Editorial

This issue has 24 contributions on a variety of topics that include: Life-Long Learning, Assessment, Remote Laboratories, Graduate Education, Ethics, Learning Outcomes, Outreach, PBL, Project Management, Calculus, Engineering Dynamics, Automation, Structural Engineering, Electronics, CAD, Computer Animation, Factory Practicum, Dosing Systems, and Solar Energy. The authors are from: USA, South Africa, Saudi Arabia, Australia, Canada, Taiwan, Israel, Singapore, Ireland, Chile, Morocco, Spain, Brazil, Turkey, France and Serbia.

Various aspects of assessment are discussed in the first five papers. In the first paper, Chen et al. present an investigation that used the Life-Long Learning Scale and the Autonomous Learner Scale to analyze the study habits, independence of learning, and life-long learning habits of over 350 engineering students with varied ethnic backgrounds. In the second, Richmond et al. show that that the existing techniques reported in the literature to evaluate concept maps could lead to inconsistencies in the assessment results. They propose guidelines to improve the consistency of assessment. The guidelines were tested using over 130 concept maps.

These are followed with a paper by Alfaries et al. who put forward a semantic representation to model a complete curriculum that permits a global view of the internal relations and dependencies within elements of a curriculum. The model is intended to simplify the continuous improvement process. Then, Mugisha et al. assess the performance of first year students in a Calculus module over a three-year period. The study is based on 200 calculus examination scripts randomly selected from over 700 scripts. The investigation re-assessed the work of the students using the distribution of marks awarded and assigning new ones based on an assessment rubric specific for the problem at hand. In the final paper of this group, Fang presents an investigation of students' perceptions of difficult concepts in an engineering dynamics course. A total of 88 undergraduates were asked at the end of the term to identify, out of a list of 50 concepts in 7 categories, the ones that are difficult to understand or to apply.

Issues related to remote labs are discussed in two papers. Gibbings investigates the variations in the experience of students engaged in remote access laboratories activities. The work is based on using the qualitative research method of phenomenography. Mhiri et al. describe the experiences gained and the development of the Lab At Distance project at the École de Technologie Supérieure in Québec, Canada. Unique pedagogical approaches of the Lab At Distance are also discussed.

Issues related to graduate work and graduate students are discussed in two papers. Chowdhury and Johri examine, using an interview-based approach, how graduate engineering students in the US approach the process of applying for external funding. They used the publicly available list of applicants to the US National Research Foundation who obtained grants over the last two years to contact potential participants; the size of the sample was determined by informational considerations. Eleven graduate students from the departments of Electrical and Computer Engineering, Engineering Education, Engineering Science and Mechanics, Civil Engineering, and Mechanical Engineering were interviewed. In the second paper, Howell et al. pose two questions for investigation: can an applicant's undergraduate grade point average and scores on the Graduate Records Examinations be used to accurately predict the performance of the applicant in a graduate mechanical engineering program? The second: is a single construct based on these quantitative predictive metrics a valuable tool in efficiently making admissions decisions? The sample investigated was composed of 92 mechanical engineering graduate students.

The topics of the two papers to follow are professional skills. Huang presents a study to investigate the current professional ethics education of engineers in Taiwan's construction industry. The study also investigates which types of ethical education experiences could effectively shape suitable ethical attitudes for construction practitioners. In the second paper, McCahan and Romkey suggest a new taxonomy of learning outcomes that demonstrates undergraduate potential for using professional engineering skills and knowledge in their work after graduation. The proposal is based on a review of the literature in the field of professional practice.

Outreach is the topic discussed by Gero and Zach who describe and assess an interdisciplinary electro-optics program for high school students. The study evaluates the change that occurred in the attitudes of 14 students toward the program during the academic year and the change in their systems thinking skills.

Project and teamwork issues are the subject of the next five papers. Chua compares the learning ability and performance differences between two groups of students; both are composed of 30 students. One used a project-based learning (PBL) approach and the second a hybrid PBL-lecture curriculum. The two groups were compared based on knowledge score, problem-solving ability, and eventual project-deliverable outcomes.

Then, Gonzalez et al. present a form of cooperative learning known as Team Game Tournament. They describe the approach and discuss its outcomes.

Maturana et al. report on a multidisciplinary experience aimed at helping first and second year Informatics and Naval engineering students develop multidisciplinary teamwork skills, applying knowledge from core courses through professional-style projects. The study involved twelve mixed groups, each group composed of about eight students. Assessment was carried out using two feedback processes: peer evaluation and a metacognition survey. This is followed by a paper by Barka et al. who present an approach based on management techniques in order to enhance performance in computer project design courses. The evaluation of competencies was carried out during design projects that involved products designed within a relatively short period of time to satisfy complex client requirements. The study involved eleven students.

In the final paper of the group, Alba-Elias et al. present an integrated framework that aims to enhance engineering students' ability to learn Project Management techniques. The study involved more than 150 students from five engineering disciplines at universities in various locations. Students attended project management courses at their own universities. However, they shared a virtual experience in executing and managing their projects. Educational Data Mining techniques were used to provide feedback and forecast students' successes at an early stage. A survey was conducted to assess the students' level of satisfaction and their learning.

Industrial automation is the topic of two papers. Burgos et al. present a training approach that aims to develop competencies for implementing control software of industrial automation systems. They introduce Methodology for Industrial Automation systems, MeiA. It guides students through the development process from the analysis, through the design, implementation and operation phases. The results of assessing the impact on learning over a five-year period were presented as well. Lima et al. present an experience of an approach to teaching industrial automation to industrial engineering undergraduates. The approach integrated Petri Net and software tools in an industrial automation course. Surveys were used to assess the various aspects of the approach; over 330 students were involved.

The final five papers discuss topics related to course and curricula development. Alhan and Gazi describe the use of the Monte Carlo simulation method to teach probabilistic structural analysis to students at various levels without the need for extensive background in the theory of probability. A questionnaire was used to evaluate the levels of understanding and satisfaction of students. The study involved 99 students. Gero and Zoabi present an animation for teaching and learning the operation of the bipolar junction transistor. They also present a longitudinal study that examines the impact of the animation-based learning of the bipolar junction transistor has on students' achievements in the long run.

Lou et al. report on the teaching effect of TRIZ (Teoriya Resheniya Izobretatelskikh Zadatch), an integrated factory practicum in a BOPPPS (Bridge-In, Objective, Pre-Assessment, Participatory Learning, Post-Assessment, and Summary) model. More than 100 undergraduate interns in a factory were involved in the study.

Dragicevic et al. developed a dosing system for raw material to enable students to work with a flexible system in the handling of raw material types. It also helps acquaint students with various types of actuator and sensor systems, field bus systems, supervisory control and data acquisition systems, material handling, and intelligent control systems. The system was assessed through questionnaires conducted with over 75 students per year for four years.

In the final paper of this issue, Ndtoungou et al. present a photovoltaic system feeding a three-phase standalone load. The approach is based on mathematical modeling of physical system components to help to understand the system components and their interactions. It provides a perspective view on how efficiently students apply the knowledge acquired in various courses in areas such as power electronics, modeling, photovoltaic panels, battery storage energy systems and control systems, and test their ability to validate complex theoretical concepts by experimentation.

Finally, I would like to express my thanks to all the authors for their time and effort to contribute to this issue of the IJEE. I wish that the readers find the papers of this issue to be interesting and useful.

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