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ASSALAMUALAIKUM WARAHMATULLIHI WABARAKATUH AND GREETINGS.

It is with deep appreciation that I write this Foreword to the Proceedings of NALI 2018. UTM’s NALI Framework was introduced in 2013 to transform the learning & teaching landscape in the university to be future-ready in an era of 21st Century Learning. Over the years, numerous initiatives have been introduced under the NALI Framework. An important step forward would be to provide an avenue for the sharing of NALI’s best practices in an ambience that embraces innovation and transformation in learning & teaching and this has led to the organization of NALI 2018.

NALI 2018 was organized to provide a platform to showcase and celebrate innovative and transformative practice, research and products in learning & teaching in line with Education 4.0 and the promotion of STEM Education. NALI 2018 also aims to recognize excellence in innovative learning & teaching through the NALI and Avicenna Awards and excellence in collaborative academic programs through the University-Industry Learning & Teaching Network Award.

Invited keynote presentations were given by four distinguished speakers. Prof. Dr. Mushtak Al-Atabi of Heriot-Watt University Malaysia, spoke about the new paradigm of innovation, Prof. Ir. Dr. Zainuddin Abdul Manan of Universiti Teknologi Malaysia spoke about uberizing quality education, Prof. Dr. Rose Alinda Alias of Universiti Teknologi Malaysia highlighted on future-ready curriculum framework for academic programme transformation and Mr. Anssi Ikonen of Metropolia University of Applied Sciences, Finland shared experiences in 21st century learning & teaching in engineering education. Parallel workshop sessions were conducted by two prominent speakers. Assoc. Prof. Dr. Wan Zuhainis Saad of Universiti Putra Malaysia presented a workshop on Immersive Learning through Cybergogy and Assoc. Prof. Dr Kumar Laxman of University of Auckland presented a workshop on Transforming Learners in the Digital Era: Mobile Learning as a Pedagogical Tool in the Educational Eco-System.

The overwhelming participation in this inaugural NALI 2018 from both local and international institutions is indicative of great interest in learning & teaching innovations. We hope NALI 2018 will inject new impetus towards further exciting innovations in learning & teaching as we prepare our graduates for a future in a connected world filled with rapid technological changes.

On behalf of the organizing committee of NALI 2018, I thank all participants for their contributions and heartiest congratulations to all medal winners and award recipients.

ASSOCIATE PROF. DR. IR. HAYATI ABDULLAH
CHAIR
NEW ACADEMIA LEARNING INNOVATION (NALI) 2018
FOREWORD FROM CO-CHAIR OF NALI 2018

Assalamualaikum Warahmatullahi Wabarakatuh and Greetings.

It is my great pleasure and honor to welcome you to the first New Academia Learning Innovation (NALI) Symposium 2018. NALI Symposium 2018 is the first collaboration between Faculty of Social Sciences and Humanities and UTMLead. UTM NALI Framework is in line with the National Higher Education Strategic Plan (PSPTN) which is focusing to improve the quality of teaching and learning through the implementation of Innovation in Student-centred teaching methods.

The Symposium theme, Sharing On New Academia Learning Innovation for Education 4.0, is also concurrent with the Ministry of Higher Education and Universiti Teknologi Malaysia agenda to focus on the use of innovation in teaching and learning to ensure development of quality and proficient mankind. This NALI Symposium provides a platform for NALI practitioners and educators especially among UTM Academic Staffs to disseminate the knowledge on NALI and their experiences in using NALI through interaction and discussion in a formal setting.

I am glad to know that NALI symposium has managed to attract participants not only from UTM but also from other institutions and other countries. Hopefully, you have ample opportunities to enjoy the various social and cultural aspects of Johor Bahru, one of the most fascinating and vibrant cities in the southern part of Malaysia.

On behalf of NALI 2018 organizing committee, I would like to express my sincere gratitude to the speakers and all participants of the symposium. I hope that NALI 2018 will be a memorable Symposium and beneficial to all participants. This symposium will not be possible without contributions and support from our sponsors, partners and supporters, which we give our appreciation. It is hoped that this collaboration can bring better impact for the development of education in our society.

Professor Dr. Muhammad Sukri bin Saud
Co-chair
New Academia Learning Innovation (NALI) 2018
Dean, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia.
# Organizing Committee

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
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<tr>
<td><strong>Patron</strong></td>
<td>Prof. Ir. Dr. Zainuddin Bin Abd Manan</td>
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<tr>
<td></td>
<td>Deputy Vice-Chancellor (Academic &amp; International) UTM</td>
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<tr>
<td><strong>Advisors</strong></td>
<td>Prof. Dato’ Dr. Ahmad Nazri Bin Muhamad Ludin</td>
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<td></td>
<td>Director, UTM</td>
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<td></td>
<td>Prof. Dr. Rose Alinda Binti Alias</td>
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<tr>
<td><strong>Chair</strong></td>
<td>Assoc Prof. Ir. Dr. Hayati Binti Abdullah</td>
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<td></td>
<td>Deputy Director, (Teaching and Learning), UTM</td>
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<tr>
<td><strong>Co-Chair</strong></td>
<td>Prof. Dr. Muhammad Sukri Bin Saud</td>
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<td></td>
<td>Dean of Faculty of Education</td>
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<tr>
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<td>Dr. Mahani Binti Mokhtar</td>
</tr>
<tr>
<td><strong>Secretary</strong></td>
<td>Dr. Nurbaha Binti A. Shukor</td>
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<tr>
<td><strong>Protocol</strong></td>
<td>Head: Dr. Mohd Rustam Bin Mohd Rameli</td>
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<td>Members:</td>
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<td>En. Ariffin Bin Basserany</td>
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<td>Dr. Jamilah Ahmad</td>
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<td>Pn. Mariyana Binti Zainal</td>
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<td>Pn. Noraini Binti Khalid</td>
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<td>Rosmawati Ismail</td>
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<td>Marlissa Omar</td>
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<td>Najua Syuhada Ahmad Alhassora</td>
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<td><strong>Treasurer</strong></td>
<td>Pn. Nurhanin Binti Ahmad</td>
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<td>Pn. Norafeza Binti Mohamed Ismail</td>
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<td>Pn. Balqis Binti Hashim</td>
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<td><strong>Head of Jury</strong></td>
<td>Prof. Madya Dr. Jamalludin Bin Harun</td>
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<td>Dr. Noor Azean Binti Atan</td>
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<td>Dr. Mohd Nihra Haruzuan Bin Mohammad Said</td>
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<td>Dr. Noor Dayana Binti Abdi Halim</td>
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<td>Wan Nur Tasnim Wan Hussin</td>
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<td><strong>Competition &amp; Technical Support</strong></td>
<td>Head: Dr. Mohd Nihra Haruzuan Bin Mohammad Said</td>
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<td>En. Mohamed Fairuz Bin Dahalan</td>
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<td>En. Zul Azri Bin A. Rahman</td>
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<td>En. Mohd Nizam Bin Ahmad</td>
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<td>En. Jeffri Bin Abdul Rahman @ Idris</td>
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<td>En. Raja Muhammad Fariz Bin Raja Rohaizat Shah</td>
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<td>Pn. Norliah Binti Mahmood</td>
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<tr>
<td><strong>Exhibition Booth</strong></td>
<td>Head: Dr. Noorsidi Aizuddin Bin Mat Noor</td>
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<td>Member:</td>
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<td></td>
<td>Dr. Mohammad Zakri Bin Tarmidi</td>
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</tbody>
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*NALI EXHIBITION AND COMPETITION 2018*
<table>
<thead>
<tr>
<th>Event</th>
<th>Head</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>NALI Symposium</td>
<td>Dr. Noor Dayana Binti Abd Halim</td>
<td>Dr. Mohd Shafie Bin Rosli, En. Mohd Reduan Bin Mohd Ariff, Pn. Norliyah Binti Mahmod</td>
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<tr>
<td>Workshop &amp; Talk</td>
<td>Dr. Muhammad Abd. Hadi Bin Bunyamin</td>
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<td>STEMazing Race &amp; Run</td>
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<tr>
<td>Promotion &amp; Sponsorship</td>
<td>Dr. Nornazira Binti Suhairom</td>
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<tr>
<td>Certificates &amp; Gifts</td>
<td>Dr. Nurul Farhana Binti Jumaat</td>
<td>Dr. Norazrena Binti Abu Samah, Ana Haziqah A Rashid, Nurul Nadwa Zulkifli, Nurliyana bt Mohamad Nor</td>
</tr>
<tr>
<td>Food &amp; Catering</td>
<td>Cik Priscilla A/P Prapagara</td>
<td>Pn. Kamalunnisa Binti Kasmuri</td>
</tr>
<tr>
<td>NALI Proceeding</td>
<td>Dr. Mohd Shafie b. Rosli</td>
<td>Dr. Mohd Nihra Haruzuan Bin Mohamad Said, En. Raja Muhammad Fariz Bin Raja Rohaizat Shah</td>
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## The Agenda

### Day 1 – 25 September 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.00 am</td>
<td>Participant Registration</td>
</tr>
<tr>
<td>8.30 am</td>
<td>Exhibition Opens</td>
</tr>
<tr>
<td>9.00 am</td>
<td>Briefing to Panel of Judges</td>
</tr>
<tr>
<td>9.15 am</td>
<td>Judging Begins</td>
</tr>
</tbody>
</table>
| 11.00 am   | Keynote Sessions by Prof. Dr. Mushtak Al-Atabi 
*Education 4.0: A New Paradigm of Innovation* |
| 11.45 am   | Keynote Sessions by Prof. Ir. Dr. Zainuddin Abdul Manan Deputy Vice-Chancellor (Academic & International), UTM 
*Uberizing Quality Education* |
| 12.20 pm   | Judging Continues                                                        |
| 1.00 pm    | Lunch                                                                    |
| 2.00 pm    | Arrival of Guests                                                        |
| 2.30 pm    | Arrival of Guest of Honour, Paduka Ir. Datin Dr. Siti Hamisah Tapsir - Director General for Higher Education, Ministry of Education Malaysia |
| 3.00 pm    | Welcoming Address by Prof. Datuk Ir. Dr. Wahid Omar Vice Chancellor UTM |
| 3.15 pm    | Opening Speech by Guest of Honour                                        |
| 3.45 pm    | Award Giving Ceremony                                                    |
| 4.30 pm    | Guest of Honour visits Exhibition Hall                                   |
| 5.00 pm    | End of Day 1                                                             |
## The Agenda

**Day 2 – 26 September 2018**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.00 am</td>
<td>Exhibition Reopen</td>
</tr>
<tr>
<td>8.30 am</td>
<td>Exhibition Continues</td>
</tr>
</tbody>
</table>
| 9.00 am   | Keynote Session by Prof. Dr. Rose Alinda Alias Azman Hashim International Business School  
             A Future Ready Curriculum Framework for Academic Programme Transformation |
| 9.40 am   | Keynote Session by Anssi Ikonen  
             21st Century Teaching & Learning                                                                                                     |
| 10.20 am  | Parallell Workshop  
             Workshop 1 by Assoc. Prof. Dr. Wan Zuhainis Saad  
             Director, Academic Development Management Division (BPPA), Ministry of Education Malaysia  
             Immersive Learning Through Cybergogy  
             Workshop 2 by Assoc. Prof. Dr Kumar Laxman  
             Faculty of Education, University of Auckland  
             Transforming Learners in the Digital Era: Mobile Learning as a Pedagogical Tool in the Educational Eco-System |
| 1.00 pm   | Lunch                                                                                                                                  |
| 2.00 pm   | Exhibition Continues                                                                                                                     |
| 4.00 pm   | Presentation of Medals                                                                                                                   |
| 4.30 pm   | Closing Ceremony                                                                                                                         |
| 4.40 pm   | Medal and Certificate Collection                                                                                                          |
| 5.00 pm   | NALI 2018 End                                                                                                                           |
Highlights

MFRS Lagoon and Theme Park game is primarily developed to assist accounting students in understanding and applying the knowledge of the accounting standards. This product is an educational game board incorporating augmented and virtual reality in learning accounting standards. By scanning the game board and accompanied cards, the images become alive and students can play the games while applying their knowledge in accounting standards. It is expected that this learning approach will enhance students’ performance since different students’ learning styles are considered and this approach provides greater motivation, enjoyment, absorption, interaction and faster learning process than conventional learning approach.

Key words: Accounting education, motivation, augmented reality

Introduction (Project or Innovation)

Evidence indicates that there was a consistently poor performance in financial reporting courses among accounting students at UiTM that was about 20-30% failure rate. It could be due to difficulty in understanding and applying the accounting standards. The issue is how to engage the students in learning technical course while exercising their judgements. In order to motivate and engage accounting students in learning process, a combination of learning situations and approaches should be created. One of the approaches that can be used is game-based learning approach. Active involvement of students with the fun elements are utilised for entertainment and to maintain the students’ engagement. It is suggested that game-based learning provides greater motivation, enjoyment and absorption than conventional learning approach; and it caters students with different learning styles. Some studies indicate that the use of augmented reality application in learning process will enhance academic achievement levels because students will be more interested and motivated, classes becoming more interactive and thus expediting the learning process.

Previous study suggests that skills and knowledge are essential to ensure the students perform well in financial reporting courses. Since the ability to use professional estimates and judgments is regarded as important criteria in analysing accounting reporting transactions, it is necessary that students must have sufficient knowledge in accounting standards and are capable to apply such knowledge in solving the accounting reporting issues. MFRS Lagoon and Theme Park game can be used as one of the teaching and learning approaches to encourage students to be more motivated and engaged in learning tedious accounting standards.
**Project or innovation objectives**

The main objective of this project is to assist students’ understanding of the concept and application of assets related accounting standards in creative and interactive approach. Specific objectives of this project are as follows:

a. To create an interactive teaching and learning approach on assets related accounting standards.

b. To assist the students’ in understanding the classification of assets based on related Malaysian Financial Reporting Standards (MFRS).

c. To assist the students’ in understanding the recording of assets based on related Malaysian Financial Reporting Standards (MFRS).

**NALI approach implemented in the research**

Apart from high failure rate in financial reporting courses, the idea to develop this product is also in line with Minister in Higher Education’s suggestion that education transformation is necessary by including the technological innovation as part of teaching and learning pedagogy. Current students are considered to be highly autonomous and self-determined learners; and teaching methodology should be redesigned by incorporating technology in teaching and learning process. Therefore, this product takes the challenge in making learning MFRS more interactive, interesting and engaging.

MFRS Lagoon and Theme Park product is an interactive educational game that consists of game board, asset cards, event cards, MFRS cards, asset worksheet, cash book worksheet, cash notes and wallets. The design of this product is using augmented and virtual reality in educational situations. By scanning certain checkpoints on the game board, students get a short description of what they are going to do. The augmented reality event cards, MFRS cards and cash notes are also created that can make learning accounting standards a more interesting and fun educational experience for a young and restless group of people who have gotten used to visual stimulation and interactivity. For example, when students scan the picture of camel on the game board, the camel becomes alive and students are given information about the value and the purpose of acquiring the camel by the business.

Current approach in teaching financial reporting known as the Framework-based Teaching of IFRS approach is incorporated in this game. The students are exposed not only on the application of the MFRS, but also on the conceptual aspects of the accounting standards. By scanning the selected MFRS cards, students are given questions related to the basic concepts of assets. This innovation of interactive learning tool may attract students’ interest to learn MFRS which could be tedious if the course is only taught through traditional approach. The focus of this game is the assets of a business, since assets are considered as one of the main elements in financial statements. There are 22 assets available in this game that can be classified into 3 main types. The assets include property, plant and equipment, investment property and biological assets. With the combination of game-based learning, augmented reality and virtual reality, learning accounting standards will increase students’ enjoyment, engagement and motivation; and students are able to use their imagination and they are encouraged to be curious to look forward to learning new standards.

This game is useful for the accounting students and professional to enhance their understanding on the concepts and application of MFRS through a fun, interesting and immersive approach. This product provides an interactive and exciting module that should be used for financial reporting courses besides learning the traditional way of classroom-based teaching and learning method. In addition, this product can be used as a module for financial reporting training for new or current employees.

This game is unique as it incorporates the use of augmented and virtual reality technology in teaching and learning financial reporting. The images on the board become alive when students scan the game board to play the game. It will support the Malaysian Education Blueprint 2013–2025 particularly in accelerating ICT innovations especially for interactive and self-paced learning. Unlike conventional board game, this game will transform traditional classroom into digital classroom. As a way forward for TN50 in changing the students’ perception in learning the accounting courses, this game also supports the 4th industrial revolution for the future landscape of accounting education.

**Product Methodology**

The methodology of the game which can be scanned from the start button on the game board are as follows:

1. At least three (3) and the maximum of five (5) players are required to play the MFRS Lagoon and Theme Park game at one time. One of the players will act as a MFRS Lagoon and Theme Park manager.

2. In order to determine the player’s turn, each player needs to throw 2 (two) dice. The player with the highest score will start the game first. Each player will throw two (2) dice to move his/her turns.
3. In this game, there are 22 assets available to be owned by the players. The classes of assets included in this game are property, plant and equipment, investment property and biological assets.

4. Each player needs to complete a touring session. The currency used in this game is MFRS. Every player will be given MFRS10,000 to start the game and the cash worksheet to start the game. The player will be given MFRS10,000 when he/she completed the round.

5. The player is only allowed to view the potential assets during the touring session.

6. The player can buy an asset provided that he/she:

7. lands on the asset checkpoint;
8. has sufficient money; and
9. answers the MFRS card correctly

The details of the assets are given when the player scans the related asset on the game board. MFRS cards require the players to understand the concept of relevant accounting standards. The players will scan the MFRS cards in order to know the question on the related concepts. Once the player is able to answer the question on MFRS card correctly, he/she will be given cash, acquired asset card and its respective asset worksheet. Then, the students need to record the transactions in the cash and respective asset worksheets.

1. Player who visits the asset owned by the other player has to pay MFRS2,500 to the owner.

2. When the player lands on the event card check point, he/she needs to scan the cards and follows the statement accordingly. Event cards require players to apply their MFRS knowledge. The assets value may be increased, decreased or remained unchanged. The players need to record the transactions correctly in their asset worksheets. The players need to record the transactions in their asset worksheets.

3. The winner of this game would be the one with the highest asset value.

Students that used this product find that it is interesting and fun. Learning financial reporting is previously regarded to be bored and very technical. With the use of this product, learning process will be more relaxed and interactive. The students are able to remember better through game-based learning after they are acquired knowledge in accounting standards.

**Other relevant information**

This game comes with a great potential to be commercialised since there are countless number of colleges and universities in Malaysia that offer accounting courses. Since MFRS is among the topics that requires accounting students to really understand and able to apply the standards in reporting. This game can serve as an alternative teaching method that is more interesting apart of the normal classroom teaching-based method. More complex accounting transactions will be incorporated in future.

This product has participated in a few exhibitions as shown in Table 1 below:

**Table 1: Number of exhibitions participated and award received**

<table>
<thead>
<tr>
<th>Title Of Project</th>
<th>Exhibition</th>
<th>Year</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFRS LAGOON AND THEMEPA RK GAME</td>
<td>Invention Innovation &amp; Design Exposition organised by UiTM</td>
<td>2017</td>
<td>Gold medal</td>
</tr>
<tr>
<td>MFRS LAGOON AND THEMEPA RK GAME</td>
<td>National Innovation and Creative Economy Expo organised by Ministry of Science, Technology and Innovation</td>
<td>2017</td>
<td></td>
</tr>
</tbody>
</table>
Acknowledgement

We are grateful for the Institute of Research Management and Innovation (ARAS Grant no. 0164/2016) and Faculty of Accountancy, UiTM Selangor, Puncak Alam for the financial assistance in this project. Special thanks to fellow innovators and researchers.

References


CDIO Practice Integrated as Mini Project in Core Subject for Mechanical Engineering Education

Zainab Asus  
School of Mechanical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia  
zainabasus@utm.my

Zair Asrar Ahmad  
School of Mechanical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia  
zair@mail.fkm.utm.my

Mohamed Hussien  
School of Mechanical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia  
mohamed@mail.fkm.utm.my

Mat Hussin Ab. Talib  
School of Mechanical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia  
mathussin@utm.my

Abdul Halim Muaimin  
School of Mechanical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia  
ahlim@mail.fkm.utm.my

Zul Hilmi Che Daud  
School of Mechanical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia  
hilmi@mail.fkm.utm.my

Highlights

Mechanical Innovation Dominoes Challenge (MIDC) is a mini-project conducted within a core subject of Mechanical Engineering program, Dynamics. This project has been introduced in 2011 with a simple objective to promote active learning activities for students to understand better theories and concepts they learnt in lectures. Since then, the project became a yearly event and has gone through improvements to maximise students’ experiences and gave positive impacts. This project addresses CDIO elements of New Academia Learning Innovation (NALI) and Integrated Design Project (IDP) to expose students early to what an engineer will really do in their real work environment and the basic of designing process.

Key words: Conceive-Design-Implement-Operate practice; active learning; engineering education; entrepreneurial exercise; communication and innovation skills

Introduction (Project or Innovation)

This paper presents Conceive-Design-Implement-Operate (CDIO) project based learning method for mechanical engineering programs in one of the core subject so that students can gain a higher cognitive level and competencies in engineering education (Anderson, 2005). The project is called the Mechanical Innovation Dominoes Challenge (MIDC) as substitute to one of the continuous evaluation of mechanical engineering core subject Dynamics. The CDIO has been integrated in the curriculum involving three design subjects throughout the program’s education year and mutually supported by disciplinary subjects like Dynamics and Programming. The MIDC is a mini-project that adopts the CDIO context at the basic level where students will have to build a system through product lifecycle development and deployment. Compared to a test in paper as assessment method, this initiative integrates active learning strategies like group brainstorming that encourage students to generate as many ideas as possible on the topic without judgment, and enable learners enhance their understanding of theoretical concepts and processes through demonstrations. This project exposes students to skills and attributes necessary for engineers to conceive, design, implement and operate a complex system.

The CDIO initiative focuses in modernizing engineering education by introducing necessary skills and thinking into the technical programmes and courses. By implementing CDIO, students will encounter more real-world problems which are cross disciplinary and are set in a context which may include societal, legal, environmental and business aspects (Ryan, Tanner, Donoghue, & Edström, 2017). The CDIO syllabus is based on the idea that CDIO skills and attributes are necessary for engineers to conceive, design, implement, and operate a complex system to meet the social needs (Fudanoi, 2013). The CDIO syllabus is comprehensive and it provides a simplified framework to enhance the engineering education. In particular, CDIO standard 7 considers the integrated learning experiences that lead to the acquisition of disciplinary knowledge, as
well as personal, interpersonal and product and system building skills. CDIO standard 8 considers the active learning: teaching and learning based on active, experiential learning methods (Schedin & Hassan, 2016). Thus in parallel with these standards, the mini project MIDC is introduced early to apply the CDIO initiative among students.

**Content (Project or Innovation)**

The project is summarized as the following:

**Project or innovation objectives**

The innovation project is a mini project called MIDC held within the Mechanical Engineering core subject Dynamics with objectives to promote active learning activities, reach higher cognitive competency level, expose students to skills and attributes necessary for engineers, and make science, technology, engineering, and mathematics more interesting for students.

**NALI approach implemented in the research (e.g. novelty, creativity, innovativeness, applicability and impact)**

The NALI approach implemented in the research is the CDIO practice integrated in a mini-project. The mini-project is to build a system with mechanisms that can slow down the falling dominoes effect. The students will have to applied theories of Kinematics and Kinetics learnt in class into their design until the system is working. It is applicable for this subject because it is stated in the syllabus where students have to study principle of motion and force. It is expected that students can gain positive impact through this mini-project by getting more understanding and can apply their knowledge in real practice.

**Research Methodology**

The innovation project is based on an integrated design project addressing a specific knowledge in Kinematics and Kinetics theories with the help of dominoes blocks. All students taking the Dynamics subject on the second semester are required to participate in the project as the assessment substitute for the second course learning outcome (CLO) which states students have to be able to analyze problems involving displacement, velocity, acceleration, and force using Second Newton’s Law with specific kinetics application (force, acceleration, work and energy, impulse and momentum, and impact). The students will have to complete the project in a group of eight to twelve persons. Four groups will have to cooperate to build a 1.5 x 1.5 x 1.5 m³ structure including dominoes arrangement and delay mechanisms. The objective is to slow down the falling dominoes in a specific given time of 240 seconds and not less than that. The 2.5 x 1.5 x 0.5-inch dominoes pieces are provided by the faculty. The lecturers are responsible to teach students about the theories and concept and guide them through the activity. The students have to build their own delay mechanisms depending on their creativity and innovative minds. Each structures are evaluated by a number of jury consist of design expert, academician, and engineer from industry. And to make the task more interesting, the event becomes a competition to inspire new innovation and reliable system as presented in Figure 1. As for the assessment, there are three aspects taken into consideration; the design, the report, and the peer review. And these criteria become the indicator for the CLO achievement. The achievement of this CLO is compared with the student’s achievement without the MIDC project which is in the first semester, to see the effectiveness of such integrated design project to increase student’s understanding in a core subject. Besides the statistical analysis, student’s feedbacks about the activity are gathered for continuous improvement. The lecturer’s observation throughout lectures and learning activities are recorded to support the findings of this teaching method.
Figure 1: Students get the experience from conceiving theories, designing structure, implementing mechanism to operating the falling dominoes system in MiDC event.

Table 1: Students results comparison between the semesters with MiDC (Semester 2) and without MiDC (Semester 1)

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>Assessment</th>
<th>Marks</th>
<th>Average Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Semester 2</td>
<td>Semester 1</td>
<td>Semester 2</td>
</tr>
<tr>
<td></td>
<td>2016/2017 (74 students)</td>
<td>2017/2018 (102 students)</td>
<td>2017/2018 (135 students)</td>
</tr>
<tr>
<td>CLO2 Q1, Q2, Q3 Test 2</td>
<td>18</td>
<td>15.60</td>
<td>13.72</td>
</tr>
<tr>
<td>CLO3 Q1, Q2 Test 3</td>
<td>12</td>
<td>9.07</td>
<td>3.58</td>
</tr>
<tr>
<td>CLO2 Q1 Final Exam</td>
<td>10</td>
<td>7.95</td>
<td>7.76</td>
</tr>
<tr>
<td>CLO3 Q2 Final Exam</td>
<td>10</td>
<td>7.30</td>
<td>6.33</td>
</tr>
<tr>
<td>CLO5 Q3, Q4 Final Exam</td>
<td>20</td>
<td>14.10</td>
<td>12.70</td>
</tr>
</tbody>
</table>

Finding and discussion of the project or innovation

Even though the event has been held for eight times, a reliable data can only be documented recently from semester 2 2016/2017, semester 1 2017/2018, and semester 2 2017/2018 considering data from the comparable experienced lecturers, the identical types of students, and similar class size. The data obtained are as depicted in Table 1 where we can see the comparison between related CLO achievements throughout the course. The direct connection for this mini-project is CLO2. CLO1 and CLO4 are not included because CLO1 is assessed before the mini-project and CLO4 has less connection to the mini-project. CLO3 and CLO5 are included because they have close connection with the concepts applied in the mini-project.

According to the data, the average CLO2 achievements are better in semester 2 than in semester 1 for both Test 2 and Final Examination. During Test 2 with the mini-project, the students are assessed on higher cognitive level of create, thus the average mark is much higher. But, for the Final Examination, the evaluation is paper based with the same level of difficulty and as can be seen, the achievements demonstrated are better than the semester without the mini-project. Therefore, proven the positive impact of such active learning activities for the intended course learning outcome. This positive trend also can be seen from the achievement of CLO3 for both Test 3 and Final Examination because this particular topic is much related to their completed mini-project. It exists discrepancies for CLO5 for the Final Examination of semester 2 2017/2018 due to the assessment format. But, if we compare the achievement of semester 2 2016/2017 and semester 1 2017/2018, the CLO5 achievement is better in the semester 2. So, based on the results improvement, it can be concluded that this active learning method can give a very positive impact to the engineering education process and learning.

Besides the data of the CLOs achievement, students are also encouraged to report their activities along the completion of the mini-project and we gathered the information as reference for continuous improvement of the program. The feedback from students like what they have done and learnt, their experience, and enhancement that should be done in the future are a useful indicator of how much the activities have affecting them in a positive way. In the knowledge aspects, the feedback we received are such as that they can apply dynamics knowledge, get better understanding, have chance to practice theories and appreciate the knowledge, and strengthen memory about the subject. Most feedbacks highlight about good teamwork, discover the right attitude to be in a team, learn how to accept criticism, know the value of hard work and moral support, learnt about leadership and how to organize a group work, and cultivate a sense of responsibility and commitment. Some of the students take this chance to learn how to communicate, learn how to deal with stress and promote a cheerful environment, handle a problem, make new friends, train themselves how to be patient, how to follow instructions, learn how to be punctual, and learn about empathy. And they have realized that this event is a good place to discover creative and innovative ideas, leveling up thinking skill in solving a problem, enjoy meaningful moments, and gain good experiences.

As for lecturer’s observation, we have noticed some of the students especially those who have taken a role as a leader have obtained a good communication and societal skills. They look more confident and assumed their role with responsibility which has enhanced their characters. Comparing between the class of semester 1 and semester 2, the students with the MiDC as mini-project are easier to be taught in class for
more advanced topics. They can grasp the lesson easier because they have experience deploying the concept practically. They appreciate the knowledge better because they have seen them through real experience and they have become less assessment oriented and motivated to cultivate creative and innovative ways of thinking.

Other relevant information (e.g. commercialization potential, awards received (title of project, exhibition and year))

According to the gathered information, we can say that this activity has loads of potential in nurturing future leaders in engineering. It is not only helps students strengthen their memory of a subject but it also helps them to gain attributes needed as engineers. This active learning method has potential to be adopted by other institutions with identical syllabus and the same background of science, technology, engineering, and mathematics education. The videos of the designs can be made as tutorial materials to understand about Newton’s Second Law of motion. Some of the innovation can be made useful by industry if there is partnership to solve a real problem in their engineering related field of work.

Acknowledgement

We are grateful for the support from the Faculty of Mechanical Engineering, Universiti Teknologi Malaysia for accommodating and supporting the students by providing materials and assistance throughout these learning activities.

References


Embedding Design Thinking in Project-oriented Problem-based Learning Approach in Software Engineering Courses

Noraini Ibrahim
Centre for Engineering Education
Universiti Teknologi Malaysia
noraini_ib@utm.my

Shahliza Abd Halim
School of Computing, Faculty of Engineering
Universiti Teknologi Malaysia
shahliza@utm.my

Nor Azizah Sa’adon
School of Computing, Faculty of Engineering
Universiti Teknologi Malaysia
azizahaadon@utm.my

Highlights
This study shares our continuous effort to improvise the generic Software Engineering (SE)-Project-oriented Problem-based Learning (PoPbL) framework. This study is the results of embedding the Design Thinking (DT) in SE-PoPbL approach that being conducted in teaching and learning activities for Software Engineering courses. The main objective of DT implementation in the SE-PoPbL framework is not only focusing on technical skills in the software project development, but also to empower learners with creativity skills that is critical for software engineer to solve real-stakeholders in industry-context settings.

Key words: Design Thinking; Software Engineering Education; Project-Oriented Problem-Based Learning;

Introduction
In the era of 21st century learning, Software Engineering (SE) education landscape must adapt to the realistic settings of teaching and learning (T&L) environment to expose learners to the real world Information Technology (IT) complex challenges (Avantikumar, 2013). Meantime, the T&L environment must be set to provide hands-on experience to the software engineers to-be in actual software development projects (Vasilevskaya, Broman, & Sandahl, 2015; Bruegge, Krusche, & Alperowitz, 2015) especially for current multi-disciplinary technology is heading towards the 4th Industrial Revolution. This study promotes Project-oriented Problem-based Learning (PoPbL) approach for SE courses that are generically designed based on fundamental theories and concepts of software development life cycles (SDLC), which comprises of requirements engineering, analysis, design, development, testing, deployment and evolution (Ibrahim & Abd. Halim, 2014, 2016) (Ibrahim, Mohamad, Abd. Halim, Ghazali, & Taliba, 2016). The SE-PoPbL approach is tailored-design to embrace the New Academia Learning Innovation (NALI) aspiration in UTM. Since its implementation in 2012, two remarkable improvements can be seen for generic SE-PoPbL framework. First expansion is to incorporate a dynamic project element that is capable to “listen” to the new demands from the industry and academia (Ibrahim et al., 2016). Second potential expansion is to integrate professional skills element, instead of focusing to the technical competencies and personal (generic) skills (Ibrahim, Halim, & Ghazali, 2017).

To improvise the current proposed SE-PoPbL framework, we first implement the collaborative case study integration into different SE courses. The integration of the same collaborative case study has been implemented for two years in two fundamental courses namely Software Engineering (SE) and Software Modeling and Requirements Engineering (SMRE) in the same semester, i.e. Semester 2, 2016/2017 session and Semester 2, 2017/2018. The main contribution for this collaboration case study integration is the systematic mapping of the collaborative project deliverables is achieved for the implemented courses. At the same time, this should guarantee the participated instructors that the course outlines are aligned with the - course content (syllabus), teaching and learning activities as well the assessments – to ensure it complied with the Outcome-based Education design. The findings for this effort have been reported in the previous NALI Symposium 2018 (Ibrahim, Abd.Halim, Saadon, & Mohamad, 2018). The second effort to extend the SE-PoPbL framework is by experimenting the suitable process of Design Thinking (DT) during the SE-PoPbL execution stage. Similar works by (Pham & Fucci, 2018) and (Penzenstadler et al., 2018) show that the embedding DT in teaching Software Engineering courses provide instructors an innovative solutions to address learners in technical complex problem solving for their targeted real-stakeholder for software projects development. However, the main objective of DT implementation in the SE-PoPbL approach is not only focusing on technical skills in the software project development, but also to empower learners with creativity skills that is critical for software engineer to solve real-stakeholders in industry-context settings (Hehn & Uebernickel, 2018; Penzenstadler et al., 2018). There are five stages in DT process namely:
empathize, define, ideate, prototype and test (Interaction Design Foundation, n.d.), as portrayed in Figure 1.

![Figure 1: 5 stages in Design Thinking Process](image)

To infuse DT in the SE-PoPbL framework, each stages in DT process are mapped to the SDLC phases embedded in the PoPbL execution stage. Table 1 presents the complete mapping between both DT stages and SDLC phase. As additional information, suggested deliverables for the mapping are as identified in Table 1 and depicted in Figure 1.

Table 1: Mapping of Design Thinking Process with the PoPB Framework

<table>
<thead>
<tr>
<th>Software Development Lifecycle (SDLC) Phase</th>
<th>Design Thinking (DT) Stage</th>
<th>Teaching and Learning Activity</th>
<th>Deliverables/Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>Empathize and Define</td>
<td>Brainstorming and elicitation workshop</td>
<td>i. SE1: Case study proposal ii. RE1: User requirements document</td>
</tr>
<tr>
<td>Analysis and Design</td>
<td>Ideate</td>
<td>i. Virtual discussion with stakeholder ii. In-class problem solving iii. Team collaborative discussion</td>
<td>i. SE2: Requirements specification and analysis ii. SE3: Software design document iii. RE2: Requirements model document iv. RE3: Software requirements specification (complete)</td>
</tr>
<tr>
<td>Develop</td>
<td>Prototype</td>
<td>Mock up for high fidelity prototype</td>
<td>i. RE4: High-fidelity prototype</td>
</tr>
<tr>
<td>Testing</td>
<td>Test</td>
<td>Symposium – demo prototype and presentation to stakeholder</td>
<td>i. SE4: Test case document</td>
</tr>
</tbody>
</table>

As software engineers to-be, learners are required to understand the real problems and challenges faced by the stakeholder who requires the software to be developed. The first stage in DT process namely the “empathy”: enables the understanding of unfamiliar problems where the learner may not have experienced. Empathy requires learner to observe, engage and listen to what stakeholder wants (Platter, n.d.). Thus, in this context, empathy can be mapped to requirements phase in SDLC. Define is the second stage in DT where it transforms problem into possible solution. Define can also be mapped to Requirements SDLC. In this process, learners are required to identify the solution context and clearly define functional and non-functional requirements based on the problem identified earlier. Elicitation workshop session for stakeholder engagement and brainstorm are the activities, which can be associated to requirements phase. Figure 2 shows the related stakeholder’s elicitation workshop and brainstorming activities.

