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World Transactions on Engineering and Technology Education

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Contents

Z.J. Pudlowski	Editorial	157
J. Turowski	Technology and technical innovation transfer in engineering education	159
W.E. White	Engineering education in Canada	163
L.F. Capretz	Is there an engineering type?	169
F. Liarokapis, P. Petridis, P.F. Lister & M. White	Multimedia Augmented Reality Interface for E-learning (MARIE)	173
A. McAllister & S. Misra	A teaching approach for software testing	177
Z. Mbanguta, K. Bolton & G. Gustafsson	North-South collaboration in technological advancement: the Sweden-South Africa Engineering Education Collaboration Project	185
G.S. Georgiev, H. Roth, S. Stefanova, G.T. Georgiev, E. Stoyanov & O. Rösch	How and why to build and use virtual laboratories	191
T-L. Kang & S-A. Chen	Enhancing architecture curricula with organisation and management for the adaptation and change of operations in architect associations in Taiwan	197
S.K. Esche	Project-Based Learning (PBL) in a course on mechanisms and machine dynamics	201
Y-H. Lin & T-L. Kang	The critical theory of Habermas' tech-ideology and its influence for organisational commitment in Taiwan	205
P.W. Magoha	Effective methods and tools for training engineers and technologists: regional trends	209
H. Tugiman	Management auditing: essential knowledge for contemporary engineering students	217
R.B. Ward	The engineering student and the laws	221
M. Makgato & Z. Mbanguta	Towards an outcomes-based teaching and learning module for teacher preparation programmes of FET institutions' engineering and technology educators in South Africa	227
L.F. Capretz	Are software engineers really engineers?	233
V.M. Puvanachandran	Growth by design: GPDP, CPD, accreditation and the Washington Accord in Papua New Guinea	237
Z. Nedic, V. Nedic and J. Machotka	Intelligent Tutoring System for teaching 1 st year engineering	241
S. Susanto, I. Suharto, & P. Sukapto	Using the fuzzy clustering algorithm for the allocation of students	245
W. Zieliński	Models of engineering education	249
H. Tugiman	Operational audit course as a tool to enhance the quality of engineering education	253
V.V. Nelayev & A.M. Ibrahim	Analysis of Internet-assisted engineering education in universities with diverse education systems	257
S. Kolari & C. Savander-Ranne	Total integration and active participation in the learning process in textile engineering education	261
Index of Authors		275

Editorial

I am delighted to present UICEE members, as well as readers and contributors of UICEE produced publications and particularly the *World Transactions on Engineering and Technology Education* (WTE&TE), the newest journal from the UNESCO International Centre of Engineering Education (UICEE), with the latest issue, Vol.1, No.2.

This second issue of the UICEE's *World Transactions on Engineering and Technology Education* presents a selection of papers that address many issues of importance to engineering and technology education, in 22 interesting papers contributions, which come from 15 countries worldwide.

With the ever-diminishing financial resources in education institutions across the world, it is of paramount importance for global education institutions to establish linkages in order to share information on research, development and application in engineering, and in engineering and technology education in particular. The emergence of the UICEE's *World Transactions on Engineering and Technology Education* should help to facilitate the transfer of information between education institutions, with particular emphasis on the transfer of information concerning new developments and best practice from developed countries to education institutions in less privileged environments. We are, indeed, very fortunate that so many distinguished international academics were willing to contribute to the process of sharing information through the UICEE publications and the *World Transactions on Engineering and Technology Education* specifically.

This issue commences with a paper by Professor Emeritus Dr Hab. inż., Dr hc Janusz Turowski of the Technical University of Lodz (TUL), Lodz, Poland. Prof. Turowski, a Doctor Honoris Causa of the University of Pavia, Pavia, Italy, and a former Vice-Rector of the TUL, is an outstanding Polish scientist, researcher, educator and, even more importantly, an intellectualist, who has made an outstanding contribution to science and electrical engineering in particular. He has been instrumental in establishing several international initiatives such as a global UNESCO-UNISPAR network, a EuroUNISPAR network and a Baltic Sea Innovation Network (BASIN). Readers will find many interesting and stimulating ideas, concepts, as well as achievements discussed in his paper titled: *Technology and technical innovation transfer in engineering education*.

Readers will also find an interesting piece of engineering education research and development undertaken by our colleagues and active members of the UICEE, Ms Carina Savander-Ranne and Mr Samuli Kolari, representing, respectively, Helsinki Polytechnic, Helsinki, and Tampere Polytechnic, Tampere, in Finland, in their paper titled: *Total integration and active participation in the learning process in textile engineering education*.

