



GLOBAL JOURNAL OF ENGINEERING EDUCATION

Editor-in-Chief: Zenon J. Pudlowski

World Institute for Engineering and Technology Education (WIETE)
Ivanhoe East, Melbourne, VIC 3079, Australia

WIETE Partners



Commonwealth Science and
Technology Academy for
Research (C-STAR)
Chennai, India



Faculty of Architecture
Cracow University of Technology
Kraków, Poland



Faculty of Architecture
Gdańsk University of Technology
Gdańsk, Poland



Faculty of Architecture and Design
Slovak University of Technology
in Bratislava
Bratislava, Slovakia



Faculty of Architecture
Wrocław University of Science
and Technology
Wrocław, Poland

Published by:

World Institute for Engineering and Technology Education (WIETE)
141 The Boulevard, Ivanhoe East, Melbourne, VIC 3079, Australia

E-mail: info@wiete.com.au

Internet: <http://www.wiete.com.au>

© 2023 WIETE

ISSN 1328-3154

Articles published in the *Global Journal of Engineering Education* (GJEE) have undergone a formal process of peer review by international referees.

This Journal is copyright. Apart from any fair dealing for the purpose of private study, research, criticism or review as permitted under the Copyright Act, no part may be reproduced by any process without the written permission of the publisher.

Responsibility for the contents of these articles rests upon the authors and not the publisher. Data presented and conclusions developed by the authors are for information only and are not intended for use without independent substantiating investigations on the part of the potential user.

Global Journal of Engineering Education

EDITOR-IN-CHIEF

Prof. Zenon J. Pudlowski

World Institute for Engineering and Technology Education (WIETE)
141 The Boulevard, Ivanhoe East, Melbourne, VIC 3079, Australia
Tel/Fax: +61 3 94994339, E-mail: zenon.pudlowski@wiete.com.au
Internet: <http://www.wiete.com.au>

MANAGER & ASSOCIATE EDITOR

Dr Dianne Q. Nguyen

WIETE, Melbourne, Australia

ASSOCIATE EDITORS

Prof. Andrew Nafalski

University of South Australia, Adelaide, Australia

Prof. Derek O. Northwood

University of Windsor, Windsor, Canada

Mrs Dorota I. Pudlowski

WIETE, Melbourne, Australia

A/Prof. Arthur J. Swart

Central University of Technology, Bloemfontein, Free State, South Africa

Prof. Robert Špaček

Slovak University of Technology in Bratislava, Bratislava, Slovakia

ADVISORY BOARD MEMBERS

Prof. Waław Celadyn

Cracow University of Technology, Kraków, Poland

Prof. Colin U. Chisholm

Glasgow Caledonian University, Glasgow, Scotland, UK

Prof. Pavel Gregor

Slovak University of Technology in Bratislava, Bratislava, Slovakia

Prof. Barbara E. Gronostajska

Wrocław University of Science and Technology, Wrocław, Poland

Prof. Ahmad Ibrahim

Yorkville University, Toronto, Ontario, Canada

Prof. Adinarayana Kalanidhi

Commonwealth Science and Technology Academy for Research, Chennai, India

Prof. Magdalena Kozień-Woźniak

Cracow University of Technology, Kraków, Poland

Prof. Viljan Mahnič

University of Ljubljana, Ljubljana, Slovenia

Prof. George Metaxas

Piraeus University of Applied Sciences (TEI), Piraeus-Athens, Greece

Prof. Lucyna Nyka

Gdańsk University of Technology, Gdańsk, Poland

A/Prof. Branislav Puškár

Slovak University of Technology in Bratislava, Bratislava, Slovakia

Dr Steven Thatcher

Private Consultant, Cairns, Australia

Prof. Jacek Uziak

College of Management and Enterprise, Wałbrzych, Poland

Prof. Algirdas V. Valiulis

Vilnius *Gediminas* Technical University, Vilnius, Lithuania

Prof. Ľubica Vitková

Slovak University of Technology in Bratislava, Bratislava, Slovakia

Dr Aji P. Wibawa

State University of Malang, Malang, Indonesia

Prof. Maria J. Żychowska

Cracow University of Technology, Kraków, Poland

Contents

Z.J. Pudlowski	59	Editorial
J. Szczepański and L. Nyka	60	The evolution of education spaces - from plan as generator to regenerative architecture, virtual rooms and green campuses
J. Legény, R. Špaček and M. Sonnleithner	68	Transcript(ion) of nature into architectural substance and culture
W. Celadyn	76	The role of technical education in architectural studies
A. Gero, V. Wilczynski, N. Krumholtz and O. Danino	83	Project-based learning in international teams composed of excelling high-school and first-year engineering students: high-school students' perspective
S. Sapliyan, P. Chatwattana and P. Nilsook	90	A constructionist, imagineering learning system with the metaverse: a study of learning outcomes at secondary schools in Thailand
L. Vargas-Mendoza, D.V. Melo-Máximo, K. Gallardo and J.A. Álvarez-Chávez	99	Development of scientific thought in an advanced research internship: building up a performance assessment system
K. Życzkowska and B. Krawczyk-Brylka	106	Levels of creativity in architectural education
D.T.K. Tien and S.N. Namasivayam	112	Transformative learning in engineering education: the improved people and relational skills outcome
T. Ngonda	117	Mechanical engineering academics' attitude towards graduate attributes: antecedents and a conceptual model
E. Vitková	123	Issues of public spaces in the education of architects and urban planners
J. Borucka, S. Parrinello and F. Picchio	129	Digital data and tools in transformative education to preserve architecture and cultural heritage: case studies from Italy and Poland
Z. Čerešňová, K. Görner, K. Macháčová and L. Štefancová	135	Effectiveness of universal design education in architectural design studios
Index of Authors	143	