![Figure 2: DT Stage Empathy-Elicitation Workshop and Brainstorming Activities](image)

Ideate is the subsequent stage in DT process where learner are required to generate feasible solutions for the stakeholder (Platter, n.d.). This stage is mapped to analysis and design phase in SDLC. Analysis requires learner to produce step-by-step scenario to solve problems. While in the design phase, the scenario is transformed into feasible software design structure to support the development of the software. This process is realized by number of activities such as virtual discussion between team members and the stakeholder (using Whatsapp group), in-class problem solving as well as team collaborative discussion, as shown in Figure 3.
Prototype is a process to develop an early working solution to get user experience of the proposed solution (Platter, n.d.). Prototype is the following activity in DT stage where it can be mapped to SDLC development phase. Developing mock-up for high fidelity prototype is an activity for this phase. Test, the last process in DT is mapped with the same testing activity in the SDLC phase. Both tests are to ensure the developed prototype fulfill the stakeholder’s requirements based on the empathy identified earlier. During this stage, well-planned symposium was conducted where every team involved during prototype demo and pitching presentation to get the feedback from the stakeholder. Figure 3 shows the conducted activities during the prototype and test stages.

Acknowledgement

We would like to express our appreciation to Universiti Teknologi Malaysia (UTM) for the financial support allocated for our study in T&L activities (Instructional Development Grant (IDG) under Cost Centre No. R.J130000.7728.4J237. Also, we wish to thank learners that participated in the PoPbL implementation into the coursework (SE and RESM) and their willingness in answering the survey, as well as our industry collaborators – role as system stakeholders: (i) Iskandar Regional Development Authority (IRDA), Johor State Education Department, UTM IMELC Project Manager and (ii) Vector Unit team, from Johor Bahru District Health Office for their professional cooperation and knowledge sharing involvement.

References


Engagement in Peer Review and Learning Outcomes Through E-Learning Vehicle

Goh Chin Fei, Tan Owee Kowang, Loo Jie Lin, Francis Wong Chee Hong, Lee Khang Xian, Tan Poh Ling

Azman Hashim International Business School
Universiti Teknologi Malaysia
gcfei@utm.my

Highlights

An online reciprocal peer review approach that resembles to scholarly peer review using Moodle e-learning system is proposed. Specifically, this study investigated the interrelations among engagement with providing peer feedback, engagement with responding to peer feedback, learner-content interaction and learning outcomes. The study starts with the participants to provide peer review report on peer’s research proposal reciprocally. Thereafter, participants are required to revise their proposal along with a response letter that highlighting the changes were made. The results show that engagement with learner-content interaction fully mediates the relationship between engagement with providing peer feedback and learning outcomes.

Key words: Peer review; Engagement with providing peer feedback; Engagement with responding to peer feedback; Learner-content interaction; Learning outcomes

Introduction

Peer feedback is a powerful instructional method to engage learners in effective learning. Peer feedback is also known as one type of formative peer assessment that provides an intermediate evaluation on learning performance. Peer feedback is a form of collaborative learning that can establish dialogues among learners through learning activities. In a reciprocal peer feedback activity, learners assume the role of a reviewer to provide feedback to their peer and vice versa. However, prior studies have recognized our understanding about mechanisms of peer review are inadequate.

Prior studies have found that the effect of received peer feedback on learning performance is mixed (e.g. Cho & Cho, 2011; Gielen, Peeters, Dochy, Onghena, & Struyven, 2010; Li, Liu, & Steckelberg, 2010; Mulder, Pearce, & Baik, 2014). There are two possible causes to explain why learners are less engage with the responding to peer feedback. First, learners believe that they have engaged in reflective critical thinking and develop a good understanding on the discipline knowledge and key criteria through providing peer feedback process. Learners, particularly those are overconfidence, believe that they can improve the final works independently and may ignore the peer feedback. Second, learners tend to have a lower level of confidence level on peer feedback compared to feedback from instructors.

Peer feedback and assessment resemble providing feedback in many professional practices. For example, peer review is the underpinning pillar to guarantee the quality of an academic journal. The quality of peer feedback, particularly those with constructive comments, has been shown to be beneficial in the publication process in academic society. With regard to pedagogy, there is lack of understanding on the effect of learners respond to the feedback in peer review literature (Baker, 2016).

Despite the pervasive studies on the peer review, the role of learner-content interaction in influencing learning performance is rarely explored. Learner-content Interaction is an indicator of learners’ commitment to their learning in terms of their engagement with instructional material and activities (Bolliger & Armier Jr, 2013). This study draws on the belief that peer review can enhance learner-content interaction. It is assumed that learner’s engagement with providing peer feedback (EPP) and engagement with responding to peer feedback (ERP) may affect learner-content interaction (LC), which in turn, enable learner-content interaction to affect learning outcomes (LO).

Specifically, the following research questions were asked:

1. What is the impact of EPP on LO?
2. What is the impact of ERP on LO?
3. What is the impact of EPP on LC?
4. What is the impact of ERP on LC?
5. Does LC mediates the effect of EPP and ERP on LO?
Method

This study adopted the recommendation by Baker (2016) to require learners to write a statement to respond to peer feedback. Marks were allocated to the peer review report, response letter and final proposal as the incentives to motivate learners to construct an internal plan to revise the initial proposal. Such interventions address the problem that learners may over emphasized on providing feedback process and not responding to received feedback. All participants followed the same peer review process in the Moodle e-learning system (see figure 1). Participants are 45 students enrolled in the undergraduate research methods course.

![Figure 1 Peer review process](image)

Results and discussion

Two-sample independent t-test and Wilcoxon signed rank sum test shows there is a statistical difference between the scores of first and final research proposals with a positive improvement. This confirms the preliminary evidence that the engagement in online peer review can enhance learning performance.

<table>
<thead>
<tr>
<th>Table 1: Assessment of structural model in PLS-SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Endogenous constructs</strong></td>
</tr>
<tr>
<td>LC</td>
</tr>
<tr>
<td>LO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relation</th>
<th>Path Coefficient (t-value)</th>
<th>Biased Correct Confidence Interval</th>
<th>Effect Size (f²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPP à LC</td>
<td>0.46 ***</td>
<td>(0.14, 0.73)</td>
<td>0.25</td>
</tr>
<tr>
<td>ERP à LC</td>
<td>0.20 n.s.</td>
<td>(-0.19, 0.51)</td>
<td>0.05</td>
</tr>
<tr>
<td>EPP à LO</td>
<td>0.04 n.s.</td>
<td>(-0.35, 0.33)</td>
<td>0.00</td>
</tr>
<tr>
<td>ERP à LO</td>
<td>0.23 *</td>
<td>(-0.07, 0.47)</td>
<td>0.08</td>
</tr>
<tr>
<td>LC à LO</td>
<td>0.54 ***</td>
<td>(0.18, 0.77)</td>
<td>0.37</td>
</tr>
</tbody>
</table>

(*** p < 0.01; ** p < 0.05; + p < 0.10; n.s. non-significant)

In the partial Least Square-Structural Equation Modelling (PLS-SEM) analysis, the results show ERP is not related to learner-content interaction (see Table 1). Nevertheless, it is positively related to LC with a mild statistical significance (p < 0.10). It can be interpreted that learners have engaged in metacognitive reflection during reviewing the peer proposal. In this experimental study, the learners were informed the pre-defined review criteria and attended the relevant peer review workshop. Learners developed self-assessment skills to respond to peer feedback. Analyzing peer feedback leads to learners to integrate useful revisions into the final proposal.

The results show that EPP is positively related to learner-content interaction. Such a finding is consistent with the notion that learners tend to engage with peer feedback will engage with a self-study with course materials. LC is an active learning that enables learners to develop cognitive structure and perspectives. Thus, peer review can enhance self-regulation among learners and leads to effective learning.

It is noted that LC is positively related to LO. Peer review can enhance self-regulation among learners and leads to effective learning. Stated differently, learners tend to develop cognitive structure and perspectives with engaging with course content. LC denotes that learners perform internal didactic conversation through talking to themselves when they extract information from course materials. EPP enables learners to perform reflective critical thinking and develop a good understanding on the discipline knowledge and key criteria.
Thus, a higher level of engagement with course materials leads to better LO.

Overall, above results suggest that LC may intervene (or mediate) the causal relationship between EPP and LC. In this study, EPP is positively related to LC; the latter is also positively related to LO. Thus, a mediating analysis is performed. The analysis shows that indirect effect from EPP to LO is significant. Additionally, the variance account for (VAF) analysis shows a full mediation which leads to non-significant relationship between EPP and LC.

There are two important implications for the above full mediation result. First, LO can be enhanced if there is a high level of EPP among learners. The rising of EPP, however, is insufficient because LC fully mediates the positive effect of EPP on LO. Second, the role of EPP will enhance the learner motivation to intensify their learning from the course material. Thus, learners will have a higher level of subject knowledge and achieve a better learning performance. From the teaching and learning perspectives, e-learning practitioners who engage with online peer review should first construct a high quality of course materials to enhance learning outcomes.

Finally, the effect size analysis shows that LC has a large effect size on LO, i.e., the magnitude of the observed effect between LC and LO is substantive. On the other hand, EPP has a moderate effect size on LO whereas ERP has zero effect size on LO. From the practical perspective, it is noted that ERP is not as much of important due to its small effect size on the LO. However, e-learning practitioners should augment the EPP to maximize the LC because the latter has a substantive impact on LO.

References


Using Toy Bricks as an innovative teaching in Operations Management

Siti Zaleha Omain  
Universiti Teknologi Malaysia  
zaleha@utm.my

Norhalimah Idris  
Universiti Teknologi Malaysia  
norhalimah@utm.my

Norhayati Zakwan  
Universiti Teknologi Malaysia  
norhayatimz@utm.my

Nor Zafir Md Saleh  
Universiti Teknologi Malaysia  
zafir@utm.my

Zuraidah Sulaiman  
Universiti Teknologi Malaysia  
zuraidahs@utm.my

Highlights

This paper describes an innovative technique of teaching Operations Management course by using toy bricks simulation game. This course is typically delivered through lectures, discussions and case studies. However, toy bricks simulation game was introduced in class as a scenario in production. A survey has been conducted in investigating students’ perspectives of this technique. The survey shows that majority of the students agreed that this technique increases their interests and understanding of the subjects and this technique is regarded as a valuable tool in the business curriculum and should be included in the future.

Key words: Toys Brick; Operations Management; Scenario-Based Learning; Material Requirement Planning

Introduction (Project or Innovation)

This paper presents an innovative technique of using toy bricks game for Operations Management course in Azman Hashim International Business School (AHIBS), Universiti Teknologi Malaysia. The course is typically delivered via lectures, discussions and case studies. However, the innovative toy bricks technique was introduced in this class starting in semester 1 2017/2018 to groups of students majoring in Management of Technology in AHIBS, UTM. The followings are the objectives of this teaching innovation:

1. To improve students’ understanding of Operations Management topics i.e Material Requirement Planning (MRP), Inventory Management, Layout Strategy and Quality Control which are considered relatively challenging among students.

2. To introduce scenario-based learning among students by incorporating toy bricks in a production scenario.

3. To enhance students’ learning via team-working and applying operation management theories i.e MRP theory.

4. To emphasize the “reflection-on-action” and “reflection-in-action” learning techniques among students.

The feedback from this study will help researchers in improving the innovative teaching technique in the classroom.

NALI implementation approach

NALI approach implemented in the research are:

Novelty: An original teaching technique using toy bricks as a medium in executing the manufacturing process as per MRP concept.

Creativity: Embedding toy bricks and challenging students’ ability to execute given tasks within a given time frame.
Innovativeness: Integrating students’ learning process in assembling the toy bricks in a production scenario along with producing “part request form” using the computers.

Applicability and impact: Toy bricks provide many opportunities for simulating real production scenarios with great flexibilities for instructors to tailor those activities to their teaching needs. Students’ obtain significant in-depth understanding and experiences with regards to the actual MRP process that help them to reflect the theories learned in class.

Research Methodology

In order to investigate the effectiveness of this teaching technique, questionnaires were distributed via Google form to 45 students enrolled in Operation Management course during semester II 2017/2018. The 5-point Likert scale was used in the questionnaire.

Finding and discussion

There are 29 students responded to this survey. 41.4% of the respondents were male while 58.6% were female. Table 1 shows the findings of the study.

Table 1: Students’ perspective on the implementation of Toy Bricks simulation game

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The game has adequate information to assist me in decision making</td>
<td>4.59</td>
<td>65.5</td>
<td>27.6</td>
<td>6.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I increase my skills in analysing relevant data to make managerial decisions</td>
<td>4.62</td>
<td>65.5</td>
<td>31.4</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I think playing this game has enhanced my interest in this course</td>
<td>4.69</td>
<td>72.4</td>
<td>24.1</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I got better understanding on the related course material after playing this game</td>
<td>4.66</td>
<td>69.0</td>
<td>27.6</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I think playing this game help me communicate more effectively</td>
<td>4.31</td>
<td>37.9</td>
<td>55.2</td>
<td>6.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>All members in my group contributed equally to the work</td>
<td>4.55</td>
<td>62.1</td>
<td>31.4</td>
<td>6.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>There was a high-level of co-operation in my group</td>
<td>4.48</td>
<td>55.5</td>
<td>37.9</td>
<td>6.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I think playing this game help me understand how to better organise a group work as a team</td>
<td>4.66</td>
<td>69.0</td>
<td>27.6</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I consider the toy bricks game a valuable learning tool in a business curriculum</td>
<td>4.58</td>
<td>62.1</td>
<td>34.5</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The toy bricks game should be part of the operations management in the future</td>
<td>4.58</td>
<td>65.5</td>
<td>27.6</td>
<td>6.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I enjoyed playing the game and liked the excitement of competing with others</td>
<td>4.48</td>
<td>55.2</td>
<td>37.9</td>
<td>6.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I think the game was interesting</td>
<td>4.79</td>
<td>82.8</td>
<td>18.8</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I would like to play this game again</td>
<td>4.62</td>
<td>79.3</td>
<td>13.8</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

This innovative toy bricks game technique provides better integration of several concepts in the Operations Management course simultaneously. Among the experiences that have been developed includes identifying number and types of materials needed to be ordered from the warehouse (inventory) in order to fulfill customer’s orders, exercising the quality check on products produced, drawing the product structure tree and producing bill of materials, calculating the MRP reports and managing procurement and inventories movement in the warehouse. This technique covers four different topics which normally taught in different chapters namely; Material Requirement Planning (MRP), Inventory Management, Layout Strategy and Quality Control.

Among the feedback from students that participated in this simulation game were relatively positive. Among the anecdotes given by students include: “This game can guide me to understand more about these topics”; “I love the game because instead of trying to grasp on the theory, I had the experience of applying it in a real situation”; “I am able to experience the reality of managing a warehouse, production and quality control”; This game gives me much knowledge about management and working in teams”; “This game comes out with a lot of enjoyable tasks which provide opportunities to apply it in the real life”; “Playing this game improves my understanding about the MRP concept”.

There are many lessons learned from implementing the toy bricks into a production scenario. It promotes
change and educational practice, especially through student experience and feedback. Traditional examination assessment only focus on ‘what a student knows’ instead of ‘how the student came to know something new.’ This toy brick technique illuminates the implicit process of students’ thinking and reflection on the knowledge that they learned in class into conducting the given tasks as Maguire (2006, 67) argues that it is time to ‘make visible the conditions of knowledge production, lest we create more alienating knowledge’. The authors suggest honouring student voices by embracing the process of learning and valuing the collaborations amongst students and instructors.

This technique emphasizes on the use of toy bricks in a production scenario to enhance the learning process of students on Operations Management subject. The learning process gives the opportunity for students to apply their theoretical knowledge into practice through reflection-on-action and reflection-in-action in completing the required tasks. This study lends support to the argument by Hermant et al. (2015), who strongly promote the learning process in entrepreneurship education to focus on real-world experience, action, and reflective processes to engage students in authentic learning. The authors believe that this strategy would lead to greater entrepreneurial abilities and propensity, which eventually enhance the entrepreneurial performance, which benefits individuals and societies.

In conclusion, this innovative toy bricks technique is very innovative and effective pedagogical technique in teaching Operations Management. Initially, the technique clearly demonstrated the increase in students’ interest in the subject, improve their team working and communication skills, and their engagement in class. Students strongly recommend that this technique is embedded into the teaching of Operations Management courses.

Commercialization Potential

This innovative teaching technique has a high potential for commercialization. This technique is in the process of IP registration. This technique can be marketed to all public and private institutions that offer Operations Management courses. It can also be targeted to Secondary schools and colleges that offer Commerce subject.

References


Accounting Educators 4.0 Readiness Identification System (AERIS 4.0)

Mohamad Ridhuan Mat Dangi
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
ridhuan@salam.uitm.edu.my

Maisarah Mohamed Saat
Department of Accounting and Finance, Azman Hashim International Business School, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor Darul Takzim
maisarahsaat@utm.my

Aida Hazlin Ismail
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
aidah348@salam.uitm.edu.my

Shukriah Saad
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
shukriah736@salam.uitm.edu.my

Highlights

Accounting Educators 4.0 Readiness Identification System (AERIS 4.0) is innovated to measure the educators’ readiness and willingness to adopt and integrate educational technology and digital tools for the teaching-learning process in the classroom. The variables generated in this system is based on several well-established theories that were used to comprehend the educator’s behavior, educator’s technology acceptance, educator’s constructivist role, educator’s discovery ability, and competencies. This innovation could serve as an initial solution to encourage educators to adopt educational technology in their pedagogical practice. At the faculty level, AERIS 4.0 helps to identify educators requiring more attention; hence, further action can be formulated to find a resolution to improve their approach in adopting technology. Furthermore, the industry practice shows an increasing demand for technology usage in which future employment and workplace environment necessitate the graduates to be imbued with technological knowledge and 21st century skills. Hence, it is vital to assess the digital readiness among educators since knowledge and skills could not be transferred to students if the educators themselves are trapped in the loopholes.

Key words: Accounting; Educators; Educational technology; Digital readiness; System.

Introduction

History bear witness to the major transformation of the society due to the advancement of technology. Nowadays, technology implementation in every level of the educational institution is deemed pivotal in line with the changing of time and to engage with the 21st century style of teaching and learning. The technology revolution has altered the education field in order to prepare students for a world of rapidly changing technology, increased interconnectedness, digitalization, and new forms of employment towards the Industry Revolution 4.0 (IR 4.0). Consequently, not only the students but the educators as well must also upskill themselves and embrace technology in their pedagogical activities. The emerging trend of digital education is spreading worldwide, which make the engagement of technology in education obligatory.

Technology and digitalization have created its pathway and transformed the accounting education field in which it has become a collaborative, self-driven, and more engaging with imaginative and experiential learning. However, there are some issues of educators’ readiness in implementing technology in their teaching practice. The numerous reasons for the issues could stem from the technical or societal aspects, which resulted in the technology and its innovativeness still not being widely adopted by the accounting educators (Abu Karsh, 2018; Arokiasamy, Abdullah, & Ismail, 2014; Mat Dangi & Mohamed Saat, 2018). It has become a major challenge to encourage educators to adopt technology in their teaching-learning activities. The reluctance of some educators to use digital technology in the classroom may be attributed to technology anxiety, which related to the educators’ lack of self-confidence in using technology (Johnson, Wisniewski, Kuhlemeyer, Isaacs, & Krzykowski, 2012). Therefore, it is imperative to ensure that accounting educators are well prepared and encouraged to adopt educational technology in the classroom. For this reason, AERIS 4.0 serves as the initial step to identify the educators’ readiness in educational technology adoption. This innovation is expected to measure the educators’ readiness level based on the educator’s behavior, technology acceptance, educator’s constructivist role, educator’s discovery ability, and competencies. Educators with a low readiness level can be identified so that further action can be designed and formulated by the faculty or education institution to improve their level of educational technology adoption and integration.
Since technology is advancing rapidly and it will continue to evolve, education institutions must be prepared to be equipped with technology. Although the availability, suitability, and cost of technological tools have a significant role in the educators’ pursuit towards educational technology, it is also important to understand educators’ behavior and attitudes to discern their responses (Ghavifekr, & Rosdy, 2015; Abdul Latif, Mat Dangi, Abdul Wahab, & Azero, 2013). Moreover, technology can only be integrated and fully understood when the educators’ belief and perception are taken into consideration (Tondeur, van Braak, Ertmer, & Ottenbreit-Leftwich, 2016). Therefore, it is hoped that AERIS 4.0 can enlighten the educators about the prominent effect of educational technology in the process of teaching and learning.

Content and Features of the AERIS 4.0

The primary objective for the creation of AERIS 4.0 is to measure the accounting educators’ readiness level of integrating and adopting the educational technology. The measurement can be used to identify whether the educator is inclined or hesitant to integrate educational technology into their teaching-learning activities. Secondly, this measurement system could assist the top management, the faculty and education institution in identifying educators who require more attention in the process of embracing educational technology. The assessment result will illustrate the educators’ readiness level; thus, the faculty or education institution could pay more attention to those with a low level of readiness. In addition, it could ease the process of formulating the necessary action, which not only increases the readiness level but also encourages educators to adopt technology in their classroom activities.

Prior to the creation of AERIS 4.0, the researchers have produced three publications presented at an international conference and proceedings related to the issue of educators readiness with educational technology, which eventually has sparked the idea to develop a systematic measurement to evaluate the educators’ readiness towards educational technology adoption. The measurement used in AERIS 4.0 is based on the past literature that has been tested and from well-established theories, hence, rendering it reliable. Furthermore, to the best of the researchers’ knowledge, a solid and compact measurement to quantify the educators’ readiness level towards the adoption of educational technology for accounting educators has never been designed. Thus, it specifies the novelty and exclusiveness of AERIS 4.0 with its uniqueness since there is no other similar system exist at present. AERIS 4.0 has duly undergone the necessary process for the intellectual property right (IPR) application—an initiative to protect the content and its originality before it can be commercialized.

Creativity-wise, AERIS 4.0 is designed in the form of computerized database assessment system that can be accessed electronically, hence, the assessment made is paperless, fast and easy. Despite its interesting layout, user-friendliness, and color-indicator method, the measurement process of this system employs a self-assessment feature, which allows educators to evaluate their readiness level themselves. The result of the assessment can be sent instantly to the top management of the faculty for evaluation and further action preparation to improve the readiness level of the educators. Besides, the assessment and information of the system can be stored and retrieved for future reference. The system can also generate three tiers of scoring: the first tier yields the score of the individual item of the measurement, the second tier yields the total score for each theme, and the third tier yields the result of the total score for overall level of adoption and integration.

The innovative feature of the AERIS 4.0 system greatly depends on its systematic database that is different from the traditional format of measurement, which is typically performed on paper. In other words, the innovation in the form of a database system is not just paperless, fast and easy, but the interactive design combined with creativity allow the result to be presentable and can be illustrated in real time. Additionally, the measurement used is compressed and comprehensive as it combines the determinants that measure the educators’ behavior, technology acceptance, educators’ constructivist role, educators’ discovery ability and competencies, which were extracted from various relevant literature. The scoring system used for the measurement is gauge through a scale ranging from 0 to 5 with distinguishing colors (as shown in Table 1). Meanwhile, Figure 1 shows an excerpt of AERIS 4.0 main interface. It contains the menu that links to the system introduction and user manual for guidance as well as the five measurement themes where the user can tab to each link to begin the assessment.

By using AERIS 4.0, educators can evaluate their readiness level towards the adoption of educational technology. As a result, top management can formulate further action to engage educators with deprived readiness level and to find the solution to improve their approach and effort in adopting technology in their teaching-learning process. Since technology is advancing rapidly and utterly unavoidable, therefore, educators need to be prepared and embrace the impact of technology in education whether it is favorable or otherwise.

AERIS 4.0 Applicability and Commercialization Potential

AERIS 4.0 is highly potential to be commercialized since it functions as a measurement tool to evaluate the accounting educators’ readiness level of integrating educational technology into their teaching and learning activities. The potential target users of AERIS 4.0 are the accounting educators at all level of
education—universities, colleges, and schools. In fact, AERIS 4.0 also has the potential to be used by other background and field of education because the measurement can be generalized, adopted and modified to suit a given context. Since the measurement used is based on universal theories, it can be generalized to other fields of education, different faculty, school teacher and even administration staff. This is because educational technology does not only affect the higher education institution but also to all level of education system. Besides, there are an enormous number of schools and education institution in Malaysia as well as educators, thus, it is practical to commercialize and to employ the system.

Product Methodology

The initiation of AERIS 4.0 is inspired by various literature reviewed related to educators’ adoption of educational technology, which has not reach its optimal level. According to the review, numerous factors are influencing the educators’ decision whether or not to adopt technology in their teaching-learning activities. The factors are delineated to five themes, namely educator’s behavior, technology acceptance, educator’s constructivist role, educator’s discovery ability, and competencies. The variables used in the previous studies are extracted and divided according to these themes, and then modified to suit with the higher education system and included in AERIS 4.0 as a measurement apparatus. To use AERIS 4.0, educators themselves or the person-in-charge in handling this system need to key in the score of each measurement item. Each item is annotated with a score and color indicator that has a different interpretation of the adoption or readiness level of educational technology adoption (see Table 1). The score then can be calculated automatically by the system to yield the total scoring for each theme and a total score for the overall themes. Educators could use the outcome of the score to make the necessary self-improvement. Eventually, the score can also be forwarded to the top management for further necessary action, such as to provide training or encouragement program to enhance the educators’ readiness level in adopting and integrating educational technology into their teaching and learning activities. Meanwhile, educators with high scoring can be rewarded with incentives, such as an award, rewarding a grant scheme and so forth to motivate other educators to adopt and integrate the educational technology in their classroom activities.

Table 1: Score range used in AERIS 4.0.

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Color Indicator</th>
<th>Interpretation</th>
<th>Rehabilitation Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Red</td>
<td>No integration or adoption readiness</td>
<td>Very High Action</td>
</tr>
<tr>
<td>1</td>
<td>Purple</td>
<td>Very low integration or adoption readiness</td>
<td>Very High Action</td>
</tr>
<tr>
<td>2</td>
<td>Orange</td>
<td>Low integration or adoption readiness</td>
<td>High Action</td>
</tr>
<tr>
<td>3</td>
<td>Yellow</td>
<td>Moderate integration or adoption readiness</td>
<td>Moderate Action</td>
</tr>
<tr>
<td>4</td>
<td>Blue</td>
<td>High integration or adoption readiness</td>
<td>Moderate Action</td>
</tr>
<tr>
<td>5</td>
<td>Green</td>
<td>Very high integration or adoption readiness</td>
<td>Low Action</td>
</tr>
</tbody>
</table>

Figure 1: The excerpted interface of AERIS 4.0.

Acknowledgement

I would like to express my deepest thanks to Universiti Teknologi Malaysia (UTM) for the astounding support as this innovation project is part of my PhD work. My best gratitude to my Supervisor, Associate Professor Dr. Maisarah Mohamed Saat for the persistent knowledge, support, guidance and direction to me. Finally, my appreciation to the Faculty of Accountancy, UTM for the funding of this project. Last but not least, my gratitude towards my fellow researchers.
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MRMD DIGITAL BOARD: A NEW WAY Engaging WITH STUDENTS

Shukriah Saad
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300,
Bandar Puncak Alam, Selangor Darul Ehsan
shukriah736@salam.uitm.edu.my

Mohamad Ridhuan Mat Dangi
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300,
Bandar Puncak Alam, Selangor Darul Ehsan
ridhuan@salam.uitm.edu.my

Aida Hazlin Ismail
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300,
Bandar Puncak Alam, Selangor Darul Ehsan
aidah348@salam.uitm.edu.my

Norli Ali
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300,
Bandar Puncak Alam, Selangor Darul Ehsan
norli170@salam.uitm.edu.my

Highlights

MRMD Digital Board represents the new era of teaching and learning technology for the lecturers by using digital platform which enables lecturers and their students to convey and share information by using QR (Quick Response) code. MRMD Digital Board provides lecturers with the opportunity to shift from the traditional teaching methodology to a more interactive methodology of teaching and learning which represents an entirely new way of engaging with students. The potential for MRMD Digital Board is limitless. Students will have immediate access to what is relevant to their courses and lecturers can use this platform to create and manage the information on the PADLET application instead of the traditional way of using paper. It empowers students by getting them to be more interested in learning and allows students to better connect with learning materials.

Key words: Digital; Lecturer; Student; Teaching; QR code

Introduction of MRMD Digital Board

The Industrial Revolution 4.0 (IR 4.0) has given a new incentive to educational transformation (Parker et al. 2016). In recent years, education experts recognize the great impact that numerous technological innovations in ICT is having on all areas of education-curriculum, methods of teaching, classroom learning etc (Andre 2014). Thus, traditional process of teaching and learning in education has been replaced by new and emerging technologies. The incorporation of information technology tools in education is an opportunity to transform the teaching and learning method in universities. The students can keep themselves updated with the most relevant contents for their curriculum using these learning tools and technologies (Ali & Lodhi 2014).

The integration of QR codes in teaching has been identified as an important tool in promoting active as well as distributed learning, especially in higher institutions (Goyal et al. 2016). The use of QR code for all teaching materials on the MRMD Digital Board provides more venue for the lecturers to be more creative in providing knowledge to their students. QR code is often used to provide access to information through a mobile phone (Benlian et al. 2015) by scanning using a QR scanner. All QR codes will be created using the PADLET application and the materials for teaching will be uploaded in the respective walls. From the environment aspect, MRMD Digital Board supports the concept of green learning and saves the earth. This is because this platform will require less paper handouts and saves time with quick access to information, which will benefit students and lecturers alike.

Content and Features of MRMD Digital Board

MRMD Digital Board offers digital platform with the objective of enriching and enhancing the classroom experience. This platform helps students to learn better and lecturers to teach through better engagement. The emerging of industrial revolution 4.0 has inspired the education sector to reexamine the way of doing business and with this in mind, universities must play their role as test beds for educating the future generation and spur innovation, and thus MRMD Digital Board is initiated to make that possible. There is no limit to how or even how much lecturers can share their course materials with their students by using MRMD Digital Board. Using this product, all QR codes for each element is placed together on a piece of paper which is called MRMD Digital Classroom Catalogue. This demonstrates the extent of innovativeness where
MRMD Digital Board enables lecturers to convey and share information with students more effectively by sharing this catalogue. More importantly, this platform eases the process of updating contents and eliminates the need for photocopied handouts (refer figure 1).

**Figure 1: MRMD Digital Classroom Catalogue**

The effect of the use of MRMD Digital Board can be seen in figure 2. Before the use of this platform, some documents or materials tacked on the board outside of the room are not neatly placed, resulting in not enough space to put more materials and documents, making the board looks untidy and unorganized. However, the situation has improved with the use of MRMD Digital Board. A QR code for each course material is tacked neatly on the board. The teaching materials just need to be uploaded once on the PADLET application. Any new uploaded materials or updated process for existing materials will be automatically updated to the PADLET application without the need to create new QR codes. Drawing on a survey of 1658 undergraduate students, the study identifies 11 distinct digital benefits like flexibilities of time and place, easy to get access, organize and manage the study tasks, ability to revisit the teaching materials and learn more visual forms (Bullock 2013; Henderson et al. 2017). These data confirm digital technologies such as MRMD Digital Board can be an important aspect to the ways in which students experience their studies (Popova et al. 2019). The interaction with MRMD Digital Board should also be seen as a way of preparing students for the workplace as the students are made familiar with emerging technologies with the use of this platform as part of their learning process.

<table>
<thead>
<tr>
<th>BEFORE MRMD DIGITAL BOARD</th>
<th>AFTER MRMD DIGITAL BOARD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BEFORE MRMD DIGITAL BOARD</strong></td>
<td><strong>AFTER MRMD DIGITAL BOARD</strong></td>
</tr>
</tbody>
</table>

**Figure 2: Before and After the Uses of MRMD Digital Board**

Based on observation made on student perception of using digital platform, generally students found that MRMD Digital Board helps to make them become more efficient in their learning process. Prior results suggested that students had very positive attitude towards QR code utilization (Abdul Rabu et al. 2018). MRMD Digital Board enables students to develop effective self-directed learning skills and become more engaged as they are able to identify what they really want to learn and give them confidence to learn new things (Madigan & Sirum 2015). As for the commercialization aspect, as at 31 August 2018, there have been 9 training sessions conducted for academicians and administrators on the digital platforms including MRMD Digital Board with total income of RM600. These trainings are also registered with an i-expert system under Consultancy Unit of UiTM.

**Acknowledgement**

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References


Mobile Tangible Edutainment Games for Kids Education

Farhan Mohamed
UTM-IRDA MaGICX
Universiti Teknologi Malaysia
farhan@utm.my

Mohd Khalid Mokhtar
UTM-IRDA MaGICX
Universiti Teknologi Malaysia
khalmokh@me.com

Mohd Azhar Arsad
V3X Malaysia
azhar@v3x.my

Mohd Kufaisal Mohd Sidik
V3X Malaysia
kufaisal@v3x.my

Highlights
TEG stands for “Tangibles Education Games” is physical play set that integrates tangible objects with mobile application with a concept that allow kids to play beyond screen. TEG aims to use Augmented Reality library as core of the mobile-based games application that combines with mobile devices as display, reflector mirror, stand and set of tangible objects as tracking and interaction technology. TEG sees a vision of the future where technology is greatly used to create boundless interaction, while still embodying the concept of play to learn. This work can be a platform for the kids to learn by plays collaboratively.

Key words: Educational Games; Augmented Reality; Tangible Interaction

Introduction
Insufficient physical activities are a global healthy issue (Graham and Hipp, 2014). New emerging technology plays part in improving health issue of human. Active Video Game (AVG) technologies such as the Microsoft Kinect and Nintendo Wii equipped with whole body sensor through depth camera, accelerometers, and pressure sensor. AVG in mobile device is also possible to be developed. Current mobile device deploy with sufficient processing capacity, can utilize wide range built-in sensor (WiFi, GPS) and features (audio and camera). Augmented Reality (AR) is an example AVG that through overlaying synthetic visual content above images of real world (Graham and Hipp, 2014).

AR is the technology to create the next generation reality-based interface (T.Jebera et.al, 1997). Another term is Tangible AR, which refer to physical controller the virtual content. The AR is currently moving from laboratories around the world into various industries and consumer markets. AR basically supplements the world with virtual (computer generated) objects that appear to coexist in the same space as the real world. AR was recognized as an emerging technology in 2007 and growing until today since smartphones and AR browsers starting to embrace the very new and exciting kind of human-computer interaction (Julier & Bishop, 2002).

Basically the new application of AR has been grouped into three areas: mobile, collaborative and commercial applications. We will focus on the mobile area and collaborative. With advances in tracking and increased computing power, researchers are developing mobile AR systems. These may enable a host of new applications in navigation, situational awareness, and geo-located information retrieval. Researchers has been investigating mobile AR research system operating in well-prepared indoor environments for some time. Collaborative AR systems are ensuring that the users can establish a shared understanding of the virtual space, analogous to their under-standing of the physical space.

AR in mobile application can be divided into two categories (Graham and Hipp, 2014) (Rabet, 2015) (Rekimoto and Ayatsuka, 2000): Specially designed maker images (posters or cards) and location-based gaming. The first category is the most popular implemented in mobile app platform. AR mobile engine called Vuforia that is the most popular and easy to use AR engine exist in the market. Advantage of this AR library allows application to recognize images, boxes, cylinders, text, and arbitrary objects in environment. These capabilities allow us to develop AR application using tangible objects such cards and shapes for mobile applications.

Reflective Artificial Intelligence (AI) by OSMO product inspired new games concept in called play beyond screen (Osmo news, 2014). This games concept is using mirror attached with the camera to view the real
object in real world for interaction to be successful between virtual worlds with the real object. There are
two main components in reflective AI, which are mirror (the reflector) and computer vision algorithm to
process the data (Hashimshoni, 2015). These two components working together, the reflector and the
computer vision give mobile application ability to integrate physical objects into games or application in
real time. The game engine integrates the objects recognized by computer vision into the game or
applications. This is how the physical object you put in front of screen become digitally connected with
objects in real time, which AR technology and tangible object can work in. This work is can be described in
three objectives:

To design tangible object interaction using AR library.
To design mobile-based games using play beyond the screen concept.
To develop mobile-based games that use tangible objection interaction with play beyond screen concept.

