons learned and suggestions for implementation of an effective and meaningful assessment plan are presented.

Keywords: assessment; outcomes; engineering; education

The Learning Factory (LF) concept integrates a practice-based engineering curriculum that strives to balance analytical and theoretical knowledge with learning enhancements through hands-on fabrication experiences. We have completed a project based on adapting key components of the original LF model, strategically expanding manufacturing-related education within a small mechanical engineering department. The implementation includes equipment installation, development of hands-on learning opportunities in materials processing and inspection, strategic formation of a lab infrastructure that creates course linkages and provides complementary coverage of fabrication principles within core courses, the integration of manufacturing research and education and the implementation of K–12 outreach activities.

Keywords: Active learning; manufacturing equipment; laboratory development; educational modules