I am particularly pleased to see several paper contributions by our colleagues from developing nations and nations in political, social and economic transition. It is interesting to learn how they endeavour to address so many burning issues and solve a multitude of scientific, technical, education and social problems, often resulting from colonial, apartheid or communist periods of government in their recent history. I hope that readers from much more advanced countries will benefit from the reading of their papers in order to determine the best ways to assist them in their struggle to modernise and advance their academic institutions. I would like to quote, at this point, His Excellency Anthony C. Kevin, the former Ambassador of Australia in Poland, himself a graduate in civil engineering from the University of Sydney, who, when addressing the first *East-West Congress on Engineering Education*, held in Cracow, Poland, in 1991, said to those who came to Poland in order to assist Polish academic institutions in the early 1990s in the development of modern engineering education: *In helping them we are helping ourselves!*

We have always kept this phrase in our minds, and I do believe that this is an excellent motto for the UICEE and its global network of engineering and technology educators. Moreover, I am sure that most of our readers would gladly subscribe to it.

Zenon J. Pudlowski

Using the fuzzy clustering algorithm for the allocation of students

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ABSTRACT: It is a common practice to allocate students from certain subjects into different classes based on their ID number. A new approach for this allocation activity is proposed in this article. This proposed approach, which applies the fuzzy clustering algorithm, is based on each student's achievement in the prerequisite subjects. Utilising this method, students with similar achievements are pooled into the same class. On the other hand, students with slightly different levels of achievement will be in a different class. The approach proposed in this article for student allocation is expected to improve the effectiveness of the daily learning process.

INTRODUCTION

There is a unique yet interesting phenomenon to be observed that usually happens at the beginning of each semester of the academic calendar: the allocation of students into classes. Consider that about 180 students are about to take ITI 372 Operational Research II, a compulsory subject in the Department of Industrial Engineering at Parahyangan Catholic University, Bandung, Indonesia, which students have to take in their 6th semester. Those students must be allocated to, say, three classes. This raises the question: how are students to be allocated in those three classes? There is, in fact, a common way to do this at Parahyangan Catholic University. It is based on the students' ID number in ascending order, which are allocated into the first, second and third groups of 60 students, respectively, to classes A, B and C. And that is it!

There are four potential research questions related to the above-mentioned phenomenon that need to be answered:

1. Does this common method of allocating students to classes need to be changed?
2. What are the reason(s) if such a change is needed?
3. How can it be changed, if such a change is needed?
4. What are the factors to be considered if the faculty decide to make such a change?

QUALITY LEARNING-TEACHING ACTIVITY

The issues of quality are discussed in almost every agenda. Improving product quality is a compulsory task of all institutions, including educational institutions. However, quality is still considered an *enigmatic* concept [1]. The word *enigmatic* is defined as follows: *Something that is enigmatic is mysterious, puzzling, not obvious and difficult to understand* [2].

The concept of quality learning-teaching is also *enigmatic*. It seems that educators agree that improving quality is a worthy undertaking. However, there is no such agreement on the definition of quality and how to measure it [3].

The learning-teaching activity involves two parties, namely lecturers and students. Students are unique individuals: they differ from each other. As such, each student's level of mastery of the prerequisite subjects for ITI 372 Operational Research II will be unique as well. In this light, the authors propose a definition of the *quality teaching-learning process* as that which enables us to facilitate students with regard to the uniqueness of their level of mastery of the prerequisite subjects. If an agreement to this definition is reached, then the first and the second potential research questions mentioned above are implicitly answered. The common way of allocating students to classes has to be changed in order to enable educators to facilitate students with regard to the uniqueness of their level of mastery of the prerequisite subjects. The definition at present is too student-oriented; however, they are the University's main and direct customers.

Ideally, the quality learning-teaching activity demands the availability of one lecturer for one student per subject. Of course, such a demand is financially unfeasible, especially for a private university like Parahyangan Catholic University. Thus, a compromise solution, which is still based on quality learning-teaching, must be offered.

EFFORT TO ESTABLISH QUALITY LEARNING-TEACHING ACTIVITY

A quality learning-teaching activity can be established if serious attention is given to the allocation of students to classes. Mathematically, the process of allocating students to classes is called *clustering* and the class obtained is called a *cluster*.