Content
The originality and the idea in making TEG are by combining interaction with physical accessories and
augmented reality technology. TEG is different from other game products available because the game will
contain local content for education purpose in Malaysia. It uses Vuforia AR engine that allows the
applications to use physical objects to be part of the game components. Since, the product comes as a set
of physical objects, the content of the applications also different for each physical object. Thus, make the
content flexible enough to be modified to fit with the needs for different age group. Plus, TEG game
applications are made to support multi-mobile platform, which will add the value of the product.

Vuforia library
Tangible Objects

Figure 1: AR technique integrates with play beyond screen concept.

TEG has its own special features emphasize educational value through its applications. TEG focus is to foster
learning in key areas such as creative problem solving, languages and mathematics. TEG application
learning modules is based on letters, numbers, shapes and colors. Letters teaches to recognize and spell
words using letters and it is available up to three different characters; Latin, Arabic and Chinese. Numbers
teaches mathematical operations such as counting, addition and multiplication. For Shapes and Colors, it
encourages creative problem solving skills and spatial relational skills.

The innovativeness of TEG includes in its benefits for the users. As for the kids, TEG could bring a new way and
experience of learning when playing the games in the application using the physical toys. While for the
parents, by having this product for their kids could help both to enjoy the concept of play to learn together
at home. In fact, TEG also has the potential as a teaching tools for the teachers to teach their students thus
create a new way of interactive learning at school.

Figure 2: Common AR interaction verse play beyond screen interaction method.

TEG is a possible and marketable for local educational game application and digital content industry that
will revolutionize the way of how we usually use our mobile devices to play where it uses the concept of
reflective to allow the user to play beyond the screen. Advantage of this product is it can improve local
economy directly because of production of the physical tools to be played with the application is at an affordable cost compare to imported product. Besides, it can help the children to use their imaginary and creative thinking to solve the problem that will be proposed to them using interactive and fun ways in this application. TEG application also will encourage the children to work in a team where they can play the game in a group instead of playing alone. This application also can help the teachers in kindergarten to teach and expose the children to identify the various types of shapes and cards in entertaining ways.

Table 1: Comparison table with existing product.

<table>
<thead>
<tr>
<th>Format name</th>
<th>Our Product</th>
<th>Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiplatform support (IOS &amp; Android)</td>
<td>√</td>
<td>×</td>
</tr>
<tr>
<td>Easy for any upgrades</td>
<td>√</td>
<td>×</td>
</tr>
<tr>
<td>Multi-devices design</td>
<td>√</td>
<td>×</td>
</tr>
</tbody>
</table>

The education sector is the main potential market for TEG because it will help to enhance the interest of the learning especially for the young kids. On top of that, the educational value of TEG can be expanded to support more various games in single product. TEG also could benefits the educational sector especially in Malaysia as it brings a new collaborative concept of educational games for kids.

Figure 3: Prototype testing at Tadika Al-Fatteh.

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References


Landscape Architecture Design Studio: Ecological Design for Nusa Damai Community Park, Pasir Gudang

Zanariah Jasmani
Universiti Teknologi Malaysia
zanariahj@utm.my

Lee Yoke Lai
Universiti Teknologi Malaysia
lylai@utm.my

Sapura Mohamad
Universiti Teknologi Malaysia
b-sapura@utm.my

Highlights

Recreational Park Design (SBEL 2425) course is designed for second-year Bachelor of Landscape Architecture students in Universiti Teknologi Malaysia. The course offers opportunities for University-Industry networking. The engagement is between the local authority, community and university students for Nusa Damai Community Park, Pasir Gudang. Project-based learning is applied whereby students conducted the site inventory, data collection, interviews and observation towards producing a Landscape Master Plan. Series of focus group discussions and design critique sessions were also conducted within the community to choose the best design idea to be implemented at the community park which also enhances students’ technical and generic skills.

Key words: Project-based Learning; University-Industry Networking; Community engagement; Landscape Master planning

Introduction

Landscape architecture (LA) education in the 21st century is becoming more challenging which requires integration and innovation. Landscape architecture programme at the Universiti Teknologi Malaysia (UTM) is established in 1993, and since then LA education has undergone a series of changes in the curriculum design to meet the expectation of higher education and industry. In the LA programme, the most important course that each student has to undertake is the design studio. In each semester, there will be a different studios focusing on the different design theme. In line with the transformation of higher education to meet the challenges for the 21st century teaching and learning, New Academia Learning Innovation (NALI) framework has been implemented in LA programme. This paper will highlight one of the studio courses called Recreational Park Design which designed for second-year LA students. What is unique about this course is the collaboration between university, industry and community in the development of community park in Pasir Gudang and it is a real landscape project funded by Majlis Perbandaran Pasir Gudang (MPPG).

In January 2017, UTM and MPPG have signed the Memorandum of Agreement (MOA) for the development of Community Park in Pasir Gudang. The main agenda of the MOA is the integration between the Department of Landscape Architecture, Faculty of Built Environment (before the UTM Synergy 4.0) and MPPG in designing and preparing Landscape Master plans for Community Parks. By bridging academia with industry and community, students will gain experience in handling a real landscape design project which is highlighted in the Education and Research Strategic Focus Areas in Landscape Architecture Agenda 2050. (LAA2050). Project Based Learning (PBL) prepares students for academic, personal, and career success, and readies young people to rise to the challenges of their lives and the world they will inherit.

Project objectives

The aim of the project is to design a livable eco-community park at Nusa Damai, Pasir Gudang. The approach of this University-Industry networking is to integrate students and community participation throughout the whole project exercises which in line with the Key Focus Area 2 of Pelan Global UTM 2012-2020 (PGU3). This engagement should develop students’ know-how technical skills as well as generic skills. The eco community park should be conducive, sustainable and take into consideration the local community’s needs and principles of park design. The design process and development also should take into consideration the environmental and socio-cultural aspects in which the community will have their sense of belonging to the park development.
NALI Implementation in the course

The overall concept of this course is studio-based learning which in line with the NALI model of blended-learning and student-centred learning (Alias and Aris, 2016). Table 1 shows the NALI framework in LA education. Discussions, brainstorming and critique sessions were organised between the students, lecturers and community throughout the process of developing the Landscape Master plan.

In the era Internet of Things (IoT), landscape architecture education has evolved through the years. From only physical books and articles in the library, students nowadays have been able to use many resources from the internet as part of their learning activities. Flipped classroom technique was applied in this course to encourage students for independent learning. In this project, UTM E-Learning has been used as a platform for the lecturer and students to discuss the design ideas and work progress. E-Submission has been made compulsory for the students in submitting assignments.

### Table 1: The NALI framework in Landscape Architecture Education

<table>
<thead>
<tr>
<th>NALI in Landscape Architecture Education</th>
<th>University to Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio-based learning</td>
<td>Integrated Technology</td>
</tr>
<tr>
<td>Experiential learning</td>
<td>Design and Build</td>
</tr>
<tr>
<td>Case studies</td>
<td>Entrepreneurial</td>
</tr>
<tr>
<td>Community engagement/Service Learning</td>
<td></td>
</tr>
</tbody>
</table>

**Methodology**

Nusa Damai Community Park is the major project for Recreational Park Design course. This project took eight weeks to be completed. There are three main stages in the preparation of landscape design proposal. Stage one and two were done in a group and stage three is individual work. The first stage is on site inventory, analysis and synthesis. In a group, students have carried out the interviews, site measurement and observation at the park. At this stage, students have identified the site potential and constraints based on the several aspects which include physical characteristics of the site, accessibility and circulation, vegetation, visual quality, user’s needs and social activities.

The second stage is on the development of Landscape Master plan. Four groups have been formed and based on the site analysis and synthesis, each group have produced a conceptual master plan. At this stage, students have presented their design concept and preliminary landscape master plan to the community and MPPG. This is the important stage whereby each group has received the feedback, comments and suggestion before finalising the master plan.

After the Landscape Master plan was finalised, each group proceed to the final stage which is the development of Detailed Landscape Plan. Each student in each group has come out with their detailed plan that in line with the overall master plan proposal.

**Findings and Discussion**

Integration of teaching and learning experience in cooperating with eco-community landscape design expose students learning outcome in creating a sustainable landscape master plan. Students learning process reveal their hands-on actual learning experiences in cognitive knowledge, entrepreneurship, design and built. Indeed, integrating studio-based learning with NALI Blended learning enhance the visibility of project-based learning via design analysis, site issue evaluation and design concept application. In this teaching method involved students to explore real-world landscape architecture practice as well as to meet the on-site client.

**Potential for Commercialisation**

The designated landscape master plan is an important landscape planning and design tool for Pasir Gudang authority as a guide to implement and develop an eco-community park in the industrial-residential area. Hence, the landscape master plan is potential for design patent commercialisation in granting the rejuvenating Pasir Gudang neighbourhood park and communities. Furthermore, the entire process of student-centred learning and experiential learning created innovation intellectual landscape architecture module containing a collaborative design process, community engagement and dealing live project. In all, the product of design has a potential of commercial returns and meanwhile provisional for non-commercial achievement in education and sustainable environment.
Acknowledgement

Special gratitude to Majlis Perbandaran Pasir Gudang for this great opportunity of University-Industry networking. This project is supported by Majlis Perbandaran Pasir Gudang (MPPG). We would also like to show our gratitude to the Landscape Department of MPPG for sharing their pearls of wisdom with us during this project. We thank our colleagues from the Landscape Architecture Department, Faculty of Built Environment who provided insight and expertise that greatly assisted the students in the project. We are also immensely grateful to Nusa Damai Rakan Taman (Friends of Park) who are very accommodating and contributed in sharing their views and experience with the students throughout the design process.

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‘DOJOING’ 21st Century Traits in Classroom

Norli Ali
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
norli70@salam.uitm.edu.my

Aida Hazlin Ismail
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
aidah348@salam.uitm.edu.my

Mohamad Ridhuan Mat Dangi
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
ridhuan@salam.uitm.edu.my

Shukriah Saad
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
shukriah736@salam.uitm.edu.my

Norbijan Abu Bakar
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
noorbi374@salam.uitm.edu.my

Highlights

‘Dojoing’ 21st Century Traits in Classroom is a handbook that provides guidelines for lecturers to utilize gamification style application known as Class Dojo in the classroom. The objective of Dojoing’ 21st Century Traits in Classroom is to show step by step graphic illustrations that can act as the user manual for Class Dojo. Class Dojo permits lecturers to provide real-time feedback on students’ developmental skills as prescribed by 21st-century holistic traits such as social responsibility, professionalism, critical thinking, teamwork, communication and interpersonal skills to name a few. The application allows lecturers to reward students with positive feedback in real time when they show good effort in a task or activity in class as well as if they demonstrate good values or adhere to values. Dojoing’ 21st Century Traits in Classroom will guide lecturers to use the application in assessing students with those skills during the teaching and learning process while in class and not only during an examination. This is important as the real-time feedback may act as an intervention if there is a regression in their performance or behaviour. The guidebook is intended to illustrate users of Class DoJO on its applications. Although the application itself is very friendly and easy to use, a guidebook can be handy for a particular group of user.

Key words: Digital learning; skills; mobile applications

Introduction

Phone users in this new millennium spoilt with hundreds of mobile applications (apps) they could choose. It seems like using apps in daily routine nowadays have become ubiquitous. This phenomenon is highlighted in Godwin-Jones (2011) when the author mentions almost everyone from government, organizations or even individuals has their mobile applications. Godwin-Jones (2011, page 2) stresses that ‘it seems like everyone has an app available’ for various usage. The ubiquity of these mobile apps has drawn educators worldwide in using them in their classroom activities. Currently, there are hundreds of innovative educational mobile applications popping up worldwide, like ‘Class DOJO’ for educators to complement their teaching and learning. Furthermore, pricing and mobile connectivity are accessible to students as the market becoming inundated with more affordable smart mobile devices. As reported by Traxler (2011) smartphones ownership outnumbered that of laptops by 36% in 2011 with the expectation to grow further in the future (Perez, 2010 and Godwin-Jones, 2011).

Previous researchers reported various benefits of mobile applications on effective teaching and learnings (Steel, 2012; Godwin-Jones 2011; Alexander, 2004). Among them includes convenience, portability and the ability to learn on the go as well as after class support by parents or academic advisors. However, low mobile applications literacy among educators may obscure those benefits. This issue has been addressed in a study by Hill and Simha (2016). Their findings suggest that, with initial guidance, users of mobile applications able to independently continue using those apps. Therefore, a proper guideline or manual on such application is essential to improve literacy among users.
Content

While most projects on educational innovations in the past focused on the invention of its mobile applications, this project aims to present mobile applications user, namely ‘Class DOJO’ with a guidebook. The guidebook is intended to illustrate users of Class DOJO on its applications. More specifically, the guidebook will assist lecturers to plan and implement to use Class DOJO and its content in their classes. Although the application itself is very friendly and easy to use, a guidebook can be handy for a particular group of user.

The guidebook provides users with step by step tour on how to use Class DOJO in the following ways:

1. Getting started
2. Creating Class and adding students into classroom
3. Inviting students, parents or academic advisors
4. Assessing student’s activities, skills, and participation
5. Sharing with parents and academic advisors

In addition to step by step tours, the guidebook uses a screenshot from the mobile application for a clearer illustration as shown in Figure 1.

**STEP 5: Add New Class**

Let’s create your class.

![Figure 1: Illustration on Using Class DOJO in the Guidebook](image)

Besides that, the guidebook also provides additional information on the pertinent issue where necessary as demonstrated in Figure 2.

![Figure 2: Illustration on additional information](image)
The approach adopted by the guidebook is practical and easy to use by the users. It allows for optimal uses of Class DOJO application by the lecturers. The impact from the project is significant as it facilitates the users namely lecturers, students as well as parents or academic advisors to gain the most from the applications. It is hoped that the guidebook can make the use of Class DOJO more palatable to low mobile application literacy user. Furthermore, the project has a good potential for commercialization by selling the handbook and conducting workshop to the potential users.

**Acknowledgement**

We would like to acknowledge the Faculty of Accountancy, UiTM for the funding and my gratitude towards my fellow researchers.

**References**


PEDAGOGICAL BENEFITS OF YOUTUBE IN IMPROVING HAIR STYLING PERFORMANCE AND INTEREST AMONG LEARNING DISABILITY STUDENTS

Hemarani A/P Munisamy
SMPK Vokasional Indahpura
School of Education, Faculty of Social Science and Humanities, Universiti Teknologi Malaysia
henira83@yahoo.com

Mohd Rustam Mohd Rameli
School of Education, Faculty of Social Science and Humanities, Universiti Teknologi Malaysia
mrustam2@utm.my

Yeo Kee Jiar
School of Education, Faculty of Social Science and Humanities, Universiti Teknologi Malaysia
kjyeo@utm.my

Abstract

YouTube is a tool used as a Blended Learning method which has potential to increase the performance and interest among learning disability students in vocational school. Accordingly, there have been no studies conducted on the application of YouTube in learning hair-styling among learning disability students. The objective of this study is to enhance the students’ performance in hair styling after using YouTube and to identify the students’ interest in learning hair styling skills. YouTube was used towards 10 students in a single group in pre and post-test research designs. The findings proved that YouTube has high potential as an instructional tool in teaching hair styling skills, in line with the current trends of Blended Learning in education.

Keywords: YouTube; learning disability students; special education; vocational training.

Introduction

YouTube has been used in vocational education, which provides online access to vast quantities of free public video in a broad spectrum of topics. This research emphasises on student-centred instructional method that implements the Case Based Learning (CBL) approaches in accordance with the New Academia Learning Innovation (NALI). Many researchers used YouTube in mainstream education rather than special need education. The students have become more productive, creative, and innovative when YouTube was adopted in teaching and learning activities. CBL is proven able to engage students in active learning and also in solving problem creatively and collaboratively. The students will be able to understand the problem better when they use different sources to get the answers, which involve critical thinking, and simultaneously able to improve their soft skills such as communication and teamwork skills, engaging problem-solvers, as well as continuous and self-directed learners. At the same time, it will also foster the development of students' thinking and improve their abilities in learning. In some cases, CBL has also proven able to facilitate thinking and problem solving, assist the mastery learning, inspiring, and engaging the students.

Research Objectives

This study aims:

To investigate the difference in hair styling performance after using YouTube among learning disability students;
To investigate the difference of interest in hair styling after using YouTube among learning disability students.

Research Methodology

A pre-test and post-test study were conducted involving a single group of students. 10 students were selected as the sample. The students were learning disability students who are taking hair styling course. There are two instruments used to collect the data which are performance test which consists of three parts, namely the work process, outcomes, and attitude while the second instrument is observation form consisting eight items. The data was analysed using Wilcoxon Test.

Finding and Discussion

Table 1: Pre and post-test on Students’ Performance

<table>
<thead>
<tr>
<th>HAIR STYLING</th>
<th>Straightening Hair</th>
<th>Mean</th>
<th>Hair Bun</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Pre</td>
<td>Z 29.400</td>
<td></td>
<td>Z 31.200</td>
<td></td>
</tr>
</tbody>
</table>
To reflect on the students’ performance, a paired sample Wilcoxon Test was conducted to compare the total score obtained in the pre and post-test. The test revealed a significant difference, where the post-test for Straightening Hair and Hair Bun statistically has significant difference in the work process part as compared to pre-test with $Z = 2.859$, $p < .004$ and $Z = 2.816$, $p < .005$. There are also significant difference showed for outcomes part with $Z = -2.410$, $p < .016$ and $Z = -2.911$, $p < .004$. The attitude part also recorded significant difference with $Z = -2.810$, $p < .005$ and $Z = -2.814$, $p < .005$. Lastly, the total ranks recorded were statistically has significant difference for both styles with $Z = 2.816$, $p < .005$ and $Z = 2.805$, $p < .005$. In sum, students’ performance in hair styling increase after the use of YouTube as the teaching aid.

Table 2: Descriptive Analysis on Students’ interest

<table>
<thead>
<tr>
<th>Interest In using YouTube</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>1.925 (.302)</td>
</tr>
<tr>
<td>Post</td>
<td>3.575 (.318)</td>
</tr>
</tbody>
</table>

To report on the students’ interest in hair styling, observation form was used and the total score obtained in the pre and post was compared. Results showed that the total mean for pre-test was 1.925 (SD = .302) while the post-test was 3.575 (SD = .318). As a conclusion, the result showed that students’ interest in hair styling increase after the use of YouTube as the teaching aid.

Conclusion

This study has implications on the learning of hair styling in the vocational education for learning disability students. Efficient teaching methods should be practiced, specifically in dealing with the hair styling practice. YouTube can be used to enhance the basic knowledge in hair styling. In addition, the effectiveness of YouTube can be studied to determine its strengths and weaknesses, especially in vocational education for learning disability students. More importantly, the teacher can also use YouTube as an authentic tool for the students to increase their interest and activate the students’ schema to construct the meaning and to provide critical thinking. Related to this, previous studies have shown that there is a positive relation between YouTube and students’ achievement. The findings of this study could also serve as a guide to the Ministry of Education, in particular to the Teacher Training Division, to encourage all language teachers to use YouTube in developing skills among learning disability students.

References


Developing a Model of Flash Floods Detector for School Physics Teaching and Learning

Nur Asyikin Zailan
Universiti Teknologi Malaysia
nurasyikinzailan@gmail.com

Mariani Tain
Universiti Teknologi Malaysia
tain.m@yes.my

Muhammad Abd Hadi Bunyamin
Universiti Teknologi Malaysia
mabhadi@utm.my

Highlights
The product is a model of Flash Floods Detector. It is invented to get early warning of the occurrence of flash floods. An alarm has been created with the aim of detecting an increase in water in the drainage system and thus detecting the probability of flash floods. This product can be used for teaching and learning to educate pre-service physics and science teachers and school students about the concept of buoyancy and how it is applied in solving the issue of flash floods. The model will be registered as an intellectual property (IP) and then can be commercialized as a teaching and learning aid.

Key words: Flash flood detector; Archimedes' principle; physics; teaching and learning aid

Introduction
Flash floods are a threat that should not be taken lightly even though the damage they cost might not as horrible as any other natural disaster. Flash floods are described as a sudden flood of water caused by heavy rain. Flood is defined as a significant amount of water covering an area that usually dries.

On 5 November 2017, Penang was hit by flash floods (Basyir, 2017). The news report stated that there was an increase in flash flood cases that hit the state from 2013 with 22 cases to 30 cases in 2016 (Dermawan, 2017). The contributing factor of flash flood was the inability of the drainage system in the housing area to accommodate excessive rainfall during heavy flow. In this regard, maintaining and upgrading the drainage system in the housing area would be the most appropriate immediate action. However, these actions in need of micromanagement planning especially when it comes to housing area with a poor plan and high population. Hence, it requires a high cost and takes time to run.

Content
Although challenging to enforce, precautions and preparations can still be taken to enhance personal safety and minimize loss due to flash floods. One of the most appropriate measures is to get early warning of the occurrence of flash floods. In this context, an alarm has been created with the aim of detecting an increase in water in the drainage system and thus detecting the probability of flash floods.

This alarm is created based on the principle of buoyancy, the Archimedes’ principle (Hewitt, 2002) that tells that the upward thrust force experienced by a body immersed entirely or part is the same as the weight of the fluid displaced by the body. For an object that sinks to the base, the weight of the object is larger than the thrust force while for an object that arises to the surface the weight of the object is less than the upthrust.

This alarm system is created by manipulating objects that weigh less than upthrusts. This is to ensure that the object will always float on the rise of water and allow this object to act as a water level detector. This alarm system is a circuit consisting of a bell, a dry cell, and a water level detector. The water level detector is coated with aluminum foil and placed on the base of the drainage system, while the bell and dry cell are attached to the board that is also covered with aluminum foil. The board is placed at a determined height that will indicate the rise in water level and the probability of a flash flood will occur. When water levels rise, the detector will raise parallel to the water level. When the object is at the predetermined level, it will touch the alarm board, the circuit will be complete, and the bell rings to alert.

This alarm system can act as an early warning that there is an increase of water level in the drainage system. Users can take precautionary measures by transferring family members and valuable items to a safe place. Nevertheless, this alarm needs to be placed in a drainage system that is free of accumulated waste. This is to prevent the detector giving a false alarm.

The primary advantage of this product is it just uses low-cost materials thus saves money. This product can be used for teaching and learning to educate pre-service physics and science teachers and school students about the concept of buoyancy and how it is applied in solving the issue of flash floods.
students about the concept of buoyancy and how it is applied in solving the issue of flash floods. The model will be registered as an intellectual property (IP) and then can be commercialized as a teaching and learning aid.

References


ClickMe: A Portable Interactive Learning System

Fauzan Khairi bin Che Harun
School of Electrical Engineering, Faculty of Engineering,
Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.
fauzan@utm.my

Weng Howe Chan
School of Computing, Faculty of Engineering,
Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.
cwenghowe@utm.my

Highlights
ClickMe is a portable web-based interactive learning system integrated in Raspberry Pi aimed to provide interactive learning and analyses for monitoring of students’ learning progress. It is a PHP-based system that take advantage of the Raspberry Pi’s ability to provide full functional local server with database access. The integration in Raspberry Pi, which also function as an instant wireless hotspot, provides localised access via smartphones and tablets without the internet. ClickMe also comes with additional analyses of the data collected during the learning session for efficient monitoring of the class’s learning progress. The gamification element that integrated in this system can efficiently engage students’ focus in the class to create a more effective learning environment. This makes ClickMe a potential interactive learning system for remote locations and even at outdoor, where learning is not bounded only in the classroom.

Key words: Interactive learning system, Raspberry Pi, e-Learning

Introduction
Conventional learning process often hard to be monitored and students could easily get distracted. This give rise to various types of interactive learning system to make learning interesting and effective to both students and instructor. Various studies also have been carried out regarding the impact of the gamification on e-learning (Amriani et al, 2014; de-Marcos et al, 2014). However, these systems often setup in online servers, which require the use of internet connection and the internet speed will affect the learning experience and impact on the learning progress.
Moreover, interactive learning is important to ensure effective delivery of knowledge from instructors to students to unleash full potential of the students. ClickMe is a web system designed and developed for interactive learning between instructors and students. The main concept of ClickMe is to create an improved learning process by providing more interaction between students and instructors through the simple and intuitive design of the system, which is accessible through mobile devices. ClickMe is also able to improve the focus of students during class and their interest in the field of study as well as provide a simple platform to instructors for monitoring the learning progress of students.

Innovation Objective
ClickMe is a system developed with the aim to provide portable and interactive learning environment for students and instructors, where integration of gamification elements for engaging students’ participation and focus in the class, and the analysis ability of the system provides the data for the instructors to monitor the progress of the learning. ClickMe also envisioned to provide such interactive learning environment with portability, where the system can be used in various location, even without access of the internet.

Methodology
ClickMe is developed based in PHP and with MySQL database. The interface of the system is designed for both instructors (admin) and students respectively. For students, the interface is mainly focuses to provide them a platform to answer the question given by the instructor. ClickMe accepts two types of answers, multiple choice and text. By default, each of the question are given a specific time to answer before the system stop accepting answers. While for instructors, an admin interface is provided for the instructors to control the time given to answer the question, to control over a class session, and to view the analysis of the data collected during the class.

During the use of ClickMe, the data is collected in the MySQL database for analysis. The system can detect the fastest student who answer a certain question. The system will also display the distribution of the answers key in by the students. As for the text-based answers, the results will be displayed in a word cloud which is easier to comprehend. These analyses are aimed to give the overview of the class learning progress so that the instructors can keep track of each student’s learning progress.

ClickMe is introduced with the integration of Raspberry Pi. This is due to the extensive capability of the Raspberry Pi with its exceptional low cost (retail at $99). Raspberry Pi is a small size, loaded with fully capable
Linux OS and equipped with wireless communication capability. In ClickMe system, the Raspberry is configured as a wireless gateway, which allows students and instructors connect to it via mobile devices such as smartphones and tablets. It is also configured with full web server capability (PHP, MySQL and Apache) which required to execute the ClickMe system.

Features

The main feature of ClickMe system is its portability. ClickMe system is small size, light weight, and can be setup easily even using a capable power bank. Furthermore, with the configuration of the Raspberry Pi as a wireless access point thanks to its wireless networking capability, ClickMe is a full fledged system that can be used in anyplace and can be accessed by the students and instructors in the class using mobile devices. During the use of ClickMe in class session, all the data is saved in MySQL database according to the class session set by the admin, which can be accessed by the instructors for further analysis of the students’ progress in the class.

Another feature of the ClickMe system is the ease of configuration and customization. Raspberry Pi comes with fully functional Linux OS, which can be further customized and configured. The rich flavours of connection ports available in Raspberry Pi also make it easy to handle and configure.

Potentials

ClickMe is best suited for small to medium-sized class with not more than 30 students. With its low cost and portability, ClickMe can be beneficial for remote areas where internet access is unstable. The instant wireless access point and local server accessibility of ClickMe makes the interactive learning system usable in such situation, thus benefitting the students and instructors. Access via mobile devices also neglect the use of computers in conducting the class with ClickMe.

Acknowledgement

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Effective Team Formation Using Personality Type Differences in an Interdisciplinary Engineering Education Project

Hayati Abdullah
Universiti Teknologi Malaysia
hayatiabdullah@utm.my

Sya Azmeela Shariff
School of Professional and Continuing Education (UTMSPACE)
azmeela.kl@utm.my

Fauzan Khairi Che Harun
Universiti Teknologi Malaysia
fauzan@utm.my

Norhanisah Abdullah
Universiti Teknologi Malaysia
norhanisah87@gmail.com

Highlights

Engineering education programmes should include interdisciplinary team-based learning experience to develop and build student’s character, enable them to work efficiently in teams, and develop the skills needed in order to prepare them for real world engineering practice. The formation of an effective team is also crucial to maximize the team’s performance in an interdisciplinary working environment. In this study, the selection of team members based on their personality type is presented. A total of 282 students from four engineering schools were divided into 15 teams and they were tasked to complete an interdisciplinary project involving the development of a food delivery robot to deliver a cup of water between two locations. At the end of the project, a competition was held where the teams presented their projects and were assessed. The results of this study showed that team members with different personality types worked really well together in an interdisciplinary project. The results also showed that personality inventories can be used as an academic guidance tool in forming effective teams.

Key words: interdisciplinary; engineering; teams; personality types

Introduction

In the real world of engineering, engineers from different disciplines work together in a team and even with other professionals such as architects and surveyors to work on projects. Therefore, it only makes sense that working in an interdisciplinary type of setting should be included in engineering education programmes to allow students to experience working with others from different disciplines in completing one large integrated project. However, in the current practice, engineering programmes curricular are most often implemented from a single disciplinary perspective only. Even so, the formation of an effective team is especially important to maximize the team’s performance in an interdisciplinary working environment. Various criteria have been used to form teams for students’ projects in the engineering curricula. However, studies on the formation of teams based on Personality inventories such as Keirsey temperament sorters are scarce for engineering students’ projects.

There are published works on the interdisciplinary approach in the literature using various implementation strategies. Robbie discussed the implementation of an introductory design course for engineering which is centred around a multidisciplinary project and requires integrative thinking in solving problems within a team-based learning experience (Robbie, Baker, Lotko, & Collier, 2008). Their approach includes a systematic iterative problem solving methodology. AbdulGawed (2015) utilized the multidisciplinary learning technique in a Capstone Project through the design, fabrication and implementation of an Automated Storage and Retrieval System (ASRS) model. His study highlights the practical challenges in implementing a course based on a multidisciplinary approach. Strong (2011) describe the challenges faced in implementing the multidisciplinary approach including scheduling of multidisciplinary courses and acceptance of the multidisciplinary design project as an acceptable alternative to discipline-based capstone courses. An interdisciplinary approach can therefore be seen as an approach that is student-centred and allows students to see the connections, synthesize, and transfer knowledge to a variety of problem solving situations in a real-world setting. The use of team-based learning in the interdisciplinary approach provides a wide variety of benefits to the students and their instructors (Michaelsen, Sweet, & Parmalee, 2011).

There are numerous publications in the literature which focus on performance measurements of teams but few on the formation of the team itself. There are several team formation methods discussed in the
literature based on different criteria. Among them, random selection methods based on heterogeneous mixtures of students are the most commonly used. However, even these teams sometimes fail to perform due to no particular reason. In this study, selection of team members based on their personality types is presented. Information on personality types can be obtained by using a questionnaire style instrument such as a personality test. Two widely used personality tests are the Keirsey Temperament Personality Assessment Test and the Myers-Briggs Type Indicator (MBTI) (Prior, Bradley, & Shen, 2006; Neal& Neal, 2009). However, the current study is only focused on the use of Keirsey Temperament Personality Assessment Test. The Keirsey Temperament Personality Assessment Test, also known as The Keirsey Temperament Sorter (KTS) consists of 70 questions designed to help the participant determine what their personality type is. The personality test is based on the Keirsey Temperament Theory created by David Keirsey. There are four temperament groups in the Keirsey theory. The four basic groups are Guardian, Artisan, Rationals and Idealist.

Research Methodology

The Keirsey Temperament Personality Assessment Test was utilized in this research to identify a range of personality types for forming effective teams in an interdisciplinary project for an introductory engineering course. Utilising the Conceive, Design, Implement and Operate (CDIO) framework, 282 students from four schools of engineering were divided into 15 teams. The four engineering schools involved are the School of Mechanical Engineering (SME), School of Biomedical Engineering and Health Sciences (SBME), School of Electrical Engineering (SEE) and School of Computing (SC). The goal of the interdisciplinary project was to develop a hospital food delivery robot that will deliver a cup of water between two locations. The project was divided into four subsystems so that students from each respective schools in a team will be responsible for different parts of the project. SME students were responsible for the design and development of the body structure of the robot. Students from SBME were responsible to develop a robotic hand that will handle the cup. Students from SEE were responsible for the navigation system whilst SC students were responsible for developing the mobile application for controlling the Bluetooth and servo motor. At the end of the project, a competition was held where they presented their projects and were assessed. Apart from technical assessments, students went through a peer assessment process via an online system.

Findings and Discussion

Most of the students (27% of the 282 students) were determined to belong to the Guardian temperament category. According to Keirsey (2004), this temperament comprises about 40% to 45% of the population. It can be observed from Figure 1 that students from SC and SME mostly belong to the Guardian category in which 33% and 37% are Guardians, respectively. It is interesting to note that most of the students from SBME belong to the Idealist category (33%) whilst majority of the students from SEE are from the Rational category (34%). Even though 30 to 35 percent of the population are Artisan according to Keirsey (2004), only 10% of the students that participated in this project belong to this temperament category. Students from these four engineering schools were divided into 15 teams and were instructed to work on an interdisciplinary project. At the end of the project, each team presented their project and was accessed based on their presentation skills and innovation during a competition. The results of the assessment during the competition for the 15 teams are shown in Table 1.
Table 1 Competition marks and percentage of temperament in each team

<table>
<thead>
<tr>
<th>Rank</th>
<th>Team #</th>
<th>Competition marks (15)</th>
<th>Guardian (%)</th>
<th>Artisan (%)</th>
<th>Rational (%)</th>
<th>Idealist (%)</th>
<th>No Personality Test Taken (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11</td>
<td>14.19</td>
<td>31.2</td>
<td>0.0</td>
<td>25.0</td>
<td>25.0</td>
<td>18.8</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>14.15</td>
<td>25.0</td>
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<td>25.0</td>
<td>25.0</td>
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</tr>
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<td>4</td>
<td>13.91</td>
<td>40.0</td>
<td>13.3</td>
<td>6.7</td>
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</tr>
</tbody>
</table>

According to Keirsey Temperament Theory, Guardian individuals are the ones who act as the steadying element in society. Guardians are natural-born leaders and they follow rules. They find it easy to interact with other personalities. Their strengths include being good at managing and organizing work. Guardians also pay attention to details when carrying out their work. As shown in Table 1, all teams consist of students with the Guardian temperament. It can be observed that all teams performed well in completing the project. According to the peer assessment results, students with Guardian personality worked well with other members in their team.

It can also be observed that each team consist of a small number of students belonging to the Artisan personality as compared to other temperaments. However, in the engineering field, the Artisan temperament individuals could contribute significantly. This is because they have an instinctive knowledge of how to use a tool to its best advantage and tend to seek work involving operations and equipment. In this project, it was observed that the Artisan students were creative at utilising recyclable items for their group project. Therefore, even though the Artisan individuals are few in numbers, they are a great asset to the teams in completing their project.

Based on Table 1, team No.11 and No.12 performed well compared to the other teams during the competition. Although the teams did not seem to apparently have representation from the Artisan Category, both teams seem to consist of equal number of students with Idealist and Rational personalities and a strong presence of the Guardian personality. Rationals are good strategist. They can view problems from multiple perspectives and will bring well thought-out arguments and profound reasoning to concepts and ideas. They are also strong-willed, independent and practical. On the other hand, Idealists are calm and easy-going individuals. They have the ability to bring people and ideas together for long-term relationships and connections. They also have good communication skills and can easily tolerate and cooperate with Rational individuals. For these two particular teams, it may seem that the balanced combination of the Idealist and Rational temperaments together with a strong presence of the Guardians had resulted in the teams to perform well during the competition and in completing their project.

In conclusion, members in all the teams seemed to work really well together. Students seemed to enjoy getting to know their peers from other disciplines. They were enthusiastic during the group practical work sessions and everyone seemed to put an effort and play their role as a team member in successfully completing their project with good results. By having diversity in terms of different personality types in a team seems to have resulted in good overall performance when working on an interdisciplinary project and students are able to get the most out of their team-based learning experience.

Acknowledgement

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References


Coolverter: A learning aid to master the skill of converting units of length

Mohd Hafizi Haris Fadzillah
Universiti Teknologi Malaysia
m.hafizi@graduate.utm.my

Dr Norulhuda Ismail
Universiti Teknologi Malaysia
p-norulhuda@utm.my

Dr Sharifah Osman
Universiti Teknologi Malaysia
sharifah.o@utm.my

Highlights

Coolverter is an innovative learning aid which aims to help students in understanding the concept of converting units of length and mastering the skill of converting units of length in Mathematics. Coolverter is specifically designed to show and demonstrate the process of converting units of length to student. Coolverter provides opportunity for students to find the answer and build the concept of converting units of length on their own. Students can identify the operation needed to convert the units of length, then see clearly the changes on units of length, including the position and direction of decimal movement.

Key words: Coolverter; innovative; learning aids; converting units of length; Mathematics.

