Volume 20 Number 5 2004 ISSN 0949-149X

The International Journal of Engineering Education

Contents

Part I

Part II

creativity education in the classroom has not been fully recognized. In this paper we reviewed recent publications in this regard, attempting to dissect what creativity means to engineers, and how they can overcome the blocks to creativity. Having comprehensively explored the creative process, we suggested an operable tool based on Treffinger's creative learning model that can be implemented in a classroom setting to facilitate creativity.

This article describes a class where engineering students develop potentially patentable commercial products in a studio setting. Students work on two individual projects, with prototypes, patent description, and a small business plan within one semester. The first long-term survey of participating students indicated that the greatest impact of this class was on their understanding of real-world situations, and their ability to come up with creative ideas. Some positive commercialization results have occurred with nearly one fourth of the students participating. The emphasis of the article is on the pedagogical methods involved in this kind of course, although some assessment results are also included.

Assurance of equity in student outcomes includes ensuring that module results are comparable within reasonable bounds. We present a procedure that first compares (and adjusts if necessary) module variances. Then, student results are individually normalised to standard variates. A simple sign test is used to identify modules with disproportionately good or poor results. Module results are offset so as to adjust averages that do deviate. A detailed examination of an artificial data set shows that the proposed very simple procedure yields results that agree with a sophisticated statistical analysis.

This paper presents a critical analysis of the Bachelor of Materials Engineering programme compared with the expectations of the Institution of Engineers Australia (IEAust) and of UQ. To set the scene, the graduate attributes are listed, the programme framework is presented and the educational culture and available facilities are described. Then, the programme delivery is described; this includes an analysis of the learning opportunities that allow students to develop the graduate attributes. Finally, an assessment is made of programme outcomes relating to graduate attributes.

In this paper we present the general features of the project known as I-Campus, developed for enhancing the traditional lecture format in subject 2.005 Thermal-Fluids Engineering I, a core second-year subject in the Mechanical Engineering curriculum at the Massachusetts Institute of Technology (MIT). This new methodology utilizes computer-based teaching and learning models. We also introduce the pedagogical basis for the study and then present the details of the fundamental characteristics of the study together with the new learning technologies derived from them. We then illustrate the manner in which we have incorporated these new materials of the study.

The study presented in this paper explores the effect of modifying a robot design, build and test project to motivate the students to adopt a deep learning approach. This was achieved by changing the end product to a robot kit, which was used to teach year 9 school pupils about analogue electronics. The results showed that the students were motivated towards a deep learning approach by different factors. In this study, three factors were identified. A second part of the project involved the students teaching year 9 pupils using the robot kits. The indications were that this had a favourable outcome.

This paper presents an educational spreadsheet programs for calculating the convolution sum of two finite sequences. This convolution sum is accomplished using three different methods. After each method is presented, the procedure for computing the convolution sum is outlined, and the results are obtained for each of these cases. These explicit methods of calculation are proven to be well suited for an educational environment as characterized by their flexibility and simplicity. Moreover, when such software is used, they could make engineering studies more appealing to the students.

In the laboratory we use didactic experiments to consolidate and integrate the knowledge that students receive in theoretical classes. We present a procedure based on the batch fermentation of glucose, followed by a solid-liquid separation and the subsequent distillation to obtain high purity ethanol. The organisation and operation of the laboratory is such that students have to formulate hypotheses, search for information, conduct experiments, extract conclusions and determine the best set of operating parameters. Moreover, we pose open-ended questions to force students to develop their social abilities, and address important topics of the hidden curriculum (environmental, legal regulations, safety, etc.).

This paper discusses the implementation of a Web-based multi-user remote microcontroller laboratory designed for electric-electronic engineering education. The MicroLab has been developed to provide programming and monitoring microcontroller modules through the Internet for undergraduate students. Students can access the MicroLab individually and simultaneously. The MicroLab consists of a server with web cams and microcontroller modules which have 8051 core architecture, and are equipped with a CAN (Control Area Network) as its peripheral architecture.

A material is exposed that appears to be appropriate for the future strength of materials textbooks. The described solution is simpler than the classical solution by Euler derived over 250 years ago. The material, although elementary in mathematical terms, represents a simple example of a semi-inverse design problem and leads to the closed-form solution. The material can be covered within 2 lecture hours of 50 minutes duration each.