Introduction

UPSR students of 2012 also sat for PMR in 2015 and SPM in 2017. Based on the UPSR 2012, PMR 2015 and SPM 2017 data, Mathematics subject shows a decreasing level of achievement (Bahagian Pembangunan Pendidikan, 2018) where the percentage of students who have passed Mathematics is decreasing from UPSR 2012, PMR 2015 until SPM 2017. This data suggests that the number of students who master Mathematics is fewer as they continue their studies at the higher level. Students who have difficulties in Mathematics tend to forgo further studies in the field of mathematics and science. In the long run, low enrollment of students in mathematics and science can affect national development in technology, business, economy and education.

The phenomenon observed could be as a result of the lack of mastery in basic mathematics concept and skills among Malaysian students. It is imperative that this problem is conquered from the early stages of education. Converting units of length is one of the Mathematics skills learned in primary school. This basic skill is used frequently and is needed to understand more complex and difficult concepts in higher level Mathematics (Fuchs, Malone, Schumacher, Namkung, & Wang, 2017). If students do not master this basic skill in primary school, they will face a much bigger problem when learning higher level Mathematics. So, it is extremely important to ensure students can master this skill at primary school level.

Teachers play a major role in making sure the learning process is effective to accomplish the learning objectives (Arikunto, 2012). Teachers should be creative and innovative to help students understand the mathematics concept and master the skill needed (Ngatiman, Udin, Yusop, Ibrahim, & Halim, 2017). One of the elements for effective learning process is the usage of suitable learning aids. The available learning aids used in converting units of length, although can demonstrate the process of unit conversion, cannot explain the concept well. Students tend to memorize the procedures which then leads to errors in their conversion. Therefore, an innovative learning aid needs to be designed and developed to help students understand the concept and master the skill of converting units of length.

Objectives

The objectives of this project or innovation are:

To design and develop a learning aid for converting units of length.
To help students master the skill of converting units of length.

NALI Approach

Different from the other products that are being used as learning aids in converting units of length such as multi-units’ ruler, mathematics notes chart or computer software in internet, Coolverter offers the experience of self-exploration in finding the answer and build the concept of converting units of length. Coolverter is designed with seven sets of digits so student can try from number 1 to 9999999. There are four basic units of length that are ready to be converted in any way between kilometre, metre, centimetre and millimetre as suggested in KSSR. Furthermore, students can learn beyond the curriculum as they can convert kilometre all
the way to millimetre. Coolverter is designed with a specific mechanism to make it simple and user-friendly for students. Students can remember and master the skill of converting units of length using Coolverter as they participate themselves actively in self-exploration with the use of enactive approach as suggested by Bruner’s Cognitive Theory (Choong, 2008).

Methodology

ADDIE model is a systematic approach to instructional development (Molenda, 2003) and was used to develop Coolverter. The process in ADDIE model is divided into three separate phases in this project as follows: Phase I – Analysis of need for learning aid, Design of learning aid; Phase II – Development of learning aid; Phase III – Implementation of learning aid, Evaluation of learning aid. In Phase I, One-Shot Survey Design was used to conduct a diagnostic test to identify the error codes in converting units of length by students. While, another One-Shot Survey Design was used to conduct a questionnaire to identify the error codes in converting units of length from the teachers’ perspective. Phase II, an innovative learning aid named Coolverter was specifically designed and developed to avoid the error codes identified in Phase I. In Phase III, a Quasi-Experimental Design was used to conduct a pre and post test to identify the significant effectiveness of using Coolverter in converting units of length.

Finding and discussion

Results from the diagnostic test in Phase I shows several error codes in converting units of length as follows:

- Students do not change the unit after conversion.
- Students do not place decimal after conversion.
- Students do not change or misplace the position of decimal after conversion.
- Students do not place meaningful zero after conversion.
- Students do not remove unmeaningful zero after conversion.

Based on the results from the diagnostic test, it is clear that students do not understand the concept of converting units of length. The error codes indicate that students do not master the processes needed in converting units of length. They need to master operation to convert, direction of decimal movement, count of decimal movement and placing or removing zero if necessary. Coolverter is specifically designed and developed to avoid the error codes identified and to show clearly the process required in converting units of length.

Result from pre and post test in Phase III shows improvement. The students’ mean scores in the pre-test was 27.5 and in the post-test, their mean scores were 87.3. A paired sample t-test (table 1) was conducted where the results obtained were $t = -31.325$, $p = 0.00$ ($p < 0.05$) which is a significant difference between the mean scores in the pre and post test. Coolverter can help students to master the skill in converting units of length. Students were only exposed and used Coolverter during the intervention session between pre and post test. Student did not use Coolverter during the post test. This means that students have mastered the skill of converting units of length after the intervention session. After the intervention session, students did not have to depend on Coolverter to find the answer anymore. They can find the answer independently and are highly confident in their own understanding of the concept of converting units of length.

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 pretest - posttest</td>
<td>-59.83333</td>
<td>10.46203</td>
<td>1.91010</td>
<td>-63.73992 to -55.92675</td>
<td>-31.325</td>
<td>29</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Commercialization potential

Coolverter has a high potential to be commercialized in domestic and international market. So far, the prototype of Coolverter is built using fully recycled materials which makes it green, environmentally friendly, and very low cost. Coolverter also is a multi-functional tool; as a learning aid converter and can be used as a container or pencil case. Coolverter features makes it stands out, unique and different from other products that are being used as learning aids in converting units of length.

Awards received


4. Anugerah Inovasi Timbalan Pengarah Pelajaran Johor (2016) – Coolverter (Ketiga Anugerah Inovasi)

References


An online authentic learning environment to support knowledge construction among non-statistics major undergraduates

Ung Hua Lau
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, 94300 Kota Samarahan, Sarawak, Malaysia
uhlau@sarawak.uitm.edu.my

Zaidatun Tasir
Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia.
p-zaida@utm.my

Highlights
Implementing authentic learning in online platform can be extremely resource intensive and costly to develop. This project looked into an innovative and cost-effective approach to incorporate the critical characteristics of Authentic Learning Model by Herrington and Oliver (2000), underpinned by Vygotsky’s (1978) Social Development Theory and Lave and Wenger’s (1991) Situated Learning Theory to develop an online authentic learning environment that foster students’ knowledge construction in learning inferential statistics among non-statistics major undergraduates. This environment is established in a social learning network, Edmodo by incorporating Web 2.0 technologies.

Key words: Online Authentic Learning; Online Learning Environment; Knowledge Construction; Inferential Statistics; Social Learning

Introduction
Innovation in online learning is considered important to ensure students engagement in maximizing their learning. In the 21st century learning, the outcomes focused on equipping the students with life-skills. Online course research has by far focused on the creation, technique, and implementation of course material. However, particularly in online learning, students need to feel motivated to participate in discussion to ensure their successful completion in the online course, with mastery of the knowledge for practical use.

One of the course that has gained attention in using online platform for delivery is the statistics course for non-statistics major undergraduate because it is usually the compulsory subject that serve huge number of students and online learning is viewed as cost saving mean of course delivery. Online learning mode is also preferred for this subject because of technical reasons, such as its ability in assisting visualisation and animation of the concepts in statistics.

The current statistics course delivery has failed to provide contextual learning for students in learning inferential statistics meaningfully (Cobb, 2015). Upon completion of the statistics course, students are unable to apply the knowledge learnt in their research project or in real life dealings, even for students scoring high grade in the course (Fawcett, 2017). As we advanced into the age of information, we need to train people to be statistically literate at workplace and also in their daily life. The students need to be taught to think about social situations in which data are used and to give students an understanding of and hands on experience with the role of statistics in scientific discovery, as supported by Vygotsky’s (1978) Social Development Theory and Lave and Wenger’s (1991) Situated Learning Theory.

Authentic learning can be viewed as a by-product of situated learning (Lasry, 2006). It is an instructional approach which view learning process as a function of the activity, context, and culture in which it occurs. This means that students learn content through activities rather than acquiring information organised by instructors. These activities consist of real-life task that provides opportunity for complex collaborative effort.

In the framework of authentic learning by Herrington and Oliver (2000), usable knowledge is best gained in the learning settings that feature the following characteristics; provide authentic contexts (A1) that reflect the way the knowledge will be used in real life, provide authentic tasks (A2), provide access to expert performances and the modelling of processes (A3), provide multiple roles and perspectives (A4), support collaborative construction of knowledge (A5), promote reflection (A6) to enable abstractions to be formed, promote articulation (A7) to enable tacit knowledge to be made explicit, provide coaching and scaffolding (A8) by the teacher at critical times, and provide for authentic assessment (A9) of learning within task.

It has been recognized that the students of the 21st century think and learn differently than those from previous generations (Ertmer & Newby, 2013). This trend suggests the need to revisit and potentially update conventional teaching practices. Implementing contextual learning in online setting is considered a favourable instructional approach in assisting students learning inferential statistics. Hence, this project looked into the development of an online authentic learning environment (OALE) for learning inferential statistics, aimed at supporting knowledge construction among learners.
Features of OALE

The online authentic learning environment was designed and developed by attending to the nine critical characteristics of an authentic learning as in Authentic Learning Model by Herrington and Oliver (2000). To establish these characteristics in the online authentic learning environment, the following five main components of the learning environment which support authentic learning, were established:

Task

Task is presented to the students as a project work titled Online Business Rangers. The project required the learners to take the role as an online businessman to apply inferential statistics to make business decision. The students were assigned as an online business manager to conduct a study on the company’s inability to attract returning customers despite increase in company’s business. In this aspect, the students needed to use inferential analysis in the data analysis to make sound conclusion to be reported to the top management.

Forum & Group

The forum in OALE is the platform where the learners perform discussion in getting their project task done. Every member can initiate a discussion thread by posting their opinion on the class wall or group wall in Edmodo. Every other member can then reply to this post. The postings can be complemented with file attachment and also url link attachment can be supplemented with text explanations. This kind of interaction allows knowledge construction among the learners while investigate their task from various aspect pointed out by every member. The postings can be liked and shared by member in the group as part of the for social learning.

Resources

In OALE, the resources component consist of the digital learning materials such as YouTube videos, web content, audio files and also softwares that allow the students to experience authentic learning. The sharing of the dynamic learning materials were done via web links directing to the website where the materials are located. Sharing of static learning materials such as notes, slides and ebooks are stored in the Library function in Edmodo for instructors or the Backpack function in Edmodo for students. Sharing of materials from the Library or Backpack is possible when the instructor or the students shared their material to a particular group.

Assessment

Assessment in OALE provide avenue for evaluation on students’ learning. Formative assessments are conducted in the form of quizzes and assignments and summative assessments are conducted via the authentic task which is integrated with student’s performance evaluation. In Edmodo, the formative assessments were conducted using the Assignment and Quiz function.

Support

Support is also an important component in OALE to offer learners assistance to develop learning skills and moving towards independent learners. OALE offers two types of supports: learning support and technical support. In Edmodo, students can make use of the forum to get learning support from peers or direct message their instructor. Those encountering technical problem can use the same means to get support or they can make use of a dedicated technical support offered by Edmodo Support Center.

Each of the component of OALE cater for certain authentic learning characteristics as summarised in the following table:

<table>
<thead>
<tr>
<th>COMPONENTS OF OALE</th>
<th>AUTHENTIC LEARNING CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Authentic Context</td>
</tr>
<tr>
<td>Task</td>
<td>X</td>
</tr>
<tr>
<td>Forum &amp; Group</td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td></td>
</tr>
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<td>Assessment</td>
<td>X</td>
</tr>
<tr>
<td>Support</td>
<td>X</td>
</tr>
</tbody>
</table>

Objectives

The objectives of this project are:

i) To develop an online authentic learning environment for learning inferential statistics in Edmodo.

ii) To compare the mean scores of students using OALE and students not using OALE.

iii) To investigate students’ perception on OALE.
Methodology
A quasi experimental design is employed on two classes of first year non-statistics major students from a public university in East Malaysia. One class served as treatment group to work in online environment whereas the other class functioned as control group to undergo the conventional approach.

Students from both classes were given project which require them to conduct a study in groups. The task included data collection as well as analysing the data using descriptive and inferential analysis. Each group are required to produce a group project report at the end of a 10-week period. All the students from the treatment group were given a perception questionnaire on how the authentic learning features in OALE assisted their learning.

A one-way ANCOVA is employed on the project scores, controlling for the student’s prior knowledge, to compare mean scores of students using OALE and students not using OALE.

Findings and Discussion
Table 2 shows the mean scores for students from experimental and control group. The ANCOVA conducted revealed a significant difference in mean scores of students using OALE and students not using OALE (F(1, 74)=10.924, p=0.001). This implies that OALE is effective in increasing students’ performance.

Table 2: Students mean scores

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>41</td>
<td>61.8976</td>
<td>8.76556</td>
</tr>
<tr>
<td>Control</td>
<td>36</td>
<td>53.8853</td>
<td>4.58533</td>
</tr>
</tbody>
</table>

Figure 1 shows the average score given by students for each of the characteristics of authentic learning embedded in OALE. The students mostly agree, for all the characteristics, that it assisted their learning. This indicated that while OALE is incorporating all characteristics of authentic learning via various features, all these features have positively impacted students’ learning.

Figure 1: Scores of students’ perception on authentic learning characteristics in OALE

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The authors would like to thank the Universiti Teknologi Malaysia (UTM) and Ministry of Education (MoE) Malaysia for their support in making this project possible. This work was supported by the Research University Grant (Q.J13000.2510.17H93) initiated by UTM and MoE.

References


Improving Students’ Learning Outcomes Through E-Service Learning Based on Authentic Learning Strategy


Universiti Teknologi Malaysia
vbukas2@live.utm.my

Highlights
Student Learning Outcomes are statements that determine what the students know, can do or can demonstrate when they have completed or participated in a course. In order to achieve optimum student learning outcomes in a course at Higher Education Institutions, assessments should be conducted in a meaningful and authentic learning environment, such as service learning. However, for courses involving students from various faculties and across-discipline, they need a technology as a medium for better cooperations in the process of teaching and learning. Therefore, the purpose of this study was to examine the effects of online platform use in the service-learning programme, based on an authentic learning strategy towards Student Learning Outcomes (SLOs). A quantitative research design was used to conduct this research, involving 30 undergraduate students from different faculties who enrolled in one of the co-curriculum courses. The data analysis involved a pre-post-test in learning activities score. An analysis of Student Learning Outcomes (CLO1, CLO2, and CLO3) through a series of service learning activities in an online platform, based on authentic learning, showed an increment in the students’ scores. Thus, this study concluded that integrating e-Service Learning in an authentic environment provides a further enhancement of Student Learning Outcomes.

Key words: e-service learning; authentic e-learning; student learning outcomes;

Introduction
Student Learning Outcomes (SLOs) are defined by Boyd (2010) as statements that describe the assessable and measurable knowledge, skills, abilities or attitudes which students should attain by the end of a learning process. Prentice and Robinson (2010) mentioned that, the drawback of assessing student learning in specific courses or disciplines is that, the focused assessments given by teachers are not easily translated into a deeper understanding or a greater degree of learning across institutions. Therefore, they suggested conducting service learning, well in tandem with one of the key initiatives included in the Malaysian Education Blueprint, introduced by the Ministry of Education Blueprint, back in the year 2013, to enhance student learning experience. The Blueprint indicated that, student learning experience can be enhanced with the increased use of experiential and service learning to develop 21st century skills, as well as leveraging technology-enabled models to empower personalized learning (Ministry of Education, 2016).

Service learning is a programme that seeks to encourage student learning through experience related with services in the community (NYLC, 2005). Service learning provided students with the opportunity to help others and to reflect the way they have benefited from doing so (Bringle and Hatcher 1996). It promotes engagement with the community, classmates and the instructor as well as the course content by putting theory to practice through their experiences. A prior research by Waldner et al. (2012) presented that, there are four types of service learning. In the first type, Hybrid Type I, the service is fully conducted on site with teaching fully online, while in the second type, Hybrid Type II, the service is provided fully online while the teaching is also fully online. The third type, Hybrid Type III, is a blended format of instruction and service, done partially online and also on site, while the fourth type, the extreme e-Service Learning, has its instruction and service done fully online.

Unfortunately, there is a lack of in-depth studies investigating this type of service learning. As such, there is a need to help in promoting e-Service Learning pedagogy by doing more related researches to better understand its outcomes. This will enable the possibility to break the technology barrier, so that, there will be a more effective and smooth transition to an online service learning platform. As for this study, e-Service Learning was defined by the researcher as Hybrid Type III, due to the nature of the course learning outcomes intended to be investigated. Waldner et al. (2012) suggested a further research to promote an e-Service Learning pedagogy in terms of gaining a more in-depth understanding about it, hence, the reason this study was conducted. In addition to this, many researches have been carried out solely on the effectiveness of authentic learning principles in service learning, without relating these two components in online platforms.

The online service platform in this study was based on Massive Open Online Courses (MOOCs). Explosive researches have emerged for the past few years among enthusiastic advocates of MOOCs. The interactive technology promised to deliver teachings from high standard institutions, such as, Harvard, Stanford and MIT. David Pritchard, one of the MIT physicists and other researchers published a study of Mechanics ReView, an online course, taught based on an on-campus course of the same name. They found out that, MOOC was generally effective at communicating tough material, such as, Newtonian mechanics, even to students who were not from the MIT background.
In addition, students who started the online course knowing the least about Physics, showed some significant improvement during tests, as much as excellent students’. With this in mind, the same results were sought by the researcher while conducting the service learning through online platforms.

Not much is known about the most effective types of approaches to service learning. Service Learning is a student-directed teaching and learning strategy that empowers students to make a difference in addressing real-world problems related to academic contents. By definition, an authentic learning is a real-life learning. As the elements of an authentic learning strategy are quite similar with the service learning process, they both complement each other very well. To engage learners with both the course material as well as participating in service learning, a model that is ideally suited to improve students’ learning outcomes, Authentic Learning strategy, was implemented in this study.

Authentic learning, as a pedagogical approach, enhances a meaningful learning, as this approach is based on the situated learning theory which highlights the importance of learning in context. It facilitates the learners to use their existing knowledge, understand it in the context of the training, apply their knowledge, analyze and evaluate situations, and create new outcomes. Authentic learning is most effective when actually carried out in real-life locations and practices. However, it is now proven that it can also benefit learners through a carefully designed Web-based environment. Apart from increasing students’ academic retention, service learning with an authentic learning strategy has also been proven to enhance all round real-life skills, as found in a previous study by Liu (2015). The study showed that, authentic learning, such as writing the proposal for a real-life problem, can generate a potential solution, as the service learning portion of the assignment can provide a specific real-life location for problem solving. In addition, the study also indicated that, authentic learning experience can inspire students to move further to serve the community. By doing so, the gap between the authentic learning and service learning can be bridged, thus potentially leading students to acquire all round real-life skills and a sense of providing services to the community.

Content (Project or Innovation)

This project aims to examine the effect of online platform use in the service learning programme, based on authentic learning strategy towards Student Learning Outcome (SLOs).

Researcher has designed and developed proposed learning activities for e-Service Learning program based on Authentic Learning strategy according to Herrington and Oliver (2000). In designing the learning activities, there were nine elements of Authentic Learning that researcher implemented in relevant learning activities. Each of the learning activities were assessed for pre and post test to investigate the effect of online platform.

A quantitative research design was used to conduct this research, involving 30 undergraduate students from different faculties who enrolled in one of the co-curriculum courses. The data analysis involved a pre-post-test in learning activities score. An analysis of Student Learning Outcomes (CLO1, CLO2, and CLO3) through a series of service learning activities in an online platform, based on authentic learning, showed an increment in the students’ scores. Thus, this study concluded that integrating e-Service Learning in an authentic environment provides a further enhancement of Student Learning Outcomes.

Participants of this project able to practice classroom theory into a real-world situation resulted in authentic and meaningful learning. By injecting Authentic Learning strategy in conducting this Service Learning program, it allowed participant to be able to assess the problem in real life situation and come out with a proposed idea to solve the problem which it draws upon learner core strength in addition to use the skills set that they are developing personally. Moreover, learning by doing through this Service Learning using Authentic Learning strategy for approach enable student to be more interactive among peers and increased their understanding in subject matter. With the support of online learning platform in delivering the content, students able to experience globalized online learning.

Achievement

Gold Medal for Design and Development of Learning Activities for e-Service Learning Program based on Authentic Learning Strategy in e-Learning Carnival and Conference 2018 (eLCC 2018)

Acknowledgement

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References


Outcomes.


Conceptual diagram: An innovative approach in teaching nursing concept

Rambe C. Ramel, Jr., MAN, RN
Assistant Professor
Mindanao State University-Iligan Institute of Technology
College of Nursing
Andres Bonifacio Avenue, 9200 Iligan City, Philippines
Tel No.: (063) 63 2210744 / (063) 63 2214050 Local 4266
rambe.ramel@g.msuiit.edu.ph

Highlights

This study paved way to a new teaching approach in teaching nursing concept where a conceptual diagram is used integrated with the aid of technology, e.g., computer, audio-visual aid. Moreover, this strategy promotes active participation and engagement among the students during class sessions.

Key words: conceptual diagram; participants; skills; learning

Introduction (Project or Innovation)

The Commission on Higher Education (CHED) memorandum no. 15 in the Philippines has recently released its new policies, standards and guidelines, implementing the shift from competency-based standards to outcomes-based education (OBE). The BS-Nursing curriculum therefore has its new and updated program outcomes to ensure that graduates are competent and globally competitive. This study is intended to highlight an innovative teaching approach believed to enhance the retention and critical thinking skills of nursing students compared to traditional teaching method.

Content (Project or Innovation)

The study made use of a Quantitative Quasi – Experimental, specifically the Comparison Pretest/Posttest design or nonequivalent control group before-after design (Polit and Beck, 2008). It was conducted at Mindanao State University College of Health Sciences, Marawi City during the School Year 2012-2013. There were a total of 30 students who participated in the conduct of the study. The said participants were equated according to their pretest scores and gender and were evenly distributed to experimental group and control group. 15 participants belong to the experimental group and 15 participants belong to the control group. The experimental group was exposed using the conceptual diagram. The following are the steps on how the strategy was done: First, the students were provided with general information about the concept that includes common terminologies, assessment parameters, and laboratory procedures. Second, the respondents were assigned to study in advance the anatomy and physiology and the specific diseases or disorder to be discussed the following meeting. Third was the discussion on the anatomy and physiology with integration of signs and symptoms, nursing diagnoses, and nursing intervention which was done through the use of diagram, picture, and audio-visual presentation. Fourth, the disease or disorder was discussed using a map where nursing diagnoses and intervention were also integrated; and fifth was the discussion about medical managements and prognosis. The entire discussion of the concept was made through active interaction between the instructor and the students. Also, the previous topic was reviewed prior to the discussion of the next topic

On the other hand, the control group attended the regular class using traditional teaching method. Thus, this group was not exposed to the use of conceptual diagram and had served as the basis for the assessment of the study.

A structured diagnostic test composed of 60 items multiple choice questions which had undergone pilot testing and item analysis was used in data gathering. The questionnaire was composed of 60 items multiple choice questions with four choices: a, b, c, d. Items 1 to 30 measured the retention skills of the participants. Items 31 to 60 measured the critical thinking skills of the participants. The study was then analysed using mean, standard deviation, and t-test statistical tools.

Findings

Based on the data gathered, the following major findings arrived at:

1. The pretest score profile of the participants in the control group on skills of retention and critical thinking is below average.
2. The posttest score profile of the participants in the control group on the skills of retention and critical thinking is below average.
3. The pretest score profile of the participants in the experimental group on the skills of retention and critical thinking is below average.
4. The posttest score profile of the participants in the experimental group on retention is above average.

5. The posttest score of the participants in the experimental group on critical thinking is average.

6. There are significant mean gains from the pretest score to the posttest score on the sub-skills of learning on retention and critical thinking among the participants in the control group.

7. There are greater significant mean gains from the pretest score to the posttest score on the sub-skills of learning on retention and critical thinking among the participants in the experimental group.

8. There are significant differences in the mean gains in the sub-skills of learning on retention and critical thinking between the experimental group and control group.

9. Conceptual diagram is effective in improving the retention and critical thinking skills of the participants in the learning of a nursing concept.

References


Implementation of Holistic Social Learning Environment

Junaidah Yusup
Universiti Teknologi Malaysia
junaidah.yusup89@gmail.com

Mohd Nihra Haruzuan Mohamad Said
Universiti Teknologi Malaysia
nihra@utm.my

Norasyikin Mohd Zaid
Universiti Teknologi Malaysia
norasyikin@utm.my

Noor Azean Atan
Universiti Teknologi Malaysia
azean@utm.my

Mohamad Bilal Ali
Universiti Teknologi Malaysia
mba@utm.my

Highlights

Ministry of Higher Education (MOHE) lists out ten shifts in the Malaysia education blueprint and the first shift is to develop holistic, entrepreneurial and balanced graduates. In MBE, the Ministry sets out to produce well-rounded graduates with both akhlaq (character) and ilmu (knowledge) as preparation for them to enter the industries. To be able to survive in the industries with complex environment, students need to have critical thinking skills and social skills. Therefore, this study intends to design, implement and evaluate an online social based learning environment that provides the elements of social and cognitive. Learning module with seven learning activities have been designed to cater both social and cognitive aspects in the online learning environment with each learning activity helps students to develop their social and critical thinking skills. Using this learning activities, students become the creator of their own knowledge and break the conventional learning environment by constructing their own knowledge through social interaction within the learning community. The learning activities can be commercialized into a learning module to be used by lecturers, educators, and instructors in higher education as a guideline to create their learning plans.

Key words: social learning; holistic learning; higher education

Introduction

Industrial revolution is a complex environment that will be faced by graduates from higher educations. Conventional teaching and learning are no longer able to provide students with skills to help them survive in the industry. Upon this, Ministry of Higher Education (MOHE) through Malaysia Education Blueprint (MEB) have lists out ten shifts to transforms education system and the first shift is to produce holistic, entrepreneurial and balanced graduates. MOHE sets out to produce graduates who possessed both akhlaq (character) and ilmu (knowledge) in which graduates should be an effective communicator, emotionally intelligent, socially responsible and at the same time graduates should be able to think critically and has problem solving initiative as well as able to apply knowledge learnt in real-world situations.

Content

To achieve the goal of this study, three main objectives were outline:

- To design and implement an online learning environment based on holistic approach to enhance critical thinking.
- To evaluate to effects of students’ holistic learning in online social learning environment based on holistic approach on students’ performance.
- To develop framework of holistic learning approach through social based learning environment.

This study conducted in blended learning setting and focus on student-centered learning by giving students authority to construct their own knowledge mainly through discussion and social interaction within their learning community. This study applies the Problem-Based Learning in an open social learning platform that is Course Networking (CN)(www.thecn.com). The critical tasks in the learning activities presented to students were based on real-world problem and students were required to solve the problem in groups. All the activities and discussions were conducted in the CN. Each learning activities was designed to cater both social and cognitive aspects. This study follows consist of three main elements that is Teaching Presence, Social Presence, and Cognitive Presence. The Five Stage Model of
online learning (Salmon, 2011) as the Teaching presence to conduct learning and teaching in a proper sequence and this study integrate the Holistic Approach to Learning and Teaching Interaction (HALTI) by Patel (2003) as the Social Presence. While the cognitive aspects of this study are using the Practical Inquiry Model by Garrison, Anderson & Archer (2011) as the Cognitive presence.

Figure 1: Integration of Social Presence and Cognitive Presence into Teaching Presence.

The first two steps were focused on getting students familiarized themselves in a new learning environment as well as building their social relationship with their peers. In these stages, the learning activity conducted focused on helping students with any technical difficulties and help them trigger the social interaction among their learning community members. The third steps involved information exchange between members of community. The activity presented in this stage focused on promoting students to exchange information inside the learning community. This stage exercise lower order thinking skills and it is a start before they practice higher order thinking skills. Finally, the last two stages of learning in online environment is involved solving real-world problem through group discussion. In these stage, student was presented a real-life situation that need to be solved by exercising critical thinking skills such as analyze, classify, compare, defend, and sketch to find the solution. These stages focused on developing critical thinking skills as well as polishing their social skills by interacting with their learning community members. At the end of the learning activity, students were asked to reflect upon what they have learnt and how does the knowledge earned within the course will help improve their life as students and how the knowledge will add value to themselves and the society.

This study was conducted in higher education setting and executed in the period of 7 weeks. This study implement pre-experimental research design for data collection in which pre-test were given to students prior to first task and post-test were given at the end of the treatment which is after the seventh task completed by students. Student performance shown post-test recorded higher marks than the pre-test. This implies a positive effect of implementation of holistic social learning environment in higher education setting.

This study has come out with a learning module consists of seven learning activities and guideline on conducting learning and teaching in holistic social learning environment in online setting. To be able to commercialize this innovation, the module has acquired copyright of intellectual property issued by Universiti Teknologi Malaysia (UTM) and International Standard Book Number (ISBN) from National Library of Malaysia. The details of the status as shown below:

Copyright: IP/CR/2018/0111
ISBN: 978-967-2171-26-3

This study also acquired several rewards as shown below:

- Silver Medal for Technology-enhanced Knowledge Community Model for Promoting Critical Thinking in I-PHEX 2014.
- Research University Grant titled Student’s Holistic Learning Process Through Social Networking Site in Higher Education.

This study has been published in Scopus:


Acknowledgement

The authors would like to thank the Universiti Teknologi Malaysia (UTM) and Ministry of Higher Education (MOHE) Malaysia for their support in making this project possible. This work was supported by the Research University Grant initiated by MOHE.

References


Enhancing Students’ Involvement and Success in E-learning Through Learning Analytics Intervention

Kew Si Na
School of Education, Faculty of Social Science and Humanities, Universiti Teknologi Malaysia
kewsiina@yahoo.com

Zaidatun Tasir
School of Education, Faculty of Social Science and Humanities, Universiti Teknologi Malaysia
p-zaida@utm.my

Highlights
As the Internet technology has been vastly used in university, this has transformed the face-to-face courses into online courses or blended courses, in particular the way to deliver learning materials to students through internet is more visible. In this regard, a massive volume of data generated by students in online learning can be tracked easily and used to enhance teaching and learning practices. Hence, with the use of these data, this project has designed a Learning Analytics Intervention integrated with learning style model and motivational model to enhance students’ involvement and success in e-learning.

Key words: Learning Analytics Intervention; E-learning; Learning Materials; Learning Success; Learning Involvement

Introduction
Concurrent with the rapidly growing online technology nowadays, the emergence of Learning Analytics (LA) aims to enhance the quality of teaching in e-learning and it is described as “the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs” (Fournier et al, 2011, p. 3). One of the LA goals is to provide assistance for educators or instructors to understand and optimize learning via an environment tailored to each student’s level of demand and ability in close-to-real-time (Aguiar et al., 2014). Hence, the role of LA is significant in teaching and learning.

However, the recent studies found the aspect of intervention in Learning Analytics is still inadequately examined and established (Wu et al., 2015) and thus, this project has filled in the gap to develop a new Learning Analytics Intervention to improve the quality of learning and teaching practices in e-learning. This project is new designedly because there is none of the design of LA Intervention integrated with learning style model and motivational model in e-learning with the intention to enhance students’ involvement and success (Kew and Tasir, 2017). Many researches have proved learning style as an important factor that enhance student’s performance (Gülbahar & Alper, 2011; Pham & Adina, 2012, Scott et al, 2014; Helmy et al, 2016). Moreover, motivation is also a vital factor to support learning process in e-learning (Lin, Wu, & Wang, 2010; Keller & Deimann 2012; Hartnett, 2016). Therefore, these two elements are taken into account when designing the LA Intervention in this project.

This project is also an improved innovation as its basic theory used is based on Learning Analytics Cycle proposed by Clow (2012). To make the intervention more effective and innovated, Felder-Silverman model (Felder and Silverman, 1988) and Keller’s ARCS model (Keller, 1987a) are integrated to this Learning Analytics Cycle. This project is applicable and relevant to New Academic Learning Innovation Model as its aims are to design meaningful and interactive learning materials in e-learning environment for students to meet the needs of students with the different learning style and to motivate students to be more active in their learning process. This new LA Intervention embedded in e-learning digital resource is then believed to help students to enhance their involvement, engagement and success in e-learning.

Research Objectives
The objectives of the research are formed, which are
a. To develop Learning Analytics Intervention in e-learning
b. To analyse the effects of Learning Analytics Intervention in e-learning
c. Learning Analytics Intervention in e-learning

NALI Approach
This project is aligned to the purpose of NALI to create meaningful and interactive learning materials in e-learning. The digital resources created in this project are original and applicable as till date there are no studies focused on LA Intervention integrated with learning style model and motivational model (Kew and Tasir, 2017). The intervention designed in this project is more on students-centered since the learning objects in this intervention were designed according to students’ learning styles in e-learning. It is then believed that the LA Intervention in this project is able to encourage better and meaningful learning.
experiences of students, and which in turn is able to enhance students’ involvement and success and improve the quality of teaching in e-learning.

Research Methodology

Firstly, fifty students who accessed e-learning activities was selected as respondents through the clustered random sampling method and the data generated by them were collected and analysed to measure their learning style, level of motivation, cognitive engagement and retention as well as academic performance in e-learning. Then, the step to identify at-risk students was carried out according to their low motivation, low cognitive engagement, low cognitive retention level and low academic performance by using data mining technique. The selected at-risk students were then classified based on their learning style, followed by developing LA Intervention based on Felder-Silverman model and Keller’s ARCS model to design and provide intervening learning objects to students in order to enhance their involvement and success in e-learning; for instance, if the at-risk students were belong to reflective learning style, then the e-learning environment was “added more” activities preferred by reflective learning style of student. After LA Intervention was provided, the step to evaluate the effectiveness of LA Intervention was taken out.

Findings and Discussions

With the help of this intervention, the result of this project found that students performed better in academic performance test that they achieved higher mark in the post-test, and their involvements in e-learning such as number of log in, post and views were enhanced greatly. This is because they were “provided more” their preferred learning materials and activities integrated with motivation elements in their learning process in e-learning. Therefore, this proves LA Intervention is useful and applicable to enhance the quality of e-learning. For educators, they had better understanding on their students in e-learning in particular from the result of data analysis, and then provide their students with suitable intervention based on their needs in e-learning that had made the teaching more effective and meaningful.

Conclusion

Students took greater responsibility for their learning by becoming aware of their behavior, for example their number of log in, views and posts. This can help to enhance the quality of online learning. Specifically, interventions and improvement can be made by educators in e-learning and to enable the teaching practices become more effective and meet the students’ demands. Furthermore, this project has shed the light on the part of LA Intervention, which is a not known yet important area in LA as less attention has been paid on intervention design for students (Wise, 2014).

Acknowledgement

The authors would like to thank the Universiti Teknologi Malaysia (UTM) and Ministry of Education (MoE) Malaysia for their support in making this project possible. This work was supported by the Research University Grant (Q.J130000.2510.17H93) initiated by UTM and MoE.

References


**Project-based Learning Approach through Mock-up Workshop for Value Management in Construction**

Zuhaili Mohamad Ramly¹, Zakaria Mohd Yusof², Sarajul Fikri Mohamed³, Mohd Saidin Misnan⁴, Norazam Othman⁵, Tantish Kamaruddin⁶

Building Information Centre (BIC), Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia

¹zuhaili@utm.my, ²b-zyusof@utm.my, ³sarajul@utm.my, ⁴b-saidin@utm.my, ⁵b-norazam@utm.my, ⁶b-tantish@utm.my

**Highlights**

This project aimed at enhancing the students learning experience through students-centered learning and to enhance the level of understanding on value management (VM) through project-based learning (PBL). Three real-life case studies were identified for PBL activities namely, Desa Bakti, Arked Meranti, and Library Foyer. All identified case studies were located within the campus, as to provide opportunities for the students to engage well in the projects. This real-life scenario enable the students to reach the relevant project stakeholders. The whole implementation of the project was based on the VM Job Plan which the objective is to optimize the value.

**Key words:** Problem-based Learning; Mock-up Workshop; Value Management

**Introduction**

Value Management course offered as an elective course in the Faculty of Built Environment and Surveying. Currently, the course was offered to Bachelor of Quantity Surveying and Bachelor of Science (Construction) programs. The course aimed at introducing the concept of value management and its application in the construction industry. It covers the history of VM, the concept and principles of VM, the concept of cost and significant items, the stages in undertaking VM, and the application of the function analysis system technique.

At the end of the course, the students should be able to achieve four intended course learning outcomes (CLOs); i) to explain the concept of VM in the construction industry, ii) to apply the principles and techniques of VM to the practice in the construction industry, iii) to provide new ideas and solutions for a specified problem in relation to the practice in the construction industry, and iv) to demonstrate basic leadership skill.

In order to achieve the intended CLOs, the teaching and learning activities applied both teacher-centered learning and student-centered learning methods. Various T&L activities were deployed to enhance the students’ learning experience by good engagements throughout the T&L and beyond classroom. Various online platforms were used and adopted including “YouTube”, “Padlet”, “Kahoot”, and “PollEverywhere”, apart from conventionally used whiteboard and stick notes. Meanwhile the assessments for this course comprises of both summative and formative assessment, where the summative assessment adopted the project-based learning approach.

**Content**

1. **Project or innovation objectives**

   This project aimed at enhancing the students learning experience through students-centered learning and to enhance the level of understanding on value management (VM) through project-based learning (PBL).

2. **NALI approach implemented in the research**

   VM which originated from the manufacturing industry was first introduced in the construction industry in 1960s by Dell’ Isola. The uniqueness of the VM is the used of structured approach, known as “VM Job Plan”. As to provide a better learning platform for the students, the application of PBL enables the exploration and learning the knowledge by doing. Real-life problems were identified for the students to implement the VM after learning the theory via in-class T&L activities.

   The pre-workshop stage of the mock-up VM workshop required the students to analyse the given site/project. In order to do that, several site visits were conducted and the relevant parties were engaged to answer the biggest question of functions of the project. The workshop was later conducted in a day, due to the limitation of time despite the 40-hours workshop as per VM theory. Having said that, the whole 6-phases were able to be completed during the 8-hours workshop. It was made possible by selection of a particular functions to be achieved in every project.

   During the workshop, the participants were challenged to be creative and innovative to achieve a better value for the project by fulfilling the function of the project. Hundreds of ideas were generated during the creativity phase of the workshop. The whole learning by doing process which follow through the VM Job Plan is very applicable and relevant to the construction industry as it follow the Society of Value Engineers (SAVE) International Standard.
The impact of application of PBL approach in delivering this course were measured and gathered based on feedbacks given by the students. Two medium of feedback were utilized: exit survey and online teaching evaluation (e-PPP). The responses received were convincing and show that the students appreciate the approach and method applied in delivering the course. In the long run, the proposals and recommendations put forwards by the participants. However, it has to be scrutinize further by taking into consideration other constraints faced by the Office of Assets and Development.

3. Research Methodology

The methodology adopted in implementation of the PBL was based on the “VM Job Plan” by the Society of Value Engineers (SAVE) International Standard. The VM Job Plan comprises of the following stages and phases.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Phase</th>
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<tbody>
<tr>
<td>Pre-Workshop</td>
<td>-nil-</td>
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<tr>
<td>Workshop</td>
<td>Information</td>
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<td></td>
<td>Function Analysis</td>
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<td></td>
<td>Creativity</td>
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<td>Evaluation</td>
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<td></td>
<td>Development</td>
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<td></td>
<td>Presentation</td>
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<tr>
<td>Post-Workshop</td>
<td>-nil-</td>
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</tbody>
</table>

PBL briefing was carried out at the beginning of the semester. Students were grouped and assigned a specific role to play: client, end user, architect, quantity surveyor, civil and structural engineer, and, mechanical and electrical engineer. Each groups were given a specific site/project located within the campus. All groups must adhere to the VM Job Plan by going through three stages of VM implementation as per Table 1. Three sites/projects were identified for the projects as presented in Figure 1.

4. Finding and discussion of the project or innovation

Findings from the mock-up VM workshop were interesting. It is good to see hundreds of ideas were generated and evaluated, before being put forward as a recommendation to improve the value of the project. Different proposal were developed by each group for the same site/project. It was found that the participants managed to think out of the box in order to address the requirement of the clients and the functions of the project.

Students’ feedback on the overall conduct of the course and assessments were gathered using the “Exit Survey”. The exit survey was carried out on e-Learning platform. Students were asked to response on questions such as things that should be keep doing in conducting the course, best things that happened to help the learning process in the course, and an encouragement notes. Among others, the response includes:
“good job in changing the way of teaching and make the T&L more interesting”
“the class is so interesting. Mock-up workshop should be keep doing in every semester”
“very interesting and systematic T&L activities”
“the way of teaching is quite creative to generate student’s interest”
“the VM mock-up workshop help me to have a better understanding and it is practically applicable”
“group activities make us know each other more and learn to act as a leader”

5. Other relevant information

The implementation of PBL in this course which promotes blended learning leads to the attainment of the “Blended Learning Awards” by UTMLead and PS rating for the ePPP in all relevant semesters. The proposal and recommendations put forward by the students has also been presented to UTM Library. Subject to the financial and approval by the University, the revitalization of the library foyer can be materialized as proposed, or at least adopting some of the recommendations.

Acknowledgement

The authors would like to thank the support given by the relevant units in enabling the implementation of the project, namely Office of the Assets and Development, Universiti Teknologi Malaysia, the residents of Desa Bakti, library staffs and users, and Arked Meranti’s tenants and users for their valuable insight and cooperation throughout the projects.

References

Edutainment Mobile Application - Kembara Nombor

Mohd Shafie b. Rosli
School of Education, Faculty of Social Science and Humanities
Universiti Teknologi Malaysia
shafierosli@utm.my

Norah bt. Md Noor
School of Education, Faculty of Social Science and Humanities
Universiti Teknologi Malaysia
norah@utm.my

Nur Sakinah bt. Mohd Isa, Rafidah bt. Omar & Alwee Shamrin
School of Education, Faculty of Social Science and Humanities
Universiti Teknologi Malaysia

Noor Azean bt Atan
School of Education, Faculty of Social Science and Humanities
Universiti Teknologi Malaysia
azean@utm.my

Azri Syazwan b Atan
School of Education, Faculty of Social Science and Humanities
Universiti Teknologi Malaysia
azrie92@gmail.com

Highlights

Kembara Nombor is an edutainment mobile app developed for the purpose of offering an interactive learning to the students with edutainment, constructivism and gamification as its fundamental elements. It is an application developed for learning basic concepts in Mathematics. The mobile app was equipped with interactive applications for its user. User interacts with the application via touch gesture using simple touch, drag and drop as well as higher interactivity through the application of accelerometer. All of these elements render the mobile application fun to be explored and learned. The mobile application is ready to be commercialized.

Key words: Mobile Application; Edutainment; Mathematics

Introduction

This mobile application was developed in order to facilitate the learning process of primary school students. It embraces constructivism as its main pedagogical overlay, rendering an interactive and engaging mobile application development. The principle of gamification was emphasized in its design. To further boost gamification, edutainment element was embedded. As mobile application offers a number of different activities than computer based application, this mobile application was equipped with accelerometer arrangement. Learning is fun as well as entertaining via Kembara Nombor.

Content

The application was authored using Adobe Flash CS6 using AIR as its main programming language. Accelerometer, touch interaction as well as touch gesture were also implemented. The mobile application was developed for the purpose Mathematics education on numbering. It was developed using creativity approach by the students. Besides that, the element of Student-to-Students Edutainment was applied during its development. Where, it was developed by students to be used by other students for the purpose of research as well as cognitive training.

The mobile application was developed using ADDIE as its ID model. First, the developer started with analyzing the preference of the target user. Based on the analysis, it was found that two avatars / figures are needed to represent male and female user. The interface was designed to be in context with its user. In the design stage, all the interface was sketched as storyboard. Instructional designer later planning the mobile application interaction architecture. Development was made using Adobe Flash, Adobe Photoshop as well as AIR programming. Implementation and evaluation are still in planning.

Based on verbal input from users in IUCEL 2016. Kembara Nombor is an versatile mobile application. It is capable of capturing and attaining focus from the z-generation. It is interaction not only from its response to users' input but also physically engaging through its accelerometer application.

Kembara Nombor is ready to be commercialized. However, it is still waiting for its copyright to be completed. This mobile application can be easily sold through Google Play and the recommended price is RM 1. Kembara Nombor was awarded Bronze Medal at the International University Carnival on e-Learning (IUCEL) 2016.
Acknowledgement

The authors would like to express their appreciation for the support of the sponsor, Universiti Teknologi Malaysia through Research University Grant (RUG) - Tier 2 with the Project No Q.J130000.2631.14J30

References

Application Development of Augment Reality in Geometry Topic Based on Multimedia Learning Cognitive Theory

Mohd Fadzil Bin Abdul Hanid¹
Universiti Teknologi Malaysia (UTM)
fadzil.btpnjohn@moe.gov.my

Mohd. Nihra Harzuwan bin Mohamad Said²
Universiti Teknologi Malaysia (UTM)
nihra@utm.my

Noraffandy Bin Yahaya³
Universiti Teknologi Malaysia (UTM)
p-afandy@utm.my

Nur Fadhilah Binti Zakari⁴
SMK Mutiara Rini
nurfzakari@yes.my

Highlights
Learning environment rapidly changed in line with the development of industrial revolution 4.0. Augmented Reality is one of the newest technology in educational field. AR technology able a user to interact with both virtual world and real world, in real time. The learning of geometry topics need someone to have good visual skill. Thus, we invented innovation by using AR technology called GeoAR in order to give new dimension of geometry topics learning. The focus of this innovation is the latest AR tracker which is Combination Multiple Tracker. Findings show positives outcomes as the user felt satisfied by using the application.

Key words: Augmented Reality; Technology; Education; Geometry

Introduction (Project or Innovation)
Educational reformation has proceeded faster with the twenty-first century learning to improve learning skills among the students. The acronym STEM (Science, Technology, Engineering and Mathematics) has been adopted by numerous programs as an important focus to improve the learning evaluation methods around the world (Rezende et. al., 2017). Nowadays, the teaching process and mathematics teaching aids is most likely to solve the problems that occur in student daily life. Self-directed learning is a main factor for the students to create more various decisions which is associated with strategy to explore and solve the mathematics problems in all kind of situation. However, the mathematics teaching aids usually does not necessarily will take place with all the theory that has been mentioned. Instead, based on the Trends in International Mathematics and Science Study (TIMMS) report for geometry topic, Malaysia student achieved a moderate ranking with an average score of 497 points, 495 points, 474 points, 432 points and 455 points in TIMMS 1999 until TIMMS 2015. The decline in this assessment internationally especially in the year of 2007, 2011 and 2015 signifies that the average geometry achievement of Malaysian students was lower than the international average. Based on the research by Abdul Halim et al., (2017) shows that the Malaysian students levels for content domain scores still far from satisfactory. The previous research showed that these students do not know on how to solve a problems because of the spatial visualization reasoning (Khor & Ruzlan, 2016 ; Halim & Effandi, 2013). So, this research presents a solution for the problem which is an overview of basic aspects of Augmented Reality (AR) and the main concepts of this technology. Augmented Reality (AR) is a new technology that involves the overlay of computer graphics on the real world to enhance the spatial visualization. In education, this Augmented Reality (AR) can be used to improve the education quality (Rezende et. al., 2017 ; Nor Farhah et., 2015). Augmented Reality (AR) also has been considered a technology between VR and telepresence. While in VR the environment is completely synthetic and in telepresence it is completely real, in Augmented Reality (AR) the user sees the real world augmented with virtual objects (Akccayir, 2017). It is expected that other potential areas of applications will appear with the dissemination of this technology. The Augmented Reality (AR) technology has many possible applications in a wide range of fields, including education. In a mean time, many researches have founded that the possibility of Augmented Reality (AR) in education sectors are related with geometry, planet movement and chemistry molecular structure.

2.0 Objective
i. Developing Augmented Reality Geometry Application (GeoAR) in geometry topics based on multimedia learning cognitive theory.
ii. Identify the usage level of Augmented Reality Geometry Application (GeoAR) based on multimedia learning cognitive theory in the aspect of:
   (a) Satisfactory level
3.0 Content (Project or Innovation)

Creativity/Innovation

• Identifying shapes of polygon in geometry topics.
• Shows that AR visual dynamic changes of polygon in geometry topics.
• Shows calculation of area and perimeter for dynamic changes of polygon in geometry topics.
• Teaching and learning videos for geometry topics.

Impact

• It is easy to use as teaching and learning process by using smart phone is trending nowadays in 21st century learning especially in STEM field.
• This positive AR technology potential increased spatial visual.
• Teaching and learning of geometry topics are easier to be understand.
• Increased students motivation in learning geometry topics by using of AR technology.

Application Design and Content

4.0 Research Methodology

The methodology that employed by researcher in this study was quantitative method using a set of questionnaire. The purposive sampling technique have been choosing by the researcher to select the special classes in the school, while the simple random sampling technique was used to choose the sample in the school. Thirty-one respondents have been selected purposefully for this study. To ensure the result is significant with the main objectives of this study, the researcher will be choosing the Grade 8 students who have been study the Geometry subjects previously. The questionnaire will be delivering via Google Form, which is embedding a link to the questionnaire on the site using Geometry Augmented Reality Application (GeoAR) to the students. Instruments that have been used in this study are Geometry Augmented Reality Application (GeoAR) questionnaire with a satisfying level assessment. The level of satisfying are measuring using nine points Likert Scale [Nur Sakinah, 2016].

5.0 Finding

Table 1: Overall Application Reaction Analysis

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<tr>
<th>Item</th>
<th>Findings</th>
<th>Interpretation (Mean Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall reaction towards application (Impressive)</td>
<td>7.19</td>
<td>Positive respond</td>
</tr>
<tr>
<td>Overall reaction towards application (Easy)</td>
<td>7.42</td>
<td>Positive respond</td>
</tr>
<tr>
<td>Overall reaction towards application (Satisfied)</td>
<td>7.45</td>
<td>Positive respond</td>
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<tr>
<td>Overall reaction towards application (Fun)</td>
<td>7.32</td>
<td>Positive respond</td>
</tr>
<tr>
<td>Overall dimension</td>
<td>7.35</td>
<td>Positive respond</td>
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</tbody>
</table>

Mean for overall application reaction shows that respondent reaction towards the application by the item ‘satisfied’ is 7.45, for the item easy is 7.42 compared to the maximum scales of 9.00, while for the item ‘fun’ is 7.32 and for item ‘impressive’ is 7.19. thus, it results high overall dimension mean that is 7.35.

6.0 Discussion
In conclusion, student perception towards the usage of GeoAR application that developed based on multimedia learning cognitive theory received positive responses. Based on the interpretation of mean (Table 1), high overall mean which is 7.35 shows that overall reaction towards the application are positive and accepted by the users. It proves that the user satisfied by using the application. According to (Alqahtani & Mohammad, 2015), ‘easy’ is the most important factor in order to measure the quality of system or application, that is user friendly. Thus, the research clearly shows that this application able to attract the users from using this application in geometry learning.

7.0 Commercialization Potential & Awards Received

Online Shop: Google Play & Platform E-Commerce (CikguF.com)
Market Size: This app can be used in the syllabus of Mathematics Form 1 (Secondary School)
Gold Medal: Faculty of Education Innovation Day, UTM (2017)

8.0 Acknowledgement

This research is conducted by UTMLead under Research University Grant (Vote: 15H91).

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FINAL YEAR PROJECT AND ITS IMPACT TO STUDENT ENGAGEMENT AND SUCCESS

Asha Hasnimy Mohd Hashim  
School of Education, Faculty of Social Science and Humanities, UTM  
asha@utm.my

Halijah Ibrahim  
School of Education, Faculty of Social Science and Humanities, UTM  
p-halijah@utm.my

Zainal Abidin Zainuddin  
School of Education, Faculty of Social Science and Humanities, UTM  
p-zainal@utm.my

Diyana Zulaika Abdul Ghani  
School of Education, Faculty of Social Science and Humanities, UTM  
diyanazulaika@utm.my

Highlights

There are some established teaching and learning techniques and designs that have been proven to hold great effectiveness in terms of student engagement and successful learning. High Impact Educational Practices (HIEPs) employs intentional program design and advanced pedagogies and the practices have been widely reported to be beneficial for students from various backgrounds. HIEPs appears in many forms, depending on context and institutional priorities, however, some common traits of these practices include their ability to promote deep learning through practical, out-of-classroom engagements, foster meaningful interaction with instructors and fellow students as well as supporting the development of collaborative skills in working with others. In this paper, we implemented the aforementioned themes for final year project (FYP). It was found that the learning process eventually sharpened the student’s knowledge and able to produce outstanding research outputs such as copyrights, research articles, assessment instruments and others. These outputs not only benefit the ownership of student’s learning but able to connect their research to the greater good satisfying communities and society.

Key words: High impacts educational practices; final year project; fundamental movement skills; assessment

Introduction

HIEPs is defined as a set of educational practices that able to enhance student engagement and success in their study (Kuh, 2008). The implementation of HIEPs is not a fixed procedure as it may involve a combination of numbers of learning strategies. This paper will discuss the implementation of HIEPs in Final year Project (FYP). The FYP provide a window on science in the making, allowing students to participate in scientific practices such as research planning, modeling of scientific observations and analysis of data. Ideally supervisor will guide students to interpret authentic images of scientific research and link their experiences to their own beliefs or expectations. Since 2010, we implement a research themes for FYP and it showed some impressive output. A group of 3-4 students will get the same theme but they have to explore the theme from different aspects. For example in 2013, the theme was regarding “young children”. A group of student chooses to study fundamental movement of young children theme and eventually produced a remarkable research outputs such as created instrument to access fundamental motor skills among preschool children, gross and fine motor skill performance analysis between gender, performance analysis between normal and special needs children. These outputs not only benefit in taking ownership of student’s learning but able to connect their research to the greater good satisfying communities and society.

Content

Final Year Project (FYP) is a compulsory course where the final year student has to undergo and completed with a good pass as a one of the requirement for conferment of undergraduate degree. In Faculty of Education, UTM (now known as School of Education, Faculty of Social Science and Humanities – FSSH, UTM) students are allowed to carry out any research topics related to education or their major field. Students have 2 semesters to conduct and complete their research sealed with oral presentation. The students were evaluated based on their management of work, log book, manuscript as well as the presentation.

Based on previous experiences, students struggled to start off a non-theme FYP, thus delaying the time frame given. Ironically it had led difficulties among supervisors in mentoring them toward successful projects. Commencing on 2010, Sports Science panel had come out with FYP theme to assist those students with difficulties in starting their project. Each group of students under one supervisor will get one theme and they need to explore their research from different aspects of that theme. At the same time the theme involved related communities, industries or societies. In this paper we will discuss how our FYP
student under the theme fundamental movement skills among young children able to accomplish a remarkable research outputs not only in generic skills but also in soft skills. the implementation of HIEPs, in line with Finley, (2011) who stated that it able to foster personal and social development, practical / hands-on knowledge (competence) for students. These attributes were measured through feedback, strategic questioning and formative discourse during presentation towards the end of second semester.

These students under fundamental movement skills among young children theme start off their project-based research process as in diagram 1 the HIEPs approaches were blend in those process.

Diagram 1: Process of Final Year Project and Implementation of HIEPs

The implementation of HIEPS in themed FYP suggests that developing the learning communities (at the beginning of process had encouraged integration of learning to involve students with “big fundamental questions” that matter in FYP. Students work closely with one colleagues and their supervisor to develop basic common understanding as in this discussion is “fundamental movement skills among young children”. Students collaborate with each other to work and solve problems related to topic and sharpening one’s own understanding. During collecting data, students gain hands-on experience and practices more applied learning to deal with authorities and young children. Thus opening the opportunities to deeply engage in the scientific procedures in research as well as instilling the generic and soft skills among them. This similar project also allowed students to identify similarities in their backgrounds, clarify the path and view themselves in those learning process. Students not only learn technical and research inquiry skills from each other and their supervisor but they are also socialized into the profession and build important connections with communities involved. Brookhart, (2009) found that when students had more ownership over their research such as data collection and analysis they were more enthusiastic about the research, felt a greater association with the research field, and were more likely to pursue for higher education.

Other than that, this themed FYP that been discussed in this paper had produced 16 IPs, one indexed publication, one non-indexed publication, three articles in book chapters and 13 articles in proceedings. From this themed FYP approach, one of the project secure a bronze Medal in Industrial Arts and Technology Exhibition 2013 (INATEX2013) and silver medal in Malaysia Technology Expo 2014 (MTE).

The themed FYP have an overall positive effect on student learning and development as it provides students with many opportunities to engaged in high impact practices, such as creating the learning communities environment, collaborative learning, increased practical competencies in research, generic and soft skills, developed impressive empirical observation and able to produce impressive academic writing.

Acknowledgement

The authors gratefully acknowledged and awarded fundings from Fundamental Research Grant Scheme (FRGS) titled Pembangunan Instrumen Pentaksiran Asas Pergerakan Baharu Bagi Kanak-Kanak: Instrumen Pentaksiran Kemahiran Asas Pergerakan (CEKAP) [R.J130000.7831.4F365] and Research University Grant Tier 2 (RUG) titled Neural Activity Of Children’s Focus Attention Tasks Following Physical Activity (Q.J130000.2631.14J95). We would also like to show our gratitude to Taman Bimbingan Kanak-Kanak (TABIKA), Jabatan Kemajuan Masyarakat (KEMAS) Kementerian Pembangunan Luar Bandar, Tadika IQ Aulad, Pusat Jagaan Kanak-kanak Cahaya Sayangku, Indigenous Children in Hutan Belum, School of Education, Faculty of Social Science and Humanities, UTM and all individual who involved in these projects.
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**WARM UP YOUR BRAIN (WARPUP): A Mobile Application Education for Attention Deficit Hyperactive Disorder (ADHD) Student Year 2**

Nurul Syafiqah bt Suhaimi  
Universiti Teknologi Malaysia  
nurulsuhaimi270@gmail.com

Siti Nur Azhana binti Hassan  
Universiti Teknologi Malaysia  
nurhana118@yahoo.com

Firdaus Bin Mohamed  
Universiti Teknologi Malaysia  
firdauspetroleum@gmail.com

**Highlights**

Do you feel the need to move constantly during times when you shouldn’t? Do you find yourself constantly interrupting others? If these issues are ongoing and you feel that they are negatively impacting your daily life, it could be a sign of attention-deficit/hyperactivity disorder (ADHD). When you first found that you have Attention deficit/hyperactive disorder or ADHD, it could be a little bit confusing and nerve-wrecking. ADHD can cause many problems in different areas of life’s such as jobs, friends, schoolwork or even relationship. Millions of children and adult around the world are diagnosed with ADHD. Therefore, in this innovation, we will create a mobile application education for the ADHD especially in Year 2 to enhance their performance of school achievement in term of problem solving, calculation, reading and writing.

**Key words:** Attention Deficit Hyperactive Disorder (ADHD); school achievement; mobile application education

**Introduction**

Attention Deficit Disorder (ADD) or Attention Deficit Hyperactive Disorder (ADHD) is a complex syndrome of impairments in developmental unfolding of the unconscious self-management system of the brain that affects significant numbers of children, adolescents, and adults, and often can be treated effectively with appropriate medication (Hinshaw, 1992).

Attention-deficit hyperactivity disorder (ADHD) is a specific developmental disorder seen in both children and adults that is comprised of deficits in behavioral inhibition, sustained attention and resistance to distraction, and the regulation of one’s activity level to the demands of a situation [hyperactivity or restlessness]. This disorder has had numerous different labels over the past century, including hyperactive child syndrome, hyperkinetic reaction of childhood, minimal brain dysfunction, and attention deficit disorder with or without hyperactivity. Most children aren’t checked for ADHD until they’re school age, but kids as young as 4 can be diagnosed, according to guidelines set by the American Academy of Pediatrics (AAP). More than 70% of preschoolers diagnosed with ADHD have at least one other co-morbid diagnosis. Early age at onset is often associated with increased comorbidity. Almost 25% of preschoolers diagnosed with ADHD also have impaired speech or language problems. Elementary school-age children with ADHD typically have significant difficulties with academic achievement and peer relationships.

Thus, in Malaysia Attention Deficit Hyperactivity Disorder (ADHD) is one of the most frequently encountered childhood-onset neuro-behavioral disorders in primary care settings. It has defining features of inattention, over-activity and impulsivity. The core symptoms co-exist with other emotional, behavioral and learning disorders. In a community survey amongst Malaysian children and adolescents between the ages of 5 – 15 years showed a prevalence rate of 3.9 %. It is more common in males compared to females (Toh et.al, 2006). This actually related to their difficulties in learning and applying knowledge, including earning poor grades and low standardized test scores, and academic performance, which includes completing classwork or homework (Leo, 2007). Through this problem, we would to propose a prototype of mobile application for the ADHD students to improve their cognitive along with their emotion. This prototype can know as (WARPUP).

**Objectives**

The objectives of this project are (1) Create an application that is fun, attractive and easy as a learning tools for children with Attention Deficit Hyperactivity Disorder (ADHD) and (2) Eliminate the outside distraction and let children engage in a challenging games that help to train their brain.

**WARPUP Approach**

This prototype is a proposal that applicable for elementary school in year 2 student. In this project, the application will consist of note with melodies, a tree note map and a game hunter. In this prototype,
only four main core subject such as Math, Science, Bahasa Malaysia and English are being applied. Thus, it will divided in term of problem solving, calculation, reading, writing and spelling. This application is emphasize to build the cognitive of the ADHD children in term of their critical thinking, creativity and innovativeness. Besides, this application is easy access and user friendly as it can be download through Google Play Store. Thus, this project will lay on a subtheme under Student to Student Edutainment.

Research Methodology

This project is an experimental design approach, where the prototype of application been tested on two ADHD children based on the observation in tutoring class and interviewing their parents. The purpose of this project is to see the validity of the objectives and the results.

Finding and discussion

Based on the prototype that been tested, it seem that this application will be a new kind of learning platform for ADHD children as this application are very interactive, concise and fun. Thus, it will leaves an impact on ADHD children where they become more focus towards the subject and enhance their problem solving skill and literacy skill.

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MyLinE UTM-UNMC BCEDP MUET Preparatory Transnational Collaboration Project

Fatimah Puteh1, Ummul Khair Ahmad2, Awis Rumaisya Azizan3, Shazwani Abd Rahman4, Rika Diana Busri5, Nurhidayah Mohd Sharif6, Nur Shamsinar Ramli7, Hema Rosheny Mustafa8

Language Academy, Universiti Teknologi Malaysia
m-fatima@utm.my1, m-ummul@utm.my2, awisrumaisya@utm.my3, shazwani@utm.my4, rika@utm.my5, nurhidayah.ms@utm.my6, shamsinar@utm.my7, hemarosheny@utm.my8

Highlights
MyLinE UTM in collaboration with University of Nottingham Malaysia Campus (UNMC) is providing language training and instruction to college professors and administrators from Bangladesh College Education Development Program (BCEDP), funded by the World Bank. The training is conducted through face-to-face (F2F) and extensive online activities. This project involves 1000 trainers divided into ten cohorts. F2F teaching is supported by MUET preparatory modules developed by MyLinE. The online learning mode offers facilitation and guidance for a duration of 12 months. The aim of this project is to make the trainers become linguistically competent and reach a minimum MUET band 5.

Key words: Blended learning, MyLinE, self-determined learning, Distance learning, Malaysian University English Test

Introduction
This project reports on the external English language support program provided by MyLinE UTM in collaboration with University of Nottingham Malaysia Campus (UNMC) for Training of Trainers (ToT) for Bangladesh College Education Development Project (BCDEP) funded by the World Bank. The aim of the project is to provide English language enrichment and support services for 1000 selected college professors and administrators divided into ten cohorts who will eventually become trainers in the BCEDP throughout Bangladesh. MyLinE UTM is tasked to improve and upgrade the participants’ English language proficiency equivalent to Band 5 MUET, as mandated by the UNMC. To meet the target, MyLinE UTM offers a blended learning approach which combines face-to-face (F2F) instructions and online learning activities. The F2F instructions take place for 36-hours spread across 3 weekends within a period of one year. The classroom meetings are supported by MUET preparatory modules developed by the team, in tandem with a microsite called ELSP@Nottingham(UNMC) in MyLinE platform (http://myline.utm.my) specifically created for online learning purposes.

MyLinE has been offering MUET modules online since 2016 but without any teacher support. However, for BCDEP, a special support in the form of a microsite was created and additional features such as monthly forum and quizzes were added in it. The forum and periodic assignments were monitored weekly. Adjustments were also made during F2F meetings to adjust and to suit the participants’ learning needs. As some of the participants have limited computer skills and notable computer apprehension, the instructions were adjusted to include basic computer skills and how to navigate the microsite as well as introducing to the features of MyLinE portal.

Design of project
The traditional practice of doing exercises and tests for MUET has been using pen and paper. With the advancement of technology, MUET preparatory activities can now be made interactive online, accessible to the public. MyLinE UTM MUET preparatory resources can be claimed as the first online platform for MUET candidates throughout Malaysia to practise for MUET. MyLinE UTM-UNMC BCEDP MUET Preparatory can be considered a novel attempt offering MUET preparatory program for specialized learners needs from different country, using the blended learning approach. This project offers additional F2F instructions and forum facilitations.

The theoretical underpinning of this project is based on Technological Pedagogical Content Knowledge (TPACK) framework introduced by Koehler and Mishra (2009). This framework presents the intricate elements of blended learning which reflects the entire design of this project. TPACK features interaction between three primary forms of knowledge - content, pedagogy, and technology as illustrated in Figure 1. This framework is adopted because of the nature of this project; in BCDEP, the trainers only in total six weeks of their study in Malaysia (3 weeks at the beginning of the program and another three at the end) and the remaining program takes place in Bangladesh. Due to this, an extensive online materials and activities are designed to accommodate the trainers’ learning needs when they are away in their home country.
Based on Figure 1, the element of PCK is addressed in classroom meetings where these students receive MUET trainings from MyLinE instructors. They are offered with 36 F2F meeting hours accompanied with tailor-made MUET modules for the needs of BCEDP participants.

The element of TPK is addressed in the project’s microsite, ELSP@Nottingham(UNMC). The MUET preparatory online and enrichment materials are parked on this site. Compulsory online tasks such as language quizzes and selected MUET practice as well as forum are made available for the participants on monthly basis to help them improve their language proficiency. The quizzes are selected based on the language needs of the participants to scaffold their learning process. Focused linguistics items contained in the quizzes direct participants’ focus on certain problematic areas.

Topics of monthly forum discussions are current, familiar, and of general interest. The participants are expected to share their thoughts and ideas in a post with a minimum of 50 words per post, and to respond to posts of others, similar to chats on social media. Their forum participations are monitored weekly by MyLinE instructors who made their online presence felt through prompting ideas, instigating issues, and providing language assistance. The forum has two pedagogical values: first, it helps the students to be familiar with the features of MUET speaking and writing skills, and second, the forum trains the participants to be adept in generating and expanding ideas, important skills that are useful for speaking and writing. The monthly forum is designed with staggered complexity to challenge participants’ linguistics skills within the period of the program. The forum activities are also tailor made to mirror the expectations of speaking and writing skills in MUET. First, the topics in the forum are similar to topics that are found in MUET. Second, through the forum participations, learners get to hone their skills in projecting their thoughts, expanding their ideas, defending their arguments and persuading their audience. Participants are also supported through additional forum where they could reach MyLinE instructors for any general language-related queries.

The element TCK is addressed through supplementary materials provided under MUET microsites in MyLinE. These microsites offer general guidelines as well as sample questions designed specifically for listening, reading, writing, and speaking components as tested in MUET. Besides that, students challenge themselves with MyLinE online quizzes and tests that are parked in World of Challenges site in MyLinE portal. The site hosts quizzes called Test & Rank, Dare2Learn, and Quick & Easy, as well as quizzes on specific items under Grammar, Vocabulary, Listening, Reading, Writing, Speaking, and Workplace Communication segments. In other words, self-motivated participants are free to roam the MyLinE portal where they can choose to practice and learn any language items from more than 200 resources parked in MyLinE that matches their learning needs. They can determine their own learning intensity as all quizzes allow multiple attempts.
Finding and discussion of the project

As MyLinE UTM-UNMC BCEDP is an ongoing project, only three cohorts have since completed the first part of the training. Figure 2 compares the learners’ participations in month online tasks.

![Figure 2: Percentage of Monthly Tasks Participation](image)

As can be seen in the figure, students’ participation were not as active as expected. Only the first cohort has completed all monthly discussion topics and they showed the lowest completion rate comparatively. Until August 2018, Cohort 2 participants have completed four topics while Cohort 3 participants have just completed six topics. While the low participation rates may seem disheartening, sustaining learners’ interests in long-distance online programs have been proven to be challenging (Lim, 2004).

Cohort 1 participants were mostly college professors with extensive administrative experience. Since they were the first group for this project, there were many missed trials and lessons learned. The completion rate for all discussion topics dipped significantly after the participants returned home. Upon returning, perhaps the participants were unable to sustain their interest due to their real job commitment and position. To prevent similar downward trends, for Cohort 2 and 3, their pre-test results were made known to them to realize how far they are from the targeted band 5. And before they return home, we repeated the instructions for maneuvering MyLinE and allowed more hours for hands-on experience. In particular, Cohort 2 possess lower English language proficiency, limited computer literacy and notable computer apprehension. Despite their lower abilities, they showed generally higher participation levels for topics assigned to them. Cohort 3 were also college professors from professional fields who are in general younger in age and more skillful with computers compared to the previous two cohorts. As shown in Figure 2, they were able to sustain interest at a higher rate to participate in all the monthly tasks assigned thus far.

While we admit participants may face challenges to remain engaged online due to many circumstances beyond our control, we remain optimistic that we could help the participants to achieve their targeted band as required by UNMC. Amongst the measures taken are increasing the frequency of sending reminders through Facebook support group and Moodle Messenger. We believe that our constant online presence and our availability for language support would motivate them to continue their efforts to improve their proficiency level.

In conclusion, MyLinE being an online portal has made it easier for learners to participate from anywhere, anytime. Regardless of geographical distance, participants can still be connected with MyLinE instructors through various means. As well documented, successful language learning rests heavily on learners’ personal attitudes and intrinsic motivation. Only with high motivation and persistent self-determination, participants should be able to achieve their target.

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References


Collaborative Online Social Learning Activity (COSLA)

Noor Hidayah Che Lah  
Department of Educational Science, Mathematics, and Creative Multimedia,  
School of Education, Faculty of Social Sciences and Humanities,  
Universiti Teknologi Malaysia, 81310,  
UTM Johor Bahru, Johor, Malaysia  
cikdaaa86@yahoo.com

Zaidatun Tasir  
Department of Educational Science, Mathematics, and Creative Multimedia,  
School of Education, Faculty of Social Sciences and Humanities,  
Universiti Teknologi Malaysia, 81310,  
UTM Johor Bahru, Johor, Malaysia  
p-zaida@utm.my

Highlights

The explosion of Facebook brought new ways in learning for higher education setting. Facebook is one of the technologies that can be used for online teaching and learning. Thus, a study was conducted within Facebook environment which is namely as Collaborative Online Social Learning Activity (COSLA) that involved five learning activities. The COSLA mainly developed based on two learning strategies which are online collaborative learning and online problem solving for learning Authoring Language subject. The COSLA was tested among 23 undergraduate’s students within 14 weeks. The finding showed that the COSLA had a positive and high effect on students’ performance.

Key words: online problem solving; online collaborative learning; Facebook; interactive learning; digital materials

Introduction (Project or Innovation)

Facebook has high potentials and characteristic for teaching and learning for online learning setting among undergraduates’ students. Thus, this study decided to focus Facebook as online learning environment. Several studies were conducted that Facebook could be used for online learning such as Lee, Teng, Hsueh, & Li, (2013); O’Bannon, Beard, & Britt (2013); Wang (2012); Cuesta, Eklund, Rydin, & Witt (2015); Kurtz (2014); Kabilian, Ahmad, & Abidin (2010). Munoz & Towner (2009) claimed that Facebook can help students in their learning such as to discuss group projects and course assignments with their peers. According a study by Arteaga Sanchez, Cortijo, & Javed (2014) found that the communication, collaboration and resource/material sharing among undergraduates students occur during they used Facebook for educational purpose. Aydin (2012) claimed that, Facebook can be used in educational environment. These supported by several studies such as given new broad and exciting learning for both instructors and students (Couros 2008); and support communication and collaboration among students for educational purpose with their faculty (Roblyer et al. 2010).

However, far too little attention has been paid to online learning design in Facebook for Authoring Language subject and its’ impact on the students’ performance. Thus, this study will give an account of the design, development and implementation of online learning through Facebook environment for Authoring Language subject and its’ impact towards students’ performance known as The Collaborative Online Social Learning Activity (COSLA). Therefore, there are two approach of learning strategies which are online collaborative learning from Jeong and Silver (2016) and online problem solving skill from Jonassen (1977) were implemented in COSLA.

Content

1. This study seeks to address the following three research objectives which are: (i) to design the interactive and comprehensive learning activities which is Collaborative Online Social Learning Activity (COSLA) through Facebook; (ii) to investigate the effect of Collaborative Online Social Learning Activity (COSLA) toward student’s performance; and (iii) to examine the strength of Collaborative Online Social Learning Activity (COSLA) towards students’ performance.

2. COSLA provides the interactive learning activity for online learning environment through Facebook. The COSLA can be used as guidance for implement teaching and learning through Facebook for instructor and students. COSLA provides the innovative learning activities with varieties of interesting activities in Facebook. In COSLA the engagements of students with their peers and instructor is really good since the activities and environment influences them a lots. Interestingly the COSLA improved method for teaching and learning in 21st century. The COSLA could increase students’ performance. The impact of COSLA could make students active in their learning activities. Then, COSLA also foster students to be a good problem solver and good team work in order to solve their problems.

3. Data collection for this study involved 23 students who are enrolled in Authoring Language subject. They were Teaching English as Second Language (TESL) students from faculty of education, in one university in Malaysia. They were selected as the purposive sampling which inclusive criteria such
as; (i) had involved in online learning (ii) had enrolled in computer based subject and (iii) had experience in using Facebook group for learning. Data were collected 14 weeks.

4. The finding showed that the COSLA had a positive effect on students’ performance with t-test analysis revealed that a significant difference (p=0.000, t (23) =-18.420, α <0.05). Furthermore, the test of effect size, cohen’s d = 3.768 which proved that COSLA has high effect on students’ performance.

5. The COSLA has high commercialization potential as e-activities in Facebook group for learning Authoring Language subject and Bronze awards was received (Collaborative Online Social Learning Activity, 1st Graduate Research Exhibition Competition (GREx COM 2017), 2017).

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MONSOON SIM BUSINESS SIMULATION: ENHANCING LEARNING THROUGH GAMIFICATION

Dr. Mohamad Shah bin Kassim
En. Shafudin Mohd. Yatim
Azman Hashim International Business School,
Universiti Teknologi Malaysia

Dr. Zulkifli Khair
Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia

Alex Ong
Infusion Technology Sdn. Bhd.

Highlights

MonsoonSIM simulation (MonsoonSIM) is a powerful experiential learning platform for business studies and enterprise resource planning (ERP). It is a powerful education platform covering hundreds of business concepts ready to be discovered by learners through immersive and competitive simulations. Furthermore, it is recognized and recommended by a global software company, SAP SE, a German-based European multinational software corporation that makes and develops enterprise software to manage business operations and customer relations (www.monsoonacademy.com).

MonsoonSIM consists of 12 modules (departments) and requires a team of 5 members to manage those modules by teamwork. The simulation advocates the concept of “learning by experiencing rather than “learning by remembering”. The simulation consists of 45 business concepts embedded in over 12 business departments.

Keywords: Business simulation, gamification, enterprise resource planning (ERP).

Introduction

The MonsoonSIM business simulation has been subscribed by the Faculty of Management, Universiti Teknologi Malaysia since 2016. The primary objective of the subscription was to introduce a new concept in business education through gamification. According to the developer of MonsoonSIM, Monsoon Academy, the gaming concept is able to enhance the students’ (especially generation Y) ability to manage a business, enhancing entrepreneurship skills as well as creative and innovative thinking skills, problem solving skills, teamwork and leadership skills. The MonsoonSIM serves as a platform for students to apply the theories and principles that they learnt in class in a simulated real environment.

Enhancing Learning Through Gamification

The simulation is configurable to enhance the creative & innovative thinking skills and problem solving skills of the players. For example, players are required to use their creativity and innovativeness to sustain the business if the amount of initial funding at the beginning is low. They need to use their creativity and innovativeness in generating more cash from sales or from borrowing loans (through the system) to support their business. In enhancing the problem solving skills, for example a problematic production requirement can be configured and players are required to calculate the correct combination of raw materials (bill of materials) to achieve production objectives (to fulfill market demands). The level of complexity of the game increases as more number of modules are switched on. Moreover, the simulation also requires a high level of teamwork among team members. Each team member is expected to play their assigned role effectively. If one team fail to perform his/her role (department) it would affect the performance of the other departments thus jeopardizing the business performance. This simulation could also become a tool to develop leadership skills. Each team member can be given the opportunity to take the leadership role because the simulation can be repeated in many sessions.

Enhancing Experiential Learning Through Competition

MonsoonSIM Academy has been organizing an annual Enterprise Resource Management Competition (ERMC) which is a business simulation competition at the national and regional level since 2015. UTM students have been participating in the competition since 2016. In 2016 six UTM teams participated at the national level but only two teams managed to be selected to represent Malaysia (together with 4 teams from other universities) in the regional competition in Singapore. Consequently in 2017, three teams participated in the Malaysia national MonsoonSIM competition. These three UTM teams became the champion, 1st runner up and 4th placing respectively. Therefore, the champion and the 1st runner up, two UTM teams (students of Faculty of Mechanical Engineering), were selected to represent Malaysia in the regional level competition which was held in Kasetsart University, Bangkok, Thailand.

In August 2018, two teams from Azman Hashim Business School Johor Bahru (previously known as Faculty of Management, UTM Johor Bahru) participated in the 2018 Malaysia national level competition and both teams were selected to represent Malaysia (together with other 5 teams) in the regional level competition.
competition in Singapore University of Social Sciences (SUSS), Singapore on 21 and 22 September 2018.

Achievement/Awards received
- Malaysian Champions and 1st runner-up (2017).
- Sponsorship by Knowledge.com (RM10,000)

Empirical Study on MonsoonSIM among UTM Students

To validate the effectiveness of MonsoonSIM in enhancing learning of multiple skills, two studies were conducted. The first study was to investigate the acceptance factors [TAM model] that influence users of MonsoonSIM and the second study was to investigate the impact of MonsoonSIM on learning by UTM students.

The aim of the first study was to investigate the factors that influenced the use of MonsoonSIM by UTM students using the Technology Acceptance Model (TAM). A total of 260 students participated in the survey. The study found that perceived enjoyment had a strong effect on behavioural intention to use MonsoonSIM. Other factors such as perceive ease of use and attitude to use were also found to influence the students to use the simulation hence acknowledging its applicability in the teaching and learning activities (Mohd Yatim, S., Goh, C. F and Mohamad, R. Z. 2018). Furthermore, a second study was conducted (ongoing) to investigate the impact MonsoonSIM on learning by UTM students. The findings suggest that MonsoonSIM simulation can enhance skills such as teamwork, creativity, business knowledge, decision making and preparing for future job. The summary of the findings from the second study are presented in the following table.

<table>
<thead>
<tr>
<th># respondents</th>
<th>Strongly disagreed</th>
<th>Disagreed</th>
<th>Neutral</th>
<th>Agreed</th>
<th>Strongly agreed</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think that playing MonsoonSim will help me better prepare for my job.</td>
<td>64 (not employed)</td>
<td>1.6%</td>
<td>3.1%</td>
<td>31.3%</td>
<td>48.4%</td>
</tr>
<tr>
<td>Playing MonsoonSim will help me to make a better choice regarding my job.</td>
<td>64 (not employed)</td>
<td>1.6%</td>
<td>4.7%</td>
<td>28.1%</td>
<td>48.4%</td>
</tr>
<tr>
<td>I like to try to figure out how to do well in the MonsoonSim on my own.</td>
<td>64 (not employed)</td>
<td>1.6%</td>
<td>1.6%</td>
<td>21.9%</td>
<td>43.8%</td>
</tr>
<tr>
<td>The MonsoonSim has expanded my knowledge about how a business enterprise is being run.</td>
<td>46 (employed)</td>
<td>2.2%</td>
<td>19.6%</td>
<td>60.9%</td>
<td>17.4%</td>
</tr>
<tr>
<td>The MonsoonSim enabled me to understand the failure of one dept can impact the other departments.</td>
<td>46 (employed)</td>
<td>2.2%</td>
<td>21.7%</td>
<td>52.2%</td>
<td>23.9%</td>
</tr>
<tr>
<td>The MonsoonSim enabled me to better understand the concept of product costing.</td>
<td>46 (employed)</td>
<td>4.3%</td>
<td>19.6%</td>
<td>54.3%</td>
<td>21.7%</td>
</tr>
<tr>
<td>MonsoonSim has highlighted the importance of teamwork at the workplace.</td>
<td>46 (employed)</td>
<td>2.2%</td>
<td>8.7%</td>
<td>47.8%</td>
<td>41.3%</td>
</tr>
</tbody>
</table>

Conclusion

The MonsoonSIM business simulation system has a high prospect to be commercialized. We recommend that this business simulation to be embedded in business studies curriculum at the tertiary level and also at the primary and secondary schooling because the system is very user friendly and can easily appeal to younger generations. Apart from that, MonsoonSIM is also applicable to the industry in various sectors as it can provide a training platform for companies to enhance their workers to learn and improve their skills on enterprise resource management.

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Prof Dr. Zainab binti Khalifah and Management Executives, Faculty of Management
Mr. Alex Ong and Mr. Abdy Taminshah
Certified MonsoonSIM Trainers

References

www.monsoonacademy.com

Development of Virtual Design and Construction Model for Open Education Resources - M&E Works Measurement

Sarajul Fikri Mohamed, Zakaria Mohd Yusof, Mohd Saidin Misnan, Zuhaili Mohamad Ramly, Mohd Azwarie Mat Dzahir & Syamsul Hendra Mahmud
Building Information Centre (BIC) Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310 Skudai Johor Malaysia
sarajul@utm.my, b-zkusof@utm.my, b-saidin@utm.my, zuhaili@utm.my, mohdadzwarie@utm.my and b-syamsul@utm.my

Highlights

Virtual Design and Construction (VDC) is becoming the norm for designing and delivering building projects in the U.S. and worldwide including in Malaysia. The process of traditional quantity extraction from 2D mechanical and electrical drawings is complex and is prone to human error. Creating and coordinating the design of mechanical and electrical in virtual reality allow design teams to integrate their design electronically in the computer and identify conflicts in all three dimensions.

Key words: virtual; design; construction; open; resources

Introduction

New academia learning innovation refers to the introduction of new teaching and learning initiatives to the current method of learning. The organisational process of introducing learning innovation for adoption by expected users is defined as innovation diffusion with an innovation diffusion constraint being defined as resistance to change drivers occurring during innovation adoption and implementation (Peansupap & Walker, 2006). Resistance may occur at the organisational, group and personal level. Understanding diffusion constraints could help academician manage improves their innovation diffusion processes by focusing on possible open learning implementation opportunities as well as challenges to implementation the open learning teaching methodology.

Open Education Resources (OER) for Mechanical & Electrical Works Measurement is aimed to provide free access to educational tools, resources and content to the widest possible audience with a general objective for the democratization of higher education. In addition, current teaching and learning approach is inherited from common M&E works measurement course that conducted using project-based learning approach. Project-based learning is a comprehensive approach to classroom teaching and learning that is designed to engage students in investigation of authentic problem. However, the level of detail in the 2D drawings used in this module often varies by trade.

Development of Virtual Design and Construction (VDC) Model

Several recent studies related to open learning implementation frameworks have identified key implementation drivers and barriers that are useful in providing a strategic view of its success in the higher learning institutions (Hwang, 2014). Common highlighted challenges in implementing include low competence of digital instruction and technologies, language proficiency and possible loss of education culture (Chen, 2013).

The automation of 3D Mechanical & Electrical Works drawings by using the latest technologies in virtual reality can provide solution to these problems. Creating and coordinating the design of mechanical and electrical in virtual reality allow design teams to integrate their design electronically in the computer and identify conflicts in all three dimensions. Moreover, by modelling in 3D models for M&E components, design coordination and cost analysis will be performed with a more accurate representation of the quantity of the materials as shown in Figure 1.

The developed VDC model is practical for new generation of learners. It is an innovative and systematic approach to be integrated with current Open Education Resources (OER) provides by UTM to enhance students’ understanding of design conflicts and details fabrication of M&E components. In term of commercialization, it can be used by the construction organisation as a practical training tool to optimize knowledge sharing and organizational learning.
The developed VDC model for M&E Works Measurement is practical for new generation of learners. Key practicality characteristics can be summarized as follows:

- An innovative and systematic approach using computer-based 3D design to enhance students' visualization and understanding of M&E components in building.

- Project-based learning approach is designed to engage students to real construction site processes, procedures and design conflict issues.

- The implementation of VDC model for Open Education Resources (OER) for this project-based course can helps students for easy access and collaborating participation by means of the Web in different geographical areas.

The developed VDC model for Open Education Resources Quantification of M&E Works Measurement is highly adaptable for blended learning by full time and part time students at Universiti Teknologi Malaysia (UTM). In term of commercialization, it is useful to be used by the construction organisation (i.e. Public Works Department Malaysia, Construction Industry Development Board Malaysia, UEM and Sime Darby) as a practical training tool to optimise knowledge sharing and organisational learning. The key information for adaptability is as follows:

- Blended learning tools for part time students in different learning centres in Malaysia (i.e. Kuala Lumpur, Kota Kinabalu and Kuantan). The developed 3D Model facilitates project-based learning processes to retrieve construction drawings and as a platform to discuss about assignments and studio works.

- Training tool for young engineers – The developed VDC models and M&E components provide a robust and innovative approach for young engineers to learn measurement of quantities for M&E works based on Standard Method of Measurement (SMM2) published in Malaysia. Based on the statistic, there is 1201 students from 52 countries enrolled to this course in last 2 years. 62% registered students are University students and 38% students are industrial practitioners (e.g. Architect, Engineer, Project Manager and Quantity Surveyor).

- Online profession development module – The developed modules has potential to be offered online for professional development module. In addition, the enrolment for Based on statistics, there was a huge enrolment from Middle East countries (e.g. Egypt, Saudia Arabia, UAE) and African countries (e.g. Nigeria and Zimbabwe).

Acknowledgement

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References


Volley Ball World: Mobile Application to Learn Volleyball

Lee Boon Kiat
Department of Educational Sciences, Mathematics and Creative Multimedia,
School of Education, Faculty of Social Sciences and Humanities,
Universiti Teknologi Malaysia 81310 Johor Malaysia
boonkiatlee2000@yahoo.com

Noor Dayana Abd Halim
Department of Educational Sciences, Mathematics and Creative Multimedia,
School of Education, Faculty of Social Sciences and Humanities,
Universiti Teknologi Malaysia 81310 Johor Malaysia
noordayana@utm.my

Mohamad Bin Bilal Ali
Department of Educational Sciences, Mathematics and Creative Multimedia,
School of Education, Faculty of Social Sciences and Humanities,
Universiti Teknologi Malaysia 81310 Johor Malaysia
mba@utm.my

Halijah Binti Ibrahim
Department of Educational Sciences, Mathematics and Creative Multimedia,
School of Education, Faculty of Social Sciences and Humanities,
Universiti Teknologi Malaysia 81310 Johor Malaysia
p-halija@utm.my

Highlights
The Volleyball World; a mobile learning application for users to learn basic knowledge on volleyball and also the volleyball skills name receive, set, spike, serve and block. Volleyball World integrated multimedia elements such as video and simulation make learning become more attractive and enjoyable. This mobile application is useful for user at beginner and intermediate level. Therefore, this study is to investigate the effectiveness of VolleyBall World towards student basic knowledge and 5 volleyball skills. The findings revealed that students had significant changes in basic knowledge and volleyball skills after learn using this mobile application on their self-paced of learning.

Key words: Volley Ball World; basic knowledge; volleyball skills; volleyball learning mobile application

Introduction
Nowadays, the development of mobile technology is getting advance and used widespread in many fields such as business (Jovarauskienė & Pilinkienė, 2009), education (Cradler, Freeman, & Burchett, 2002), sport (Bartlett, 2007), health (Lintonen, Konu, & Seedhouse, 2008) and economy (Jorgenson, D. W. and Khuong, 2005). After reviewed the papers, its discussed mobile technology tend to enhance the human to have a better living lifestyle. After the evolution of mobile technology, mobile device such as smartphone and tablet have lots of functions. The mobile technology allowed the user install several of mobile application to help them manage their stuffs or gaining information through the mobile application. In the Google Play Store (Android) and App Store (Apple), there are a lot of mobile applications can let the user download for free or paid in the app (Plouk & Fine, 2012). Also, there are several categories of mobile application allowed the user to download. In education category, the user can download the mobile application which is related with the sport and learn from the mobile application. After researcher reviewed the mobile application which in related sport, researcher found that the existing sport mobile application is slightly inappropriate for the new volleyball learner. Thus, researcher develop a mobile application named The Volleyball World to investigate students’ effectiveness of basic knowledge and volleyball skills by running pre and post-test.

Content
The objective of this study is to investigate the effectiveness of Volleyball World towards the basic knowledge and volleyball skills (receive, set, spike, serve and block). There are many previous studies proven that the mobile technology in education (mobile learning) able to provide different teaching and learning method in education (Andersen et al., 2006; Belman, Potter, Treleaven-Hassard, Robinson, & Varan, 2011; Conroy, Yang, & Maher, 2014; Teoh & Neo, 2007). The evolution of mobile technology allowed the developer to design and develop the contents which can deliver the information to the users to gain the knowledge by using multimedia elements. As mentioned above, the existing volleyball mobile application is slightly inappropriate for the new volleyball learner. Thus, researcher developed a new volleyball mobile application which is integrated several theories and principles to help new volleyball learner to learn the skills easily,
Generally, this study involved 21 students who are 13-year-old with the experience in learning volleyball in between 1-3 months. All the participants are considered as novice. Thus, the participants can help to investigate the effectiveness of volleyball learning mobile application towards volleyball basic knowledge and volleyball skills. To investigate it, the study design that used to investigate the effectiveness of basic knowledge and volleyball skills by using volleyball learning mobile application in receive, set, spike, serve and block was pre-post study design. As mention above, this study investigates the effectiveness of volleyball basic knowledge and volleyball skills before and after given the treatment.

To investigate the effectiveness of volleyball basic knowledge by using volleyball learning mobile application (The Volleyball World), researcher conducted pre-post study design to the students. A set of volleyball basic knowledge paper test was given to the students to examine their knowledge about the basic knowledge in volleyball. The score that obtained by students were recorded. In the other hand, a pre-posttest conducted to all students to investigate the effectiveness of volleyball skills before and after learning volleyball skills by using developed volleyball learning mobile application. Same as above, all results from pre and posttest were recorded to investigate the effectiveness of volleyball learning mobile application.

Table 1 showed the finding of the score obtained by students in volleyball basic knowledge and 5 volleyball skills before and posttest. From the table, researcher can summary that majority of the students able to enhance their volleyball basic knowledge and volleyball skills. For volleyball basic knowledge finding, its showed that majority the students were improved their scores at the volleyball basic knowledge post paper test. During volleyball basic knowledge pre paper test, the students scored averagely with a mean M=81.76. The improvement was found after posttest conducted with the students with a mean M=85.42. Next, researcher also found that students’ volleyball skills also improved after using volleyball learning mobile application. First, researcher found that there got improvement for receive pre and posttest in term for mean value. Mean value had improved from 28.333 (pretest) to 32.810 (posttest) with different 4.477. Second, mean value for pretest of set skill is 22.286. After the treatment, mean value success increase 7.814 to 30.100. Third, spike skill had improved 5.619 for the mean value compare with pretest (M=17.286) and posttest (M=22.905). Four, finding also showed that serve skill had improvement too in mean value which is improved 4.333 from 22.667(pretest) to 27.000 (posttest). Lastly, block skill had improved lesser compare with other skill which is 3.81 from 11.095 (pretest) to 14.905(posttest). Based on the finding in Table 1, researcher can conclude that volleyball learning mobile application that developed by researcher success and able to give benefit to the students in learning volleyball basic knowledge and volleyball skills. At the same time, this also can prove that the design of the mobile application

<table>
<thead>
<tr>
<th>Student(s)</th>
<th>Volleyball basic knowledge</th>
<th>Receive</th>
<th>Set</th>
<th>Spike</th>
<th>Serve</th>
<th>Block</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>before</td>
<td>after</td>
<td>before</td>
<td>after</td>
<td>before</td>
<td>after</td>
</tr>
<tr>
<td>1</td>
<td>92</td>
<td>93</td>
<td>37</td>
<td>40</td>
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<td>32</td>
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<td>2</td>
<td>90</td>
<td>88</td>
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<tr>
<td>3</td>
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<td>27</td>
<td>10</td>
<td>23</td>
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<td>5</td>
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<td>92</td>
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<td>42</td>
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<td>21</td>
<td>81</td>
<td>85</td>
<td>26</td>
<td>30</td>
<td>28</td>
<td>33</td>
</tr>
<tr>
<td>Total</td>
<td>1717</td>
<td>1794</td>
<td>595</td>
<td>689</td>
<td>468</td>
<td>632</td>
</tr>
<tr>
<td>Mean</td>
<td>81.76</td>
<td>85.42</td>
<td>28.33</td>
<td>32.81</td>
<td>22.286</td>
<td>30.10</td>
</tr>
</tbody>
</table>

Table 1 showed the finding of the score obtained by students in volleyball basic knowledge and 5 volleyball skills pre and posttest. From the table, researcher can summary that majority of the students able to enhance their volleyball basic knowledge and volleyball skills. For volleyball basic knowledge finding, its showed that majority the students were improved their scores at the volleyball basic knowledge post paper test. During volleyball basic knowledge pre paper test, the students scored averagely with a mean M=81.76. The improvement was found after posttest conducted with the students with a mean M=85.42. Next, researcher also found that students' volleyball skills also improved after using volleyball learning mobile application. First, researcher found that there got improvement for receive pre and posttest in term for mean value. Mean value had improved from 28.333 (pretest) to 32.810 (posttest) with different 4.477. Second, mean value for pretest of set skill is 22.286. After the treatment, mean value success increase 7.814 to 30.100. Third, spike skill had improved 5.619 for the mean value compare with pretest (M=17.286) and posttest (M=22.905). Four, finding also showed that serve skill had improvement too in mean value which is improved 4.333 from 22.667(pretest) to 27.000 (posttest). Lastly, block skill had improved lesser compare with other skill which is 3.81 from 11.095 (pretest) to 14.905(posttest). Based on the finding in Table 1, researcher can conclude that volleyball learning mobile application that developed by researcher success and able to give benefit to the students in learning volleyball basic knowledge and volleyball skills. At the same time, this also can prove that the design of the mobile application...
with several multimedia elements, theories and principle does help students to learn volleyball basic knowledge and volleyball skills with more efficient.

As conclusion, this study is to investigate students’ effectiveness of basic knowledge and volleyball skills by using volleyball learning mobile application in Volleyball skills (receive, set, spike, serve and block). At the same time, this study also attempts to address the issue that volleyball learning mobile application in the market was inappropriate to learn volleyball skills for new volleyball learner. Thus, researcher developed a new volleyball learning mobile application and try to help students to learn volleyball basic knowledge and volleyball skills in an appropriate method. Developed volleyball learning mobile application did integrated several theories and principles to help new volleyball learn to learn the skills easily and improve students’ result in pre and posttest. After pre and posttest for volleyball basic knowledge and volleyball skills, result showed significantly improved in mean value for volleyball basic knowledge and volleyball skills. Generally, developed volleyball learning mobile application help students improved their score and enhance their knowledge in volleyball as well. As summary, the idea to design volleyball learning mobile application by using several theories, principle and combination of multimedia elements did help students and improved students in volleyball basic knowledge and volleyball skills.

Acknowledgement

The authors would like to thank Universiti Teknologi Malaysia and Ministry of Higher Education Malaysia for their support in making this project possible. This work was supported by the Research University Grant (Q.J130000.2531.19H47) initiated by Universiti Teknologi Malaysia and Ministry of Higher Education.

References


An Introductory Engineering Course for First Year Chemical Engineering Students

Zaki Yamani Zakaria  
School of Chemical & Energy Engineering, Universiti Teknologi Malaysia  
zakiyamani@utm.my

Aziatul Niza Sadikin  
School of Chemical & Energy Engineering, Universiti Teknologi Malaysia  
aziatulniza@utm.my

Azmahani Abd Aziz  
School of Civil Engineering, Universiti Teknologi Malaysia  
azmahani@utm.my

Khairiyah Mohd-Yusof  
Center for Engineering Education, Universiti Teknologi Malaysia  
khairiyah@cheme.utm.my

Mohd Kamaruddin Abd Hamid  
School of Chemical & Energy Engineering, Universiti Teknologi Malaysia  
kamaruddin@utm.my

Mimi Haryani Hassim  
School of Chemical & Energy Engineering, Universiti Teknologi Malaysia  
mimiharyani@utm.my

Hashim Hassan  
School of Chemical & Energy Engineering, Universiti Teknologi Malaysia  
hashim@cheme.utm.my

Siti Hajjar Che Man  
School of Chemical & Energy Engineering, Universiti Teknologi Malaysia  
sithhajjar@utm.my

Muhammad Arif Ab Aziz  
School of Chemical & Energy Engineering, Universiti Teknologi Malaysia  
m.arif@utm.my

Nur Fazirah Jumari  
Center for Engineering Education, Universiti Teknologi Malaysia  
fazirah.jumari@gmail.com

Highlights

As part of the effort to enhance students' first year experience, Chemical Engineering students in Universiti Teknologi Malaysia are required to take the Introduction to Engineering (ITE) course. The course is designed to stimulate students’ passion, enhance their technical knowledge and develop their professional skills. This paper describes the design and implementation of ITE course which aims to introduce engineering and inculcate sustainability awareness among students. In this course, student-centered learning approaches are implemented and real problem based on sustainability related issues are designed. Result shows that ITE successfully raise awareness on engineering importance, careers and sustainability issues via various assessment, hands-on activities and projects.

Key words: active learning; cooperative learning; problem based learning

Introduction

Globalization has prompted the need for engineers to possess professional skills as well as technical knowledge. Engineers need to embrace a broader vision of their professional role to respond to global challenges. Numerous studies have addressed the importance of professional skills development for engineering graduates. Graduate engineers need to demonstrate effective communication, creativity, team working, and understand societal and global issues that can help them function well at the work place. However, many issues have been raised about the quality of the new graduates to meet the needs of the employers (Grant and Dickson, 2006). Many employers have expressed dissatisfaction with the professional skills of engineering graduates that they have hired indicating problems in workforce were mainly due to poor professional skills, rather than a lack of technical knowledge (Rugarcia et al., 2000).
mode of teaching and learning must veer away from traditional lecture-based models to more student-centered and project-based approaches. According to Grant and Dickson (2006), professional skills are more likely to be developed by students if the skills are embedded within the curriculum, rather than taught in separate classes. Thus, it is crucial to provide the students with tools at the start of their degrees that will make them more effective during their university career. In addition, it is essential that the development of engineering education takes into account the current and likely future needs of employers on the types of learning experiences that enable students to fulfill their potential.

For this reason, the “Introduction to Engineering” (ITE) course was introduced in the chemical engineering program in the 2005 academic year. The ITE course is designed to have a supportive student-centered learning environment that allowed students to develop important skills to learn, as well as understand and develop abilities required to be a good engineer when they graduate. The course aims to help students understand what is actually engineering, in everyday and professional context, and the need for good engineers, especially in facing up to the challenges of the 21st Century. ITE course has integrated various teaching approach such as active learning, cooperative learning, problem based learning and others in order to improve student’s understanding on knowledge content as well as enhance professional skills development.

**Educational Principles**

ITE course is designed based on the How People Learn Framework (HPL) and Constructive Alignment (CA). Based on constructivist principles, CA asserts that both the teaching and learning activities (TLAs) and the assessment tasks (ATs) should support the development of the intended learning outcomes (ILO) among students. Whilst, HPL framework consists of four criteria that define an effective learning environment that is conducive for learning: knowledge, learner, assessment and community centered. To underpinning both educational principles, Problem-Based Learning (PBL) and Cooperative Learning (CL) are implemented as teaching and learning approach. Problem-Based Learning (PBL) is an inductive learning approach. It embeds small groups of students and presents them with a messy, unstructured, realistic (if not real) problem, to solve. The problem should be well crafted to engage and immerse students in learning new issues. Students are guided through a PBL cycle that helps them to identify and construct new knowledge. Students are guided by cognitive coaches or floating facilitator through the PBL cycle to learn and solve the problem. CL was known to promote five principles; positive interdependence, individual accountability, face to face interaction, appropriate interpersonal skills and regular team role assessment. In a team, social interaction among students can create collaboration in the learning activities.

**Course Description**

The Introduction to Engineering (ITE) course is a three-credit hour course. There are normally 30 to 40 students in a class, with three sections, facilitated by different lecturers, at the Introduction to Engineering course, giving a total of around 100 students. In each class, students are divided into teams of three to five students. The team is formed based on careful consideration of various factors to ensure heterogeneous groups, including gender, race, cultural background, English proficiency and academic achievement. Heterogeneous groups promote more diverse thinking and provide opportunities for students to develop feelings of mutual concern. Each group needs to have diversity in all these aspects so that besides achieving the technical outcome of this course, the professional skills especially related to interpersonal skill can be acquired. In early sessions of the course, students need to go through several activities designed to help them bond with their team members. These include identifying suitable name for the group, designing group logo as well as agreeing on the group regulations, in which each team member needs to be committed with.

The contents of this course include a short project on overview of engineering, the profession and its requirements in the Malaysian scenario, basic calculations of common process variables and unit conversions using active learning, introduction to engineering ethics using case studies and a problem on sustainable development (SD) using cooperative problem based learning.

The problem is set as a competition to find engineering solutions for issues related to SD that is practical and cost effective for the society, related industries and agencies are solicited and included in the problem to make it realistic. The problem is designed in three stages to gradually challenge students with increasing difficulty, while systematically providing the necessary support to scaffold students’ learning. Stage 1 is for learning about SD, finding information on current world scenario, and benchmarking. Stage 2 is focused on the specific element of SD, data collection and analysis of the students’ and families’ consumption or generation, and pattern of behaviour. In Stage 3, students propose best engineering solutions and cost analysis. During the competition, the panel judges consist of experts in the area will invite to evaluate students’ innovative product.

**Methodology**

A simple survey instrument was designed to evaluate the impact of the course design on the student’s knowledge about engineering professions. The survey was administered to all students at the beginning of the term to explore student background, assess students understanding on engineering, its importance and the need for good engineer. Students are assessed using same instrument after they have gone through the course at the end of the semester.
The research also based on information gathered from reflective journals written by students. All students were asked to produce four reflective journals throughout the semesters. The reflective journal was written at Week 6, Week 10 and then in Week 13. At the end of the semester, the students were asked to write an overall reflective journal to look back at their learning experience throughout the whole semester. They were briefed the format of a reflective journal for the purpose of reflecting their learning through various teaching and learning activities in the class.

After all the reflective were collected at the end of the semester, a qualitative data analysis technique recommended by Miles and Huberman (1994) was employed. A qualitative data analysis technique consists of data reduction, data display, conclusion drawing and verification. The first step of data analysis was to reduce the data in to a manageable volume to answer the research questions. By focusing on the research questions, information that was not important can be put aside. Keywords and phrases that could answer the research questions were highlighted.

Discussion

It has been shown that the students who participated in the survey were able to define the engineering profession, as well as the role of engineers. The majority define that engineering is the application of mathematics, physic and chemistry in order to invent, innovate, design, build, research, and improve machines, system, materials, and processes. Students also claimed that engineers use their knowledge to find suitable solutions to a problem.

From the very beginning, an engineering overview assignment given in the Introduction to Engineering course aims to support first year students to learn about engineering, and motivate them to see it as their future career. In addition to learning from the literature, students also interviewed at least two practicing engineers to produce a group report and presentation for the assignment. The doing process were able to increases students’ interest, and, at the same time, students has successfully described a general image of what is engineering is all about.

From the reflection journals that have been collected, it can be observed that there are four professional skills developed through learning activities by the first year students: namely team working, communication, problem-solving and time management skills. Table 1 shows some sample quotes for each of the professional skills.

Table 1: Example of quotation for skills found in reflective journal of three semesters

<table>
<thead>
<tr>
<th>Professional skills</th>
<th>Example of quotations from the reflective journals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team working</td>
<td>It is normal situation in a team that we have problems with team members along the project is executed but then as a team we should try to communicate among members and try to overcome all the problem that we face.</td>
</tr>
<tr>
<td>Communication skill</td>
<td>It really suits me working in this environment for the near future. It really improves my confidence as well as my communication skills. I hope that in years to come, there will be more programs like this so that we can really learn something useful in our university life.</td>
</tr>
<tr>
<td>Problem solving skill</td>
<td>Honestly, I am very happy with the report as each of us gives full commitment to complete it. All these work are not easy as ABC as each of us need to brainstorm like a half dead person to come out with a good report. However, it taught me to be patient and don’t give up.</td>
</tr>
<tr>
<td>Time management</td>
<td>PBL was very beneficial for me as a first year student. It had given me lots of exposure about university life. It also helped me to develop my soft skills especially time management which will be useful for me in the future.</td>
</tr>
</tbody>
</table>

Conclusion

The Introduction to Engineering at UTM has adopted instructional and assessment approaches that encourage active, collaborative and problem-based learning. Overall, it would seem that the ITE course was successful in helping students to learn technical knowledge and professional skills that they need. This study shows that first year engineering students who went through the activities in the course were able to develop problem solving, team working, communication and time management skills. Mastering these skills will be a major determinant of the future competitiveness of engineering graduates, enabling them to become highly innovative global “problem solvers”. However, ITE course alone cannot be effective on its own. Every other course in the curriculum needs to foster and assess these skills, integrating into their outcomes and assessment.

References


Heuristic Evaluation in Augmented Reality Model to Aid Al-Quran Memorization for Hearing Impaired Students

Hayatunnufus Ahmad, Norziha Megat Mohd. Zainuddin, Rasimah Che Mohd Yusoff, Suraya Yaacob, Nur AzalihAh Abu Bakar, Doris Wong Hooi Ten

Razak School of Technology and Advance Informatics, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra 54100, Kuala Lumpur
hayatunnufusahmad@graduate.utm.my, {norziha.rasimah}.kl@utm.my, {suraya.yaacob,azalih,loriswong}@utm.my

Highlights

Industrial Revolution 4.0 becomes the driver of innovation like Augmented Reality. Nowadays, Augmented Reality is applied in the education area to prompt and enhance students’ learning ability. Islamic education is not spared from this; innovations in Islamic educational materials should be enhanced so that students are able to learn better, especially among the special needs students. Hence, the proposed prototyped as an integrated software model was develop, which can assist the Quran memorization among the hearing impaired students. This proposed prototyped model is based on Augmented Reality Based Content (ARBC). It is called mAR-Quran and it has been evaluated by five experts which are expertize in Augmented Reality, Mobile Application and education area. The experts suggestion are taken into account for improving the application interface and content which can enables the students to arrange the verse of surahs in the correct order in more interesting way so that eventually, they memorize verses of Quran better and easier.

Key words: Augmented Reality; Hearing Impaired; Al-Quran Memorization.

1. Introduction

Industrial Revolution 4.0 has changed the direction of an organization in achieving its goals(Kose, Koc, & Yucesoy, 2013). However, according to (Yasin et al., 2016), there is a need for Islamic teaching materials and approaches to be integrated with technology especially among the Hearing Impaired(HI) students(Yasin, Ali, Isa, & Endut, 2016). The Quran is a book that is compulsory for each Muslim to learn including the disabled. Nevertheless, Al-Quran education is less common among the HI(Hussain, Jomhari, Mohmad Kamal, & Mohamad, 2014; Jaafar et al., 2014; Sabdan et al., 2016) as many people believe that HI community is being given the exception to learn Al-Quran. This belief has hindered learning Quran among the HI students to be less important and to a certain extent, taken for granted.

A memorization method called Tahfiz Akhyar has been introduced to enable HI children to learn Al-Quran(Mohd Rashid, 2017). However, these students faced difficulty in arranging the verses of surahs in a correct sequence and made mistakes while arranging the verses of surahs(Ahmad et al., 2018). Thus, the use of technology can help HI students to learn Al-Quran better and eventually improve the students learnability(Ghadim, Jomhari, Alias, Mohd Rashid, & Mohd Yusoff, 2013) as well as the memorization quality(Hashim, Tamuri, & Jemali, 2013). Therefore, the objectives of this article are as follows: i) To identify the students learning behaviour towards Quran education.; ii) To develop an AR Software Development Life Cycle (ARSDLC) in promoting students learning.; and iii) To evaluate the effectiveness of ARSDLC in improving the hearing impaired students learning experience.

2. Background of Problem

The use of AR in the education system from preschool to tertiary can be seen from the implementation in classrooms such as in pre-school science subject, subject science in secondary school (Cheng & Tsai, 2013; Gopalan, Zulkifli, & Abu Bakar, 2016), astronomy(Yen, Tsai, & Wu, 2013), arithmetic(Young, Kristanda, & Hansun, 2016), geometry(Olalde, Garcia, & Seco, 2013) and computer science(Kose, Koc, & Yucesoy, 2013). However, according to (Yasin et al., 2016), there is a need for Islamic learning materials to be incorporated with modern methods and technologies.

Learning the book of Quran is compulsory for all Muslims. It is a gift from Allah to all Muslims as it has explanations, warnings, and guidelines for Muslims and others on how to live life here and in the world hereafter. All Muslims regardless of age, gender, race, ability or wealth are required to learn Quran. However, the method in learning Quran among HI students needs to be improved(Hussain et al., 2014; Jaafar et al., 2014; Sabdan et al., 2016). This is due to the notion that many people believe that having hearing impairment is an acceptable excuse to not read the Quran(Ghadim et al., 2013). Moreover, people with hearing problem have difficulty to hear and utter sounds as Quran is usually taught by reading repeatedly and hearing how the word is pronounced with good makhraj and Tajweed(Ghadim et al., 2013). Not only that, they also use sign language, writing, and gesture acts as the communication medium(Hidayat, Gunarhadi, & Hidayatullah, 2017; Hussain et
al., 2014) that requires all words to be translated into the sign language. However, many of HI are not able to understand or grasp something abstract and some of the Islamic terms (Awang@Husain, Zakaria, Mohd Shafie, Talib, & Kassim, 2010). Therefore, Tahfiz Akhyar, the Al-Quran memorization method was introduced by Hj Norakayiree Hj Raus and Zaharatul Sophia Mohamed Amir Abas in 2014 that is based on Prophet Muhammad’s teaching method to memorize doa, zikr, selawat and solah (Mohd Rashid, 2017). The method is based on arranging the pieces verses of surah in Al-Quran in the correct sequence. However according to (Ahmad et al., 2018) HI students faced difficulty in arranging the verses of surah in the correct order and made mistakes when arranging the verses of surah. Thus, the use of technology can help the HI students to learn Al-Quran better and eventually can improve the students’ learnability (Ghadim et al., 2013) as well as the memorization quality (Hashim et al., 2013).

3. Research Methodology

There are many software development methodologies that have been developed. In this research work, the prototyped model which is based on AR Based Content (ARBC) Model is discussed.

Figure 1: Propose Model, mAR-Quran Model.

Figure 1 show the mAR-Quran model, this model is produce by combining the Augmented Reality Based Content (ARBC) model with prototype model. The ARBC model was adapted according to name of phases and four phases were employed which were analysis, determine, produce and use. While for the evaluation phase, the prototype model was assessed to determine users’ satisfaction in using the model. It also follows the prototyping model where each phase is in the sequential order, in which the coming phase can only be executed after the present phase has been completed.

Furthermore, the iterative cycle is embedded in this model to allow the process to repeat. This enables the developers to make changes easily and in accordance with the user requirement. The feedback for users was prepared by using smiley and sad icons. When users were arranging the verses of surahs, they would get the feedback. If the arrangement was in the right order, they would get a smiley icon and if the arrangement was in the wrong order, they would receive a sad icon. The use of icons would definitely help users to identify whether they had the correct order of verses and surahs. This would make their learning easier, fresher and more effective. Figure 2a and Figure 2b show the mentioned feedback. Therefore, we can say that this mAR-Quran model can be used to fully develop the AR application to aid the Al-Quran memorization for HI students.

Figure 2a: Feedback answer for correct arrangement. Figure 2b: Feedback answer for wrong arrangement

4. Findings

The heuristics evaluation has been carried out with five experts in area of AR, mobile application and education field. The result was analysed and the experts’ suggestion was noted for mAR-Quran improvement. Table 1 show the experts’ suggestion for mAR-Quran.

Table 1: Experts’ suggestion for mAR-Quran.
Experts’ Suggestion | Reason
---|---
1 | Add information regarding the application content and module in (i) button | Students can know the application before started the modules.
2 | Add demonstration video that consist of instruction when using the apps | Students can understand clearly on how to use the application and become independent learner.
3 | Use 2D or 3D background image and makes the apps style more colourful | To enable the students familiar with AR functionality.
4 | Make the marker size smaller and clear. | To attract the students’ interest.
5 | Interaction AR scaffolding by adding zoom, rotate features | To ease the students while arranging the marker.

5. Conclusion and Future Work

Revolution Industry 4.0 has brought about great innovations in technology and the education sector is also experiencing the benefit of these innovations. In line with the birth of these innovations, a new learning approach is needed in order to help students to learn better. Therefore, this research work has developed a prototype model using the AR technology to assist the special need students to learn Quran. Moreover, the experts evaluation suggestion also has been taken into account and it has been discovered that this prototype model can be further developed in producing software to aid Al-Quran memorization among the hearing impaired students.

For future work, the proposed model will be evaluated using end-user testing.

Acknowledgement

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Infused Design Thinking Skills in the Course of Informatics in Society

Suraya Ya’acob, Rasimah Che Mohd Yusoff, Doris Wong Hooi Ten
Advanced Informatics Department, Razak Faculty
suraya.yaacob@utm.my, rasimah.kl@utm.my, doris.wong@utm.my

Highlights

21st century learning comprises of skills, abilities and learning dispositions. These are important to ensure students are competent for their future jobs. One of the crucial skills is complex problem solving. Thus, we need to equip students with skills, ‘know-how’ and a mindset to become problem finders and problem solvers. This paper proposes the infusion of the design thinking concept in the course of ‘Informatics in Society’ to develop a competent mindset and expose the process (how knowledge) for complex problem solving. Using NALI, three interventions have been made during the infusion: I) sequencing the modules according to the design thinking process, II) restructuring the modules according to problem-based learning, and III) fostering collaborative learning during NALI-Class activities.

Key words: 21st century learning, design thinking skills, problem solving.

1. Project Objectives

During the 21st century, society has undergone an accelerating pace of change in economy and technology. 21st century learning comprises of skills, abilities, and learning dispositions that have been identified as being required for success in the evolving society. In contrast with traditional academic skills, 21st century learning is not primarily content knowledge-based, thus we need to develop skills, abilities and learning dispositions to ensure students succeed in the 21st century society, workplaces, businesses and governmental agencies. Previous researchers have identified the key skills such as critical, creative and higher order thinking skills needed for students to meet the demands of the changing workplace and society. According to the World Economic Forum as shown in figure 1 below, the top ten skills needed for the future job are listed and the skill of complex problem solving remains as the number one for 2015 and 2020. This shows that we need to develop the capacity of our students to handle complex problem solving.

![Figure 1: Top ten Skills for Future Job](source: Future Job Report, World Economic Forum)

To ensure students are able to solve a complex problem, the students’ mindset needs to be developed until they are able to become problem finders and problem solvers. Usually, the problem solvers’ mindset is able to develop a sense of empathy, learn from failure, develop creative confidence and embrace ambiguity.

According to (Amanet, 2012), the skills to handle problem solving are varied but share some common themes. Based on the effective solution-problem, they require more on higher-order thinking skills, problem solving, communication and collaboration. The skills are geared towards students and workers to foster engagement; seeking, forging, and facilitating connections to knowledge, ideas and peers.

Therefore, in this paper, we propose design thinking as an important skill to develop a competent mindset for students to solve a complex problem. According to Maureen (2012), design thinking is both a process and a mindset. Design thinking is a systematic approach to solving a complex problem by emphasizing on the innovation and iterative process. This human-centered innovation process finds solution and solves problem in a user-centered context. Previously, 21st century learning has focused almost solely on analytical thinking and critical thinking. While these thinking skills are important, design thinking blends in equally powerful creative thinking. It’s not that creative thinking is more important, but a blend of both types of thinking is more productive in finding truly pragmatic and transformative ideas and innovation. Design thinking requires students to be strategic and metacognitive about when to apply creative thinking and when to apply analytical thinking. Students must recognize where they are in the process and apply different ways of thinking.
2. NALI approach to embed Design Thinking Skill in the Course of Informatics in Society.

Informatics in Society (UANP6013) is a university general course in the Advanced Informatics Department, Razak Faculty, Universiti Teknologi Malaysia (UTM) Kuala Lumpur. Embedding design thinking within this course is relevant since this course also emphasizes the importance of problem analysis and problem solving. Generally, this course aims to provide students with an understanding of informatics which involves both social and technical aspects associated with technology, people and society. Via the design thinking concept, the basic topics that are information-related such as classic themes of informatics and knowledge representation will be explored via the problem solving concept. Furthermore, research and applications related to emerging trends in informatics will be discussed and this course also exposes students to social and ethical issues in the various fields of informatics.

From the New Academia Learning Innovation (NALI), this project blends the conventional mode of teaching with the online learning platform. Through face to face learning process, this course emphasizes the problem-based learning to foster deep and active learning among the students. Furthermore, since Razak Faculty is focusing only on postgraduate students (masters and PhD), the andragogy approach is more relevant to the matured students – thus, the learning process is more on facilitation instead of instruction. From a student-centered perspective, this project encourages collaborative settings especially during the students’ activities. Collaborative settings are essential to encourage and promote pedagogies that facilitate deeper learning through both traditional instruction as well as online learning; hence we utilize more than 30% course learning using the features of UTM e-Learning.

3. The Project Methodology

In order to embed design thinking within this course, we need to bear in mind the course learning outcomes (CO) and must ensure better achievement of expected learning outcomes at the end of the course as mentioned below:

- **CO1**: Evaluate the impact of informatics in society and everyday life.
- **CO2**: Create solution through report regarding the implications of informatics in culture, society and politics.
- **CO3**: Relate social and ethical issues with the various fields of informatics.
- **CO4**: Display the implications of informatics in culture, society and politics.

Therefore, to infuse design thinking skills within this course, the project makes a cornerstone without jeopardizing the CO and previous modules. There are three interventions that have been made during the infusion: I) sequencing the modules according to design thinking process, II) restructuring the modules according to problem-based learning, and III) fostering collaborative learning during NALI activities. These three improvements have been summarized in Table 1.

For Intervention I, the modular settings of UANP6013 course suit the interventions to put the lesson as in the design thinking phases. Based on modular settings, this course only has 6 meetings. Each meeting is a full day course (8 am to 4pm). On the other hand, design thinking generally has 5 sequencing activities. Therefore, we can slot each of the design thinking phase per meeting session and arrange all the meetings according to the design thinking process. This sequence is important to ensure the outcomes from previous meeting activities will be used in the next meeting.

For Intervention II, the course modules need to be restructured and aligned according to the problem-based learning. There are two intermissions (Intermission A and intermission B) in order to slot in the important modules as the predecessor before the next phase of design thinking. To enrich the modules’ content, we blend and embed Padlet, Youtube and social media as the learning sources within UTM e-Learning.

For Intervention III, since constructive comments and communication between peers are essential in design thinking, we foster collaborative learning through the face to face and digital platforms. From the beginning of the course, the students are assigned to form a group of 4-6 people in order to develop mutual understanding between the group members. Most of the learning activities will be held in collaborative settings and they are being taught and reminded to adapt and accept critiques iteratively inter and intra group members. Furthermore, this intervention also utilizes UTM e-Learning as the collaborative platform for the students to share ideas in the digital platform. There are two features of e-Learning which are Interactive Forum and Wikipedia that have been used in most meetings and activities.
### Table 1: Three Interventions to Embed Design Thinking Skill in the Course of Informatics in Society (UANP6013)

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Phase 1: Emphasize (Meeting 1) 8 am – 4 pm</td>
<td>UANP6013 Introduction to the course</td>
<td>Sense making activity. Share the concept of current society trend using Youtube and Vimeo videos. Facilitate the students to develop the cognitive background on the society (use current/ in trend updates – e.g. TN50, 4ir, IoT, Smart City). Focus on one society issue that sparks the student’s interest. Share the issue through e-learning – forums Present the five best ideas.</td>
</tr>
<tr>
<td>Phase 2: Define (the problem) 5W+1H 5 Whys and Ishikawa Diagram, (Meeting 2) 8 am – 4 pm</td>
<td>Society (domain) Trend and culture Evolution of the society condition</td>
<td>Brainstorming activity. Download the learning content from e-learning. Develop group work of 4-6 students. Criticize the idea. From the issue shared in the e-Learning Forum during phase 1 – criticize all the ideas (using replies in the e-Learning Forum) within the group members and finally decide the best idea as the group project. Develop 5W+1H (what, where, when, who, why, how) of the idea Develop 5Whs using Ishikawa Diagram From activity 4 – identify the critical problem/root cause needed to be solved. Upload the findings to padlet.com Present the five best ideas.</td>
</tr>
<tr>
<td>Intermission A (Meeting 3) 8 am – 4 pm</td>
<td>Emerging Trends in Informatics • Informatics in Malaysia Society • Big Data Agenda • Health and Social Informatics • Digital Nation – Smart City • Internet of Things (IoT)</td>
<td>NALI Activities Download the learning content from e-learning. Using think-pair share – identify one trend and share the opinion on Wikipedia. Present five best opinions.</td>
</tr>
<tr>
<td>Phase 3: Ideation (the solution) Phase 4: Prototype + Phase 5 Evaluation (Meeting 4) 8 am – 4 pm</td>
<td>Informatics Roles as the solution Informatics roles as the solution. Social and ethics implication on the society. The cause and effect from general system theory perspectives (iceberg model)</td>
<td>Ideation (brainstorming activity) By reflecting the knowledge gained from meeting 3, group members need to identify the best solution for the problem. Using manual round rough to detail diagram – choose and develop informatics roles as the solution for the identified problem (from the phase 2 activity) Evaluation (reflection activity) Evaluate the solution using iceberg model. Identify the implication of the solution to the deeper level of symptom, trend, structure and value of living and society (people, culture, society, politics and economy)</td>
</tr>
<tr>
<td>Intermission B (Meeting 5) 8 am – 4 pm</td>
<td>Knowledge Ecosystem in Society Knowledge Elicitation Knowledge Representation Knowledge Discovery</td>
<td>Activities Download the learning content from e-learning. In the group – develop the ecosystem of knowledge from the problem solving case. Upload the findings to padlet.com Present the findings.</td>
</tr>
<tr>
<td>Reflection and Postmortem (Meeting 6) 8 am – 4 pm</td>
<td>UANP6013 Postmortem All the Course Learning Outcomes (CLO1-CLO4), All the Intervention</td>
<td>Metacognitive of the learning process Reflection for the whole learning activities, design thinking process with all the CLOs. Reflection the process of problem solving. Reflection on the iteration process in handling critiques and complex condition improvements. Students’ feedback for improvements.</td>
</tr>
</tbody>
</table>

**4. Findings and Discussion of the Innovation**
Through design thinking learning experiences, we hope to develop the students’ mindset into being able to develop a sense of empathy, learn from failure, develop creative confidence and embrace ambiguity. This mindset is crucial to be developed among our students for them to be able to handle and solve complex problems as demanded by the 21st century job skills. Furthermore, this learning intervention should be able to create environments that foster creativity by appreciating the value of process. Using collaborative approaches, design thinking helps students learn how to work in a team, ask questions and dig deeper during the learning process. From the lecturer’s observation during the class and feedbacks from students after the course, we can sense that the students are engaged during the learning activities. Most of the students loved it but it wasn’t easy. The students mentioned in the feedback that collaborations with other students are challenging yet have a powerful impact. They highlighted about an ‘impressive’ communication engagement between the students and lecturers and among the students themselves. However, they had to focus, participate well and put themselves during all the activities – in contrast, being a sleeping partner will make them suffer because the group work activities were related with the individual assessment. Indirectly, this condition led to deep and active learning during the course. Furthermore, the students also mentioned that the course let them ‘think out of the box’, get soft-skill knowledge and make the lesson feel more realistic.

For improvements, we take note of the challenges where the students faced ambiguity and also mentioned about the ill-structured aspect of the course. There were vague instructions since there is a lack of guidelines for each of the activities. Furthermore, due to modular settings, the class was too long and mentally tiring since the activities were packed and need a lot of thinking and brainstorming.
E-PaLuVed: Electronic Problem Based Learning for Sustainable Development Indicator

Noradila Rusli, M. Rafee Majid
Department of Urban & Regional Planning, Faculty of Built Environment & Surveying
Universiti Teknologi Malaysia, 81310 Skudai, Johor
noradila@utm.my, rafee@utm.my

Sharifah Norashikin Bohari, Noorfatekah Talib, Nursyahnani Nasron & Noorazwani Mohd Razli
Green Environment and Technology (GREENTech) Research Group,
Center of Study for Surveying Science and Geomatic, Faculty of Architecture, Planning & Surveying,
Universiti Teknologi MARA, Perlis, Arau Campus, 02600 Arau, Perlis
shnorashikin@gmail.com, rafekahi@gmail.com, nursy6864@perlis.uitm.edu.my noorazwani.mrazi@gmail.com

Highlights

Problem based learning is a learner-centered educational pedagogy, which requires students to undergo solving problem process, based on real life issues. This project aims to design an approach of teaching Sustainable Development indicator for undergraduate students using existing source of electronic games, which engage with environmental, social and economic issues. Total of 48 students were participated in this project; which assigned by the instructor (lecturer). students need to accomplish three (3) projects related with sustainable development. The projects, were started with the investigation and selection of one (1) sustainable development issue such as traffic congestion, human traffic, poverty, food security, brain drain and etc. in any city around the world. Then, they required to build the city layout similarly in available electronic games either eCity or SimCity. These two games are able to simulate the current situation of the city by providing significant tool for students to explore and learn to solve the issue. Meanwhile, in the third project, students were required to develop an indicator to measure sustainable development such as; indicator for happiness, disposal and recycling performance indicator; indicator for good transportation network and etc., using the same game. Aligned with the process of playing games, students learn how to analyze sustainability issue and integrated with classroom knowledge (lecture) then worked with decision making, and problem solving skills. Appropriate online assessment using Kahoot!, presentation and producing written report, demonstrate and quantity the students understanding on sustainable development. In conclusion, teaching and learning approach assisting by electronic games were successfully attracting students’ interest and classroom participation, which is quite challenging for theory-based subject such as sustainable development.

Key words: e-learning, electronic games, sustainable development, eCity, SimCity

Introduction

Nowadays, technology has been rapidly evolved around us in the usage of hand phone, computer, computer programs and so on. This evolvement gives a lot of positive impacts towards many industries field including in teaching and learning. Since the 1990s, there has been considerable growth in the adoption of technology within higher education (Kirkwood and Price, 2014). Adapting technology in teaching and learning in higher education can be costly not only in terms of financial investments for physical equipment but also in relation to the personal investment made by the staff and students (Kirkwood and Price, 2014). However, these investments are necessary in order to improve the learning experiences and knowledge of lecturers and students. A new teaching method has been introduced through the advancements of technology called ‘blended learning’. Blended learning is the fusion of face-to-face and online learning experiences [Sharkova, 2014]. This method allocates few hours of teaching and learning for the student to learn without going to classroom. It has been used widely in colleges and universities around the world. Aligned with the initiative of Education 4.0, higher education needs to equip our graduates with future proof skill sets by harnessing their humanistic technological and data analytics competencies in embracing the Fourth Industrial Revolution (4IR). The students’ self-centered learning becomes the main focus in transferring discipline of knowledge. Educator’s roles are as an instructor by utilizing nine (9) initiatives of learning modes. Electronic Problem Based Learning for Sustainable Development Indicator (E-PaLuVed) is focusing on global environmental issues on sustainability and understanding Sustainable Development Indicator (SDI). By the implementation of this module, students were applying their knowledge on global environmental issues practically through electronic games such as eCity and SimCity. In this module, they need to identify the issues and propose solutions by developing a virtual sustainable city to enhance their understanding on sustainable development issue and Sustainable Development Indicator (SDI) by developing SDI through the game. At the end of the module, student will be assessed using online assessment using Kahoot! In a nutshell, teaching a young generation especially the Z-generation; who is more attracted to technology can be quite challenging for theory-based subject such as sustainable development. But, by using a good learning initiatives, the students will be enthusiastic to attend class and take part in the lesson.

Implementation of E-PaLuVed

This module aims to design an approach of learning sustainable development for undergraduate students using existing source of electronic games, which engage with environmental, social and economic issues. The objectives of this module are:
i. To design an active learning approach by using interactive games.
ii. To integrate online assessment with interactive games in assessing students understanding.
iii. To propose E-PaLuVed module for sustainable development course in order to supporting to 21st century learning approach.

In task 1, total of three (3) projects were designed which are (i) Solve it! (ii) Win the game and (iii) Develop your SDI. In Project 1; it started with the selection of one (1) sustainable development issue such as traffic congestion, human traffic, poverty, food security, brain drain, etc., in any city around the world. By using eCity or SimCity, students need to construct a layout of the selected city and solve the chosen issue using the game. This game is able to simulate the current situation of the city by providing significant tool for students to explore and learn to solve the issue. In the second project, using eCity game, a series of challenges designed to test the students’ ability in solving one scenario (problem). They required to win the game in order to achieve the aim and objectives of the second project. In the last task (Project 3), students were required to develop an indicator in the games (eCity/SimCity) to measure sustainable development indicator such as; indicator for happiness, disposal and recycling performance indicator; indicator for good transportation network; and etc.

Then, students required to answer several questions (Task 2) that related to the sustainable issues in online assessment using Kahoot!. They need to answer all questions in limited time given via smartphone. The instructor will share Game PIN to students for this assessment for students to log in. Once they log in, insert their name; then the questions appear. Finally, for the last task (Task 3); students need to prepare written report and oral presentation for each project in the Task 1.

![Diagram of E-PaLuVed module](image)

**Figure 1:** Content of E-PaLuVed module for developing sustainable development indicator (SDI) in eCity/SimCity

Evaluation of problem solving in this module measured based on the discussion and summarization element of the game finding in written report and oral presentation on how they solve and making best decision. The main element which discuss critically and good suggestion will score for the highest mark from the rubric and vice versa. As for the evaluation purpose, Task 1, Task 2 and Task 3 were linked to MOHE (Ministry of Higher Education) learning outcome (LO) which are; (i) MOHE LO3: Problem solving & scientific skills and (ii) MOHE LO7: Information management & lifelong learning. While, the evaluation process in Kahoot! are based on the correctness answer, total mark and overall time taken to answer the question. These criteria measured for their inquisitive mind in term of their interest and effort in this module, which was related with MOHE LO7: Information management & lifelong learning.

**Conclusion**

E-PaLuVed is an interactive learning module that suitable for the Z-generation students. It is a practical learning platform where students can apply their knowledge on the current issue through gamification. Instructor can easily assess the individual student performance and understanding by using an interactive online assessment. This module is useful as best practice and self-paced learning parallel to 10th Shift: Transformed Higher Education Delivery according to the Malaysian Educational Blueprint.

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Comprehensive Academic Programme Development and Improvement: Case Study for Islamic Study Curriculum

Nazrana Haniff
PERGAS Institute for Islamic Education, Singapore
nazrana@pergas.org.sg

Roslina Ismail
PERGAS Institute for Islamic Education, Singapore
rosolina@pergas.org.sg

Zainudin Abu Bakar
School of Education, Faculty of Social Science and Humanities, UTM
p-zain@utm.my

Rohaya Talib
School of Education, Faculty of Social Science and Humanities, UTM
rohayatalib@utm.my

Sanitah Mohd Yusof
School of Education, Faculty of Social Science and Humanities, UTM
p-sanitah@utm.my

Halijah Ibrahim
School of Education, Faculty of Social Science and Humanities, UTM
p-halija@utm.my

Noor Azean Alan
School of Education, Faculty of Social Science and Humanities, UTM, Malaysia
azeani@utm.my

Highlights

A professional training project on developing a comprehensive academic programme is required by the PERGAS Institute for Islamic Education, Singapore as the demand of Islamic study curriculum at tertiary level is increased. A case study teaching strategy has been conducted in order to develop a quality academic program. This comprehensive academic program development and improvement consists of four development process. The conducted teaching strategy is appropriate for the participant to acquire the academic development skills comprehensively.

Key words: Case Study; Academic Curriculum Development; Curriculum Delivery Processes; Academic Curriculum Review

Introduction (Project or Innovation)

The academic programme should be understood as a comprehensive process including the development process, execution activities and review procedures. It is also considered as critical factors of the academic quality. Every stage of the processes should be mastered by anybody involve in academic curriculum development as a prerequisite. This case study is specifically designed to equip those who are involved in the academic curriculum at the higher institution. It structure is purposely decorated as a ‘hands-on’ opportunity for the participant to experience the challenges of developing the academic curriculum.

Every skill provided has its specific purpose but connected to one another. Starting with the understanding of educational philosophy, the curriculum development, registration, execution, and finally evaluating and reviewing the academic programme for the continual improvement purposes. As such, the case study is conducted in a structured clinical ways so the skills can be acquired comprehensively.

Content (Project or Innovation)

There are 4 types of skills that this professional training project has offer for a comprehensive understanding of academic curriculum development processes:

1. Skill 1: Philosophy and the Academic Curriculum Development Processes
2. Skill 2: Academic Curriculum Development
3. Skill 3: Curriculum Delivery Processes
These ‘hands-on’ experiences will ensure the participant to venture other contexts in future especially in assisting any academic programme development in any higher institution. Besides, the participant will also gain further collaboration with the faculty in regards to other related training to the academic programme development and delivery. As such, this professional training programme is expected to serve not just as ‘one-off’ activities but more to the continual development of human science.

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“Engaging Adult Learners in the Integration of Online Classroom: A Test-run”

Neil Madulara Martin
Mindanao State University – Iligan Institute of Technology
College of Nursing
Iligan City, Mindanao, Philippines
neilmartin6@gmail.com

The 21st Century is inevitably demanding and challenging in almost all aspects of human activities day-in and day-out. The information highway is so enormous that seem to enslave humanity. Millennial learners articulate special concerns and needs in the academe as teachers are faced in a dilemma whether to succumb into traditional and or contemporary approach in teaching. According to Early and Early (2015), the most Millennial students entering college today do not know a world without computers or new media. Hence, one of the biggest challenges facing higher education today is bridging the gap between these “digital natives” and faculty who may see themselves as digital immigrants. The objective of this study is to explore and describe the first-hand experience of 77 adult learners engaged in the integration of online classroom in a trial-run having been enrolled in Leadership, Management and Research (LMR) for the degree Bachelor of Science in Nursing in a state university in Southern Philippines. Consent was secured from each participant as self-report on characteristics: age and sex were submitted online with the first online activity, “Howdy for My First Day with LMR Online Classroom.” Written narratives of participants were analyzed and an iterative process was employed. Emergent themes include: Something New, Stressful yet Convenient, Stimulates Learning, Setbacks, and Stepping Stone to Greatness. Thus, engaging adult learners in the integration of online classroom brings immense impact to the millennial learning styles.

Keywords: online, learners, millennial, classroom
goReason: An Online Collaborative Learning System for Reasoning Skills

Nurbiha A Shukor
Department of Educational Sciences, Mathematics and Creative Multimedia, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.
nurbiha@utm.my

Ana Haziqah A Rashid
Department of Educational Sciences, Mathematics and Creative Multimedia, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.
anahaziqah@yahoo.com

Zaidatun Tasir
Department of Educational Sciences, Mathematics and Creative Multimedia, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.
p-zaida@utm.my

Highlights
Towards empowering 21st century learning, a web-based system namely goReason that implements collaborative learning approach with the aid of scaffolding method which aims at enhancing reasoning skills has been introduced. goReason offers web 2.0 features for students to collaborate among their group members and gives opportunity to students to justify and elaborate their ideas with the assistance of scaffolding by peers that has been embedded to the discussion forum page. goReason also has other interesting features including group assignment, collaborative report, multimedia content and assessment.

Key words: Reasoning Skills, Collaborative Learning, Online Learning, Peer Scaffolding

Introduction
Reasoning skill is one of the essential skills in the 21st century learning. Although there are many computer-based learning environments being developed for improving 21st century learning skills, lack of attention was given to improving reasoning skills. Due to lack of computer-based learning platform to nurture reasoning skill, goReason is developed to meet this demand. goReason online collaborative learning system is a computer-based learning environment which was developed for a specific purpose of improving students’ reasoning skill with a set of peer scaffolding guidelines within a collaborative learning environment by implementing systematic development process namely Hannafin and Peck (1988) instructional system design model.

Content
goReason aims in giving assisting students to justify and elaborate their ideas in order to improve their reasoning skills. This web-bases system was developed based on the Hannafin and Peck (1988) instructional system design model with the implementation of collaborative learning strategies and scaffolding methods. The ultimate function of this web-based system is to offer web 2.0 platform for students to collaborate among their group members and gives opportunity to students to elaborate their ideas through discussion forum page. Differ from other available web-based learning, the uniqueness of goReason is that it implements computer-based scaffolding method in the discussion forum page. This special feature enables students to scaffold their peers during the collaborative discussion by referring to the guidance of scaffolding that has been provided. On top of that, the guidance for students to give argument which an essential element in improving students reasoning skills was also provided in goReason. This feature can promote student-centered learning since teacher just need to facilitate the student during the discussion without much interruption.

To make the learning more interactive, multimedia elements was also used to deliver the task in goReason. Multimedia element is beneficial for online learning because it makes learning more entertaining and eliminate students’ frustration especially in explaining abstract concepts (Kimberly 2015). Finding by Junaidu (2008) also prove that students performed much better in understanding questions related to demonstration and application, goReason also has interactive web 2.0 features where it allows students to manage their group learning by allowing students to produce a collaborative report writing where the available learning system still lack on this feature. Another important feature in goReason is that the teachers can evaluate students’ performance in the system and hence, monitoring of students’ achievement can be more effective. Therefore, both teachers and students can monitor learning progress (Vonderwell, Liang and Alderman, 2007) in goReason. Monitoring process is important in teaching and learning because it allows reflection (Isaacs and Fujita, 2006) and encourages students to think more critically (Ku and Ho, 2010; Nicol, Thomson and Breslin, 2014). This is being supported by Sungur and Tekkaya (2006) where their finding shows that student who monitor and evaluate their progress were likely to improve learning performance compared to the one that only depend on teachers. Other than that, assessing is important in learning because it can encourage meaningful dialogue, increase collaboration, peer and self-evaluation, and sense of community for a shared purpose (Vonderwell, Liang and Alderman, 2007).

The development of goReason based on thorough research works that integrate both pedagogy and technology. Based on the Hannafin and Peck (1988) model, the pilot testing for goReason has been carried out among the online collaborative learning experts as well as students to ensure its reliability and validity. A quasi-experimental study on the effectiveness of goReason has been performed towards more than 60 actual
users. Finding showed that students in the experimental group have better learning performance ($p < 0.05$) and students’ reasoning skills differed significantly than the control group. These findings proved that goReason features does help students to interact and enhance their reasoning skills as well as their content knowledge. Apart from that, goReason also a benefit to teachers since it can assist them in facilitating students to scaffold their peers in the discussion and assess them without any hassle.

goReason web-based system also has been copyrighted under Universiti Teknologi Malaysia. This web-based system can be commercialized to teachers, students and learning institutions where they can pay to access this web system and used it in teaching and learning process.

References


Enhancing Construction Technology Course Using Mobile Augmented Reality

Ahmad Faiz Azizi Ahmad Fauzi  
Universiti Teknologi Malaysia  
afoizazizi@gmail.com

Roslan Amirudin  
Universiti Teknologi Malaysia  
b_roslan@utm.my

Kherun Nita Ali  
Universiti Teknologi Malaysia  
b_kherun@utm.my

Highlights

The number of students pursuing science, technology, engineering and mathematics (STEM) related courses in higher education has greatly decreased in Malaysia. There are studies that had concluded that the decline is due to lack of motivation and the outdated method of engagement in the learning process. Furthermore, the difficulty to visualise and understand complex processes in STEM subjects are the main reason for the decreasing trend. To overcome this problem, proper execution and the incorporation of technology can enhance student’s quality of learning as suggested by previous researchers. Therefore, augmented reality (AR) was proposed to enhance the teaching and learning experience of construction technology which involves in the learning of construction processes and understanding the construction elements. Augmented reality has the ability to change and improve the nature of education. The possibility to overlay media onto the real world for content consumption using smartphones and tablets devices will enable students to access information at anywhere and anytime. Hence, the main goal of this study is to execute and assess augmented reality-based teaching and learning tool to higher education students in order to coin out whether augmented reality could enhance student’s quality of learning.

Keywords: Augmented Reality; Quantity Surveying; Construction; Construction Technology

Introduction

With the emerging trend on Industrial Revolution 4.0 (IR 4.0) and Malaysian Higher Education 4.0 (MyHE 4.0), an update toward the conventional ways of teaching need to be implemented. This has been stated in the MyHE 4.0 that 21st-century teaching has to be implemented to enhance the quality of education. IR 4.0 as described by Schmidt & Manyika, (2013) is a phase that will address and solve some of the challenges and limitation of the world today. According to the Malaysian Education Blueprint, 2013-2025, higher education institutes have to acknowledge the change and act toward achieving the MEB 2015-2025.

Based on recent findings, students who are pursuing science, technology, engineering and mathematics (STEM) as their degree of choice is gradually decreasing. The study conducted cited that this was caused by the lack of motivation and the outdated method of teaching and learning methodology as the major reason for this decreasing trend. This is mainly because STEM education currently relies heavily on the traditional pedagogical method. The methods did not take advantages of the technological advancements and technological savvy students nowadays (X. Chen, 2013). Chien & Lajium (2016) also added that Korea has successfully implemented STEM education by emphasizing the use of technology in the classroom; Korea has packed their classroom with technologies such as computers, internet, LCD screen and smart boards that have been very helpful in their teaching and learning process.

However, the decreasing trend could be overcome by implementing Augmented Reality (AR) which has been recognised as one of the medians of interaction to capture student’s interest during teaching and learning process (Y.-C. Chen, Chi, Hung, & Kang, 2011; Mekni & Lemieux, 2014; Radu, 2014). AR has been adopted in other countries such as North America, Europe, and other countries which had shown significant results in term of developing and producing STEM students in their countries (Bower et. al, 2014; Liakokapis et al., 2004). Furthermore, AR has been proposed as one of the enablers in MyHE 4.0 by Selamat et.al, (2017) as shown in figure 1 below. With the implementation of AR in higher education, one of the elements of MyHE 4.0 will be incorporated in the quantity surveying course that will enhance the quality of teaching.

Augmented reality (AR) or mixed reality is defined as overlays artificial or virtual effects onto the real world using computer generated graphics or 3D models (Delello, 2014). Researcher Milgram et.al (1995) has explained that AR is a mixed reality that adds graphic elements to the real world and does not relate to virtual reality which creates a virtual environment for the users in Figure 1. AR can aid users to better grasp the knowledge and functionality that had been delivered through the content with the help of computer-generated visualisation (Emiroğlu & Kurt, 2018). With the current technological advancements, AR technology has come to the point that it can be accessed by anyone and anywhere. This is due to the existence of smartphones. Nowadays, smartphones are so advance that it is considered as a minicomputer that fits on the palm (Anshari et.al, 2017). Furthermore, smartphones are also considered the best tools to adopt AR technologies because of its onboard sensors which are global positioning system (GPS), internet access, display panel and a camera. Hence, AR will be integrated into an application so that it can be accessed.
AR has been utilised in the various field of education, training, entertainment and simulations. The use of AR in education has gained momentum from the Z generation as it is easily accessible by mobile devices which is available to most Z generation students. AR's ability in visualisation helps to enhance student's creativity and understanding of the course (Hughes et al., 2005; Pan et al., 2006). Besides, many researchers concluded that the AR's interactive simulations are more effective for cognitive learning (Dünser et al., 2012; Georgilakis, Orfanos, & Hatzigianniadis, 2014; Lee, 2010). Due to the rising popularity of mobile learning in the last decade, AR application for education has drastically increased in numbers and is mainly used with mobile devices (Emiroğlu & Kurt, 2018).

Quantity surveyors play an important part in the construction industry. Generally, quantity surveyor is a professional that is involved in a team comprising of client, architect, engineers, and contractors which combined the skills in drafting and interpretation of contract documents and to safeguard the ongoing progress of a construction project (Nnadi & Alintah, 2016). Quantity surveyors serve as one of the team advisors toward the construction project. In the construction industry, the main source of information exchange is largely made through construction drawings, which until this day is in the form of 2D drawings. However, there are challenges in interpreting or understanding 2D drawings into a 3D object which involves understanding the vertical and horizontal elements of the drawings (Suk, Ford, Kang, & Ahn, 2017). Therefore, construction technology courses are important for students, as the course teaches students how to understand and visualise what are the construction process involved on site. However, the attempt is insufficient as construction technology courses often utilise the outdated method of teaching and learning, same as other quantity surveying courses (Hasan & Rashid, K., 2005; C. C. Lee, 2009; Shirazi & Behzadan, 2014; Zakaria, Munaaim, Khan, 2006). With the implementation of AR into construction technology courses, students can better understand, visualise and interpret the 2D drawings.

Research conducted regarding AR integration into the construction field are infrequent. In a research by Shanbari, Blinn, & Issa, (2016) on teaching Mansory and roof components for construction management students using AR based videos, the students have positively agreed that AR had aided them in visualising roof construction and its components. Shirazi & Behzadan, (2015) has integrated AR into the teaching of building design and assembly project on construction students, Shirazi reported that AR content increased the performance of construction management students in term of understanding the concept of the subject. However, there are small numbers of AR content related to construction technology that can aid students in visualising and understanding the course. Therefore, this study aims to design, implement and assessment the readiness, expectancy and acceptance of students toward a new technology-based pedagogical methodology based on augmented reality (AR) technology to support the prospect of a more engaging learning experience in construction technology courses for quantity surveying and construction degree programmes at Universiti Teknologi Malaysia.

Methodology

Forty-one first-year Quantity Surveying undergraduates who enrolled in Construction Technology 1 at Universiti Teknologi Malaysia, Skudai participated in the study. Construction Technology is the first course that will expose students to the construction design and methods in various building components such as substructures, super-structures and finishes of a low rise building. The course learning objectives are 1) Understand the principle of design and method of construction of the related building components, 2) Describe the process of carrying out the work, 3) Sketch the plan, section, elevation and diagrams if necessary of all related building components, 4) Understand and describe the relevant construction materials. The students participated in this survey had no construction industry experience beforehand. The research design of a single group, pre-test and post-test was employed to determine whether AR images can help enhance the students understanding of construction technology. The students were asked to list out the components, materials and explain and sketch the construction process of a pad foundation. The students were given 15 minutes to answer the following questions.

Before the second test, students were presented the AR modules which include the 3D models, 3D animation video of the construction process and on-site scenario of constructing the foundations. The students were also given AR markers on foundations which can be accessed and overlaid as 3D models on the marker using their mobile phone.

The list of foundations was 1) Isolated Pad, 2) Combined Pad, 3) Piling, 4) Raft Foundation, 5) Strip Foundation, 6) Cantilever Foundation. The 3D models were created using Sketch-up 2017 and imported to the AR application.
as an FBX file format. After the presentation of AR modules, students were asked to re-take the quiz in 15 minutes and submit their answers when the 15 minutes is over.

Lastly, the two tests were graded and compared the mean scores of the pre-test and post-test. This comparison is made to analyse whether AR could enhance the students understanding and visualisation of construction technology.

Results

From the graded test, it shows that sixty-eight percent of the students had an increase in scores with the aid of a 3D model in AR and some students could explain the construction process more thoroughly after using AR application in the second attempt. Twenty-nine percent of the students have their scores remains the same and unchanged. Only one student had a decrease in scores after using the AR application. The results show that there was significant evidence that student’s understanding in construction technology was improved, as shown on the post-testing.

<table>
<thead>
<tr>
<th>Results</th>
<th>Number of Students</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase</td>
<td>28</td>
<td>68.29</td>
</tr>
<tr>
<td>Unchanged</td>
<td>12</td>
<td>29.27</td>
</tr>
<tr>
<td>Decrease</td>
<td>1</td>
<td>2.44</td>
</tr>
</tbody>
</table>

Conclusions

Based on the results of the analysis, it shows that students understand and could visualise more with the help of 3D models projected by the AR application. This confirms that AR images enhance the students understanding of the foundations and its construction process. The results suggest that AR technology could enhance the understanding of construction technology courses for quantity surveying students. Although it is difficult to visualise the construction process and the structure of the foundation, the students can illustrate and visualise it using AR technology. Moreover, with the implementation of AR in the syllabus, students who do not have the extensive field experience can understand and interpret the construction process and components of the construction elements. Even though site visits at construction sites could promote the students understanding, it is hard to conduct site visits that are tailored to the course outline.

With the integration of AR application in the student’s syllabus, students can access the 3D image overlaid on the marker easily with the AR application. Nevertheless, to apply AR in the student’s entire syllabus, it requires a lot of resources as this type of AR requires 3D modelling and animation videos. Different contents need to be developed to aid the students according to the course outline to develop the continuity of applying AR to the whole syllabus. More research efforts have to be conducted to simplify the integration of AR and the content.

Understanding and visualising construction elements is important for quantity surveying students to better prepare them for the industry. Therefore, with the implementation of AR in the teaching and learning process of quantity surveying students, the construction technology course can be enhanced.

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Implementation of Guided Milestone for PBL Assignment in Electronic Circuits Course

Nurul Ezaila Alias
School of Electrical Engineering, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.
ezaila@utm.my

Mastura Shafinaz Zainal Abidin
School of Electrical Engineering, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.
m-shafinaz@utm.my

Norhafizah Ramli
School of Electrical Engineering, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.
e-hafizah@utm.my

Highlights
In an effort to improve self-guided Problem-Based Learning (PBL) in classrooms, this paper presents an implementation of guided milestone in PBL for Electronic Circuits course in School of Electrical Engineering, Universiti Teknologi Malaysia (UTM). The focus is on developing students’ ability to think critically, creatively and productively about a given engineering problem, and also developing teamwork skills. The effectiveness of this implementation was evaluated based on students’ achievement on their individual key performance indicator (KPI) and feedbacks in the end of course (EOC) survey. Based on findings, the implementation of guided milestone gives impact on students’ skills development and better reflect their capability in team working and solve the engineering problems systematically.

Key words: PBL; self-guided; milestone; teamwork

Introduction
Despite increased efforts to enhance student’s team working and communicating skills, many engineering instructors, especially in the electronics area, have difficulties in designing, engaging and maintaining the interest and responsibility of all students towards Problem-Based Learning (PBL) [1]. In engineering area, PBL is a learning approach which places greater emphasis on targeting the learning of complex engineering problem, towards a specific objective [2]. Challenged with a complex, real-world problem, students work in teams to understand the problem and propose solutions. Students must analyze the nature of the problem, identify what they need to know and how to find needed information, and apply what they learned to generate ideas for possible solutions [3]. In today’s traditional classrooms, students are guided to work on long-term PBL tasks that involve engineering problems; they work alone, write for the teacher alone, and make presentations, however, this conventional method clearly does not reflect genuine assessment towards the students.

In this study, we have proposed on implementation of guided milestone for PBL in order to improve the conventional practice of self-guided approach. The study involved two groups of second year students from the School of Electrical Engineering, UTM who registered in Electronic Circuits course in 2016/2017-1 and 2017/2018-1 academic sessions. Both groups were assigned with similar PBL tasks and same project duration, but have some differences in project timeline delivery and assessment rubrics. Comparison were made between these two groups of students corresponds to their achievement for PBL assignments according to self-guided and milestone guided implementation.

Methodology
In 2017/2018-1 academic session, there were 12 sections offered for Electronic Circuits course. In this study, the results based on the guided milestone for PBL implemented in Section 6 with 31 students are emphasized. For comparison with self-guided for PBL implementation, the results achieved by 29 students taught by the same lecturer in 2016/2017-1 are reported as well. These two groups of students include Malay, Chinese and Indian students from Electrical-Electronic Engineering programme. This PBL assignment which contributes 10 % for the final grade marks, is an assessment method that mapped to the second course learning outcome (CLO2) of this course. The final results on individual key performance indicator (KPI) and students’ feedback in the end of course (EOC) survey are used as an indicator to evaluate the effectiveness of PBL implementation using self-guided and guided milestone approach.

With the targeted learning outcome to demonstrate team working skills and communicate effectively as stated by CLO2 for this course, this PBL method is designed with the assessment tools that consist of individual and group evaluation. In addition, peer review also was conducted to
Contribute as auto-rating factor in calculating the final assignment mark for each students. For 2016/2017-1 students’ group, there is only one assessment rubric for group mark based on the final output of PBL assignment. Next, the final mark for each students would be determined by multiplying the group mark with the auto-rating factor. For 2017/2018-1, the details marking scheme which consist of group and individual mark is shown in Table 1. A few assessment rubrics were prepared according to milestone’s task, either in group or individual delivery. The total score for group marks would be multiplied with auto-rating factor before been added to individual mark, to determine the final assignment mark for each students.

Table 1: Mark distribution of PBL assignment for 2017/2018-1 students

<table>
<thead>
<tr>
<th>Group</th>
<th>Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milestone 1 – DC Analysis and Simulation</td>
<td>-</td>
</tr>
<tr>
<td>Milestone 2 – AC Analysis and Simulation</td>
<td>1% Revision Compulsory 1%</td>
</tr>
<tr>
<td>Milestone 3 – Hardware Implementation</td>
<td>Minutes of Meeting 2% (Use the provided form)</td>
</tr>
<tr>
<td>Milestone 4 – Project Demo &amp; Final Report</td>
<td>Demo 2% - rubrics Complete Report 2% - rubrics</td>
</tr>
<tr>
<td>Peer Review (Online) – will contribute to Auto-rating factor for Group Marks</td>
<td>-</td>
</tr>
<tr>
<td>(0% on group mark if no peer review submission)</td>
<td>Week 9</td>
</tr>
<tr>
<td></td>
<td>Week 12</td>
</tr>
</tbody>
</table>

Results and Analysis

Based on EOC survey, students give their feedback on accomplishment level in PBL implementation in rating scale 0 to 5, where 5 = accomplished well to 1 = accomplished poorly and 0 = not accomplished. The pie chart in Figure 1 and Figure 2 summarized the feedback and comments given by 2017/2018-1 students towards the guided milestone in PBL implementation, respectively. As displayed in Figure 1, it shows that about 95% of the students rated level 4 and 5, which confirms that they have accomplished well in PBL assignment with milestone guided implementation. Along with this findings, 62% of the students give their satisfactory comment as shown in Figure 2. Some satisfied comments are those who said they could learn from the very beginning of the project and not depending on the team member, the lecturer will have more time in evaluating each of the students and each of the students give their full of effort since they have to fulfill every required item from the guided milestone. On the other hand, only 5% of the students who did not accomplish quite well their PBL and this reflects from the comments’ findings where 10% of the respondents do not feel satisfied with the guided-milestone implementation where most of the comments said they felt burdened with too many evaluations and delivery.

Figure 3 shows the CLO2 achievement level as rated by students in EOC survey. This is used to measure the achievement of targeted learning outcome through PBL implementation. Again, based on various feedbacks received from students, they can be classified into three categories: satisfied, neutral and unsatisfied, as shown in Figure 4. Based on these data, it is found that more than 80% of students claimed they had accomplished well for targeted CLO2, which agrees well with their satisfactory comments with only 27% who do not satisfied. The implementation of guided milestone in PBL task contributes to their satisfaction of CLO2 achievement.
The comparison between self-guided PBL (2016/2017-1) and guided milestone PBL (2017/2018-1) have also been done based on the students’ individual KPI achievement for CLO2 where their team-working and communication skills were evaluated. It was a fair comparison because the same PBL task was given to the students. The main difference is for 2016/2017-1, there was only one-time peer evaluation while three times peer evaluation were done in 2017/2018-1 according to the milestone’s task. The KPI achievement for CLO2 of students from 2016/2017-1 and 2017/2018-1 academic session was summarized in Figure 5. Majority of the students for both semesters scored high KPI where more than 80 % of the students scored more than 0.65. Although 83 % of the students from 2016/2017-1 scored more than 0.8, however, the trend for 2017/2018-1 is more reasonable with 55 % and 31% scored more than 0.65 and 0.8 respectively. This result proves that in 2016/2017-1, students are not transparent when evaluating their team member during peer evaluation as only been conducted once throughout the project duration. Most of them simply gave a high mark to their team member at the end of the course. In contradiction of 2017/2018-1, the students are more transparent and honest in evaluating their team member based on their cooperation in completing the PBL task by following the given guided-milestone. Therefore, the effort of team working among the members would be appreciated better. Moreover, they got experience being trained to adapt on real working behaviour with proper timeline in solving any engineering problem that might be faced in future.

Conclusion

As an initial study on PBL implementation for Electronic Circuits course, these findings indicate that the implementation of guided milestone do have a significant compared to conventional self-guided practice. It also gives positive impact towards students’ team working skills and capability to communicate effectively, especially in task delivery on time, inter-person responsibility, and being honest in expressing their opinion towards team members. The implementation of guided-milestone is highly recommended to other courses in School of Electrical Engineering as the students will be fully-prepared to face the real working culture.

References


Learn to play, play to learn and learn to learn (L2P-P2L-L2L): Integrating universal design for learning (UDL) and gamification

Chong Chou Min
Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia.
choumin@upm.edu.my

Zarirah Mohamed Zulperi
Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia.
zarirah@upm.edu.my

Chong Leong Puan
Department of Forest Management, Faculty of Forestry, Universiti Putra Malaysia.
chongleong@upm.edu.my

Mohd Redzwan Sabran
Department of Nutrition & Dietetics, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia.
mohdredzwan@upm.edu.my

Lai Kok Song
Department of Cell & Molecular Biology, Faculty of Biotechnology & Biomolecular Sciences, Universiti Putra Malaysia.
laikokson@upm.edu.my

Kelly Wong Kai Seng
Department of Agribusiness & Bioresource Economics, Faculty of Agriculture, Universiti Putra Malaysia.
kellywong@upm.edu.my

Highlights

The current tertiary curriculums aim solely to develop students’ knowledge in their respective fields. Most educators use the pedagogical methods that they are comfortable with, overlooking students’ individual differences and needs. This hinders effective implementation of Teaching and Learning (T&L). A transformative approach is needed to introduce scientifically proven guidelines into T&L to allow students mastering the learning process itself in addition to their respective fields. By integrating Universal Design for Learning (UDL) into gamification, this project introduces “play to learn, learn to play, and learn to learn” (L2P-P2L-L2L) system to create flexible and engaging learning environments that accommodate the diversity of both learners and educators. The “L2P-P2L-L2L” provides diverse means of self-engagement, acquisition and expression of information. This allows students to find their own way of learning and develop intrinsic motivation to learn more. In the current project, our analysis showed that the “L2P-P2L-L2L” activities statistically positively affected students’ examination scores. Furthermore, students also developed proactive behaviour in the classes. It is demonstrated that students were able to apply the skills and techniques that they attained from the “L2P-P2L-L2L” activities in their examinations. The current project is versatile and applicable in any other courses.

Key words: Universal Design for Learning; gamification; intrinsic motivation; learn to learn; L2P-P2L-L2L.

Content

Project objectives

The main goal:
In addition to mastering the knowledge in specific fields, the transformative project aims to allow students to master the learning itself, through integrating UDL into gamified T&L activities.

Specific Objectives:
A. L2P:
   a. identify the goals under competitive environment.
   b. explain and adapt the rules of the game.
   c. assess their own strengths and resources.
   d. think out of the box without breaking the rules.
   e. develop strategies to achieve their goals.

B. P2L:
   a. Students get engaged and intrinsically motivated in the gamified environments and are willing to learn more.
   b. Students obtain knowledge through the gamified activities.
   c. Students get stimulated about proactive learning through diversified means.
   d. Students cope with competition positively.

C. L2L:
Students master learning skills by realizing multiple ways for self-engagement, presentation and representation of information, as well as expression of knowledge.

NALI approach implemented in the research (e.g. novelty, creativity, innovativeness, applicability and impact)

A. Novelty
   a. The “L2P-P2L-L2L” is the original idea that integrates gamification and UDL approach.
   b. As educators, we should not assume our techniques fit for all students who have their own strengths and weaknesses. For instance, digital native generation responds differently to e-learning implying its effectiveness. The UDL is designed to accommodate the diversity of the students using neuroscientific findings. However, the complexity in designing T&L activities in accordance to UDL might hinder educators from employing it. To kickstart the concept of UDL into tertiary curriculum, our team integrates gamification and UDL.
   c. With gamification, UDL becomes vivid and can easily to be implemented. With UDL, gamified activities consider the diversity of students which means that it becomes intrinsically motivating and purposeful.
   d. The integration leads to three novel interactions:
      i. “L2P”: The games enhance students’ understanding of a subject. The games emulate rules and competitiveness of workplace.
      ii. “P2L”: Students develop intrinsic motivation, become resourceful, strategic and goal-directed.
      iii. “L2L”: Students master the learning skill, which can be applied in their respective fields and beyond that.

B. Impact
   a. The project involves educators of different faculties, who are teaching different courses of both technical and social sciences. By implementing the project, the outputs of these respective courses have been shown to be encouraging. This implies that the versality of the “L2P-P2L-L2L” system and its potential to be adopted in any other courses and fields.
   b. In fact, the technique can be adopted in the outcomes-based education (OBE) system of the current tertiary curriculum to foster mastery of learning among students.

C. Benefits:
   a. Cost savings: “L2P-P2L-L2L” emphasizes on the design of the gamified activities rather than adopting expensive game or applications. Thus, it is low in cost (if any) and effective.
   b. Efficiency: “L2P-P2L-L2L” is intrinsically engaging and fosters the students in mastering learning skills.
   c. Recyclable: “L2P-P2L-L2L” aims to create flexible environment that accommodates the needs of different students, which can be reused again and again.
   d. Versatility: “L2P-P2L-L2L” is not exclusive to certain course or field, it is applicable to any other courses. It allows the activities to be carried out with or without internet.
   e. Sustainability: Summing all the aforementioned features, the current project is sustainable and practicable.

Research Methodology

The project provides a module for “L2P-P2L-L2L” T&L activities. These activities were carried out in six different courses covering both technical and social sciences. A simple regression analysis was performed to assess the effectiveness of “L2P-P2L-L2L” activities in improving students’ performance in terms of their examination marks, punctuality and attainment of higher order thinking questions.

Finding and discussion of the project or innovation

The transformative project creates a tolerant, flexible and fun learning atmosphere which diversifies learning options. It fosters the students to master the learning itself in addition to the knowledge in their respective fields.

In the current project, a simple regression performed to assess the effectiveness of “L2P-P2L-L2L” activities, showed that all the tested parameters (examination marks, punctuality and attainment of higher order thinking questions) were statistically positively affected by “L2P-P2L-L2L” implementation.

In addition, students developed skills they learned during the activities and demonstrated their ability to apply the skills. For instance, students applied the FILA technique they learned in one of the games in answering the CTPS questions in the AKU4502 final examination.
Figure 1: Examination marks (PO1), attainment of higher order thinking questions (PO3) and punctuality (PO6) of students in the classes with or without “L2P-P2L-L2L” activities. All the differences were of statistical significance (p<0.05).

Note: Dashed line box indicates the bars produced based on data that was pooled from all the courses; #PO6 was measured based on the percentage of punctual attendance of a student.

Commercialization potential

The current project possesses the potential to be implemented in any other courses and fields, and ultimately it can be adopted in the secondary and tertiary curricula of Malaysian education.

Awards received

The project has won a Gold Medal in Putra InnoCreative Competition; Best InnoCreative Award (Category: InnoCreative in Transformative Teaching); and The Best of Best Special Award: Putra Innovcreative Award (Innovator Award in Teaching and Learning) in the Putra InnoCreative Carnival in Teaching and Learning 2018, organised by Universiti Putra Malaysia and Ministry of Education, Malaysia.
The Utilization of Work-Integrated Learning Pedagogical at Higher Learning Institution: Fostering Engagement with Industry Projects

Phuah Kit Teng  
Faculty of Business, Communication and Law,  
INTI International University  
kitteng.phuah@newinti.edu.my

Bernard Lim Jit Heng  
Faculty of Business, Communication and Law,  
INTI International University  
bernard.lim@newinti.edu.my

Siti Intan Nurdiana Wong Abdullah  
Faculty of Business, Communication and Law,  
INTI International University  
sitiintan.abdullah@newinti.edu.my

Highlights

Work Integrated Learning (WIL) is an educational strategy that intentionally integrate students’ study with real-life work experiences. WIL strategies provide career awareness on opportunities and planning which help students to achieve positive work attitudes and employability skills. The WIL is embedded with marketing subject where data were collected from 75 students who went through the industry projects for 14 weeks. The initiative is successful as the students were well-matched where WIL had provided students with industry related knowledge and understanding on professionalism. The employers were impressed with the students’ performance where the students were offered internship positions immediately.

Key words: Employers; students’ engagement; industry projects; work integrated learning

Introduction

From 2010 to 2014, Malaysia’s unemployment rate is relatively low at around 2.8 to 3 percent. However, the unemployment rate has increased from 2015 (3.1 percent) to 2017 (3.42 percent) (Statista, 2018). The number of job seekers and unemployed are generally young people, who have had trouble entering the job market (Statista, 2018). In 2017, 25% of fresh graduates in Malaysia remains unemployed for six months after graduation (The Star, 2017). This shows that Malaysia education system has failed to produce knowledgeable workforce that meets the need of the industry (The Star, 2016). Due to these unemployment issues, the Malaysian government is inspired to open up employment opportunities for young adults. As such, work-integrated learning (WIL) is being introduced in Higher Learning Institution to enhance graduates’ employability.

Project Objectives

General Objective:  
To ensure that WIL emphasizes student-centred learning and outcome based learning.

Specific Objectives:  
1. To develop the partnership with employers.
2. To provide career exploration, job opportunities and experiential learning opportunities for the students.
3. To help students reach competencies such as positive work attitudes, technical and employability skills.

Novelty (New Ideas)

Due to the unemployment issues, WIL was implemented in INTI International University where employers and industry practitioners are playing an important role to enhance student experience. WIL is an educational strategy that integrates students’ educational experiences with real-life work experiences to prepare the student with relevant professional skills such as communication, problem-solving, collaborating and planning. In addition, it helps students to reach competencies such as positive work attitudes, technical skills and employability skills.

Creativity (Design of Ideas)

According to Barnett (2006), teaching and learning in professional education should be based on the linkage between academic knowledge and professional practices. The WIL approach seeks to build such linkages that benefits the students’ learning.
The learning emphasis of the WIL programme includes learning outcomes; learning assessment; and learning plans. The learning outcomes helps to define the expected result from the arranged projects. The development of learning assessment, tasks and plans reinforces the learning outcomes and provides a measurement to ensure that relevant parties share the same learning goals. The learning plans ultimately shape the nature of the work experience by handling the required tasks, implementation and purpose.

2. Selecting the suitable employers

Lecturers are tasked to select industry project that provides the best outcome-based education and meaningful experience.

3. Mentoring

In a WIL setting, lecturer is the mentor who encourages teamwork and support the transition from theory to practice (Lu, 2007). They play a critical role in providing positive feedback and knowledge to students (Diambra et al., 2004). There are two main area of mentoring in WIL. Firstly, mentors will plan the learning activities and provide constructive feedback (Linford & Marshall, 2014). Secondly, mentors will facilitate active learning through interactive mentorship. (Linford & Marshall, 2014).

Innovativeness (Changes/Improvement)

WIL has improved the educational partnership between the academic institution and employers through integration of theory and practice. Through WIL, students were able to bring innovation to employers.

Applicability (Relevant to New Academia Learning Innovation Model (NALI))

Learning Pedagogy:

1. WIL focuses on Outcome-based education (OBE) where the educational system is based on learning outcomes. Upon completion of industry project, each student should achieve the specified learning outcomes through structured opportunities and assessments.

2. WIL focuses on the improvement in Job Creation by providing career exploration and experiential learning.

Digital Resources:

1. BlackBoard (BB): Discussion platform via group discussion / group wiki.
2. M-Learning: Connection platform (WhatsApp’s) between the employers and students for enquiry or clarification purpose.
3. Showme Apps: Knowledge-sharing platform through videos from instructors.
4. Zoom: Virtual meeting platform.

Impact to Students’ Learning (Engagement and Empowering)

WIL has emerged as a pedagogical strategy that enhance student learning and development (Kennedy et.al, 2015). It helps students to integrate theory with real-world working environment (Cooper, Orrell & Bowden, 2010) which enhance students’ learning and develop work-ready competencies. WIL had foster professional growth and enrich students’ capability in communication skills, business knowledge and professional networking.

Research Methodology

Figure 1 shows the design of WIL where the academic and workplace supervisors are able to plan and facilitate appropriate learning experiences that link the workplace and university contexts – making WIL an integrated experience (Bell et al. 2003). In this context, the academic supervisor assumes an important role as coordinator.
The WIL in this study is implemented through industry projects and data were collected from 75 students who went through the industry projects for 14 weeks with two corporate and two SMEs. Students and employers’ feedback were collected through interview (qualitative). In addition, total students undergo internship and the duration of students being hired were recorded from 2016 to 2018 (quantitative).

Finding and Discussion

The industry projects are successful as the students were well-matched with meaningful experience. WIL provides students with relevant industrial knowledge through understanding of workplace culture, practice and professionalism. Table 1 clearly shows that there is an increase of students getting job before graduation. In 2018, some employers were impressed with the students’ performance where respective students were offered internship positions immediately. This project also increased the students’ employability as compared to those who did not participate.

Table 1. The Timeframe of Students Being Offered a Job

<table>
<thead>
<tr>
<th>Year</th>
<th>Organization</th>
<th>Total students involve</th>
<th>Being offer internship</th>
<th>Before graduation</th>
<th>1 to 3 months after graduation</th>
<th>3 Months and above after graduation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Genting Malaysia Berhad</td>
<td>11</td>
<td>-</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>2017</td>
<td>Delux Company</td>
<td>24</td>
<td>-</td>
<td>14</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>2018</td>
<td>Kueen Sing Auto (M) Sdn Bhd</td>
<td>14</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T-Biomax Sdn Bhd (Brand: BioTHiK ACTIVE)</td>
<td>16</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T-Biomax Sdn Bhd (Brand: SCALPTURA)</td>
<td>10</td>
<td>6</td>
<td>Students currently undergoing their internship for 16 weeks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Upon completion of this project, students also provided positive feedback as shown below:

“Through the industry project, it equips me with the knowledge, the real market scenario and the skills to talk to employer (applicable during interview).”

Edwin Ng Teck Tsing, Graduated in 2017, currently work with AirAsia

“In my opinion, industry project is good because we got to know the real business world. This experience cannot be obtained from our textbooks. Furthermore, I am proud to inform my interviewer that industry project had effectively benefitted me in my future careers and I have learned a lot from the industry project.”

Chong Sheng Rong, Final Semester Student, undergoing internship

Other Relevant Information

Commercialization Potential: The advertisement and mobile application which created by the students being commercialized by the employer. Mobile application is currently at the trial stage. Pictures below show the sample of advertisement and mobile application. Awards received: Gold Medal, Putra Innovative in Teaching and learning, 2018
References


ACQUISITION AND COMMUNICATION SKILL

Yashotha Subramaniam, Nurul Farhana Jumaat, Nor Fadila Amin
Universiti Teknologi Malaysia
yashidgreat@gmail.com, nfarhana@utm.my, p-fadila@utm.my

Highlights
In most cases in rural areas schools in Malaysia, students of these schools usually have difficulty to communicate in English as many of them have lower language proficiency compared to students in the city. This innovation model aims to focus on the alternative way of teaching English specifically in developing vocabulary acquisition with a more hands-on activity that simultaneously promote speaking and listening skills which are the major influences on communication skill. This is a qualitative study that observed student’s vocabulary acquisition and communicative skills in a rural area in Sekolah Menengah Kebangsaan Seri Sembrong, Kluang, Johor.

The respondents consist of 26 average grading students. The students are required to work in a group where they were asked to create their own stories by using miniatures and followed by 2D miniatures individually. Their vocabulary acquisition and communicative skills are being recorded and their performance were assessed based on a focus group interview. The application of the model successfully promotes students’ positive attitudes towards speaking and listening skills. The results also evidenced that the innovation model had impacted students listening and speaking skills in a good way, such as in vocabulary development, the pronunciation and the fluency of the language. These findings give a clear view on why more implementation of alternatives modern approaches in English class can influence students’ communication in general.

Key words: Innovation in Teaching and Learning; Problem-based Learning (PBL); Entertainment Elements (Edutainment); vocabulary acquisition, communicative skill, speaking and listening skills.

Introduction
Some rural schools students have lower English proficiency level and poor communication skills as compared to those students who studies in city. Listening and speaking skills are the major elements that related closely to the enhancement of communication skill. Communication is significant for students to master especially in doing classroom activities such as group activities and discussions. Students usually get frustrated with the fact that they are still unable to speak English fluently regardless of being exposed to the language from such a young age (Thornbury, 2008).

As one of the ways to improve students’ vocabulary and communicative skill, we have created a model entitled “Journey to school”. The model that is built is a miniature of a town which incorporate small parts like buildings, houses, vehicles, road, waterfall, animals and trees. In designing the model, we focus on making this model a teaching tool that incorporate communicative approach where students will acquire vocabulary, speaking and listening skills simultaneously when they communicate in group discussion and presentation. This is as supposed by Thornbury (2008), which states that teaching language systems in isolation such as grammar and vocabulary are switched to teaching using real communication.

The innovation model is designed as an attempt to bring new and interactive teaching aids in helping vocabulary acquisition of the students as supposed from the traditional classroom activities that could be boring and no longer suitable as the 21st century learning tools. The model also aims to improve students speaking and listening skills simultaneously as they work together for group discussion and presentation. The utilization of the model in teaching and learning process of English subject in school served the purpose of creating a lesson that is less stressful where students can communicate comfortably with their peers and teacher. Through the task, students work in groups and come out with a story of their journey to school. The interesting part of the task is that the students can arrange and play the parts of the model such as the buildings, waterfall, animals and cars the way they wanted to and present their story together in front of the class. This is also to avoid students from learning English through memorization but enhancing them to acquire vocabularies and confidence in speaking the language in more natural way. Once students completed the group task, an individual task will be assigned to build more confidence and effective in acquiring vocabulary and communicating without help from peers and teachers. The following task will be in 2D game stimulation, where each student will create their own story by dragging the items to create the story according to their imagination. Students will be trained to be more creative and implementing analytical skills throughout the fun game, as the more addition of pictures in their story, the more marks will be given in the games. Teacher will observe students’ performance by getting their assessment done through the game, and assignment as an essay, as the final work.

Objectives
1. To design and develop an interactive teaching aids in helping vocabulary acquisition of the students.
2. To assess student’s vocabulary acquisition and communication skills through story creation method

NALI Approach

The task that getting students to identify, analyze, collecting information, making decisions, identifying best solutions in the given task is much considerate on Problem – Based Learning (PBL). Students are required to seek out all the possible incidents throughout the journey to school from their home. PBL enhance a deeper understanding of concepts and the moderate complexity task will ensure that the students must work in a team to solve it. Students required to make reasoned decisions and to defend them in their group presentation. The next level, will be on 2D game stimulation, where the need of each and every student to come out on their own input. PBL implementation in the group will enhance students confidence and to ensure the effectiveness. 2nd level activity will be done individually (2D game stimulation), align with Education 4.0 requirement to access students capability.

Education 4.0 emphasizes on the combination of education and entertainment (edutainment), which is implemented via software. Edutainment is implemented in this innovation to make the lesson fun and entertaining in a competitive way. Due to the completion of group work with the miniatures models, the second stage required each and every student to complete individual task. Students required to complete the journey by dragging 2D model items throughout the ‘Journey to School’ game. By now, students will communicate in individual their own story with their teachers, and final submission of an essay based on the story they create themselves. This will create more creative and innovative students, and the marks will be more challenging as, the more items used, the more marks will be accumulated. Thus, it helps the students to be more creative, to have a problem solving skills, enhancing analytical skills as well as psychomotor skills.

Findings & Discussions

Looking at the model for the very first time, respondents feel excited but confused on the operating procedures. They did not know the usage, and the purpose of the innovative model. After a brief explanation, and a mock presentation from the researches, respondents feel curious and feel confident to take part in the activity. The most important is that 88% of the respondents agree to talk in English with the usage of the model. This clearly shows that the model encourages and guides students learning and communication skills. It is undeniable that students felt excited on using our product. They were keeping on changing the ideas for the stories creatively.

It’s crystal clear, that our innovation has created a major positive impact to the students and the teacher herself. More than half of the class, are looking forward in learning English in an innovative way. From the findings, it is found that most of the students and teacher have positive feedbacks on Innovative Model for Vocabulary Acquisition and Communicative Skill. It is found that all of them stated that with the use of Innovative Model, the teaching and learning becomes more easy, faster, enjoyable and interesting for both the students and teachers. Students are majorly exposed to the traditional way of teaching and learning process which reduces their motivation to learn English and decrease their appreciation towards the language.

Through the application of the model, it is found that the students and teacher agreed that the application promotes the new ideas of teaching and learning for the students. It is important to enhance students’ motivation in language learning because motivation increases their performance and without motivation, learning is not possible (Rehman and Haider, 2013).

According to journal ‘Creative and Innovative Ways to Teach English: YOU MAKE THE DIFFERENCE’ by Associate Prof. Koh Soo Ling (2007) from Universiti Teknologi Mara, activities for language teaching can be based on everyday materials. Thus, educators should not be afraid to try out unconventional tools based on personal experience in the classroom. Its crystal clear innovation in teaching English is much more attractive. Creative and imaginative activities help alleviate problems that hinder language learning (Di Pietro, 1987).

Di Pietro statement is much appropriate in our innovation model, where students in a group will think in a creative way to create story. Model topic ‘Journey To School’ has given vast experiences to think out of box in creating stories. Some came up, with accident incident, some narrated funny stories such as swim together horse in the waterfall, and some even could match up with daily life incidents. The most surprising part is when, two group of the students has requested for 2nd round opportunity to blast new story.

Table 1 clearly shows, learning English in fun way will create a strong enthusiasm and possess high intellectual among the students. Figure 1 show presentation from 2 different group of students.
Table 1: Quick Survey Innovation Model Adaptation for Students

<table>
<thead>
<tr>
<th>Question</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you communicate in English</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>How many of you Like English Language</td>
<td>19</td>
<td>22</td>
</tr>
<tr>
<td>Do you feel shy to talk in English</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Can you make sentences / Essay</td>
<td>12</td>
<td>22</td>
</tr>
</tbody>
</table>

References


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Fun Learning Toy Library as a Passage to Shape Future Scientists and Engineers

Noor Hamizah Hussain; Habibah @ Norehan Haron, Hayati @ Habibah Abdul Talib, Roslina Mohammad, Norulhusna Ahmad, Shamsul Sarip, Mohamad Zak’ Hassan, Rasheed Mohamed Kutty

Universiti Teknologi Malaysia
hamizah.kl@utm.my

Highlights

The Fun Learning Toy Library (FLTL) has provided a conducive environment for pre-schoolers to develop their interest and motivation in science, technology, engineering, arts and mathematics (STEAM) at a very young age. The preliminary study was conducted at one rural primary school at Kelantan that was hit by flood in December 2014. The pre-schoolers were badly traumatized and not motivated due to the disaster. By having the FLTL in school, these children become excited to STEAM and to attend school daily. The preliminary result exposed the FLTL has a positive impact for grooming young scientists and engineers for the country.

Key words: Pre-school; STEAM; STEM; Toy Library; Sciences and Technology; Rural

Introduction (Project or innovation)

In the late December 2014 saw the destruction of most parts of Kelantan, badly hit by the big flood. The destruction has caused trauma to the community in Kelantan, more so to those living in the rural areas, namely Kuala Geris, Dabong in Kuala Krai District of Kelantan. The disaster has affected the livelihood of the villagers; homes, schools and all infrastructures were destroyed and damaged. A group of lecturers from Universiti Teknologi Malaysia (UTM) Kuala Lumpur teamed up and formed a social responsibility group named Adopt a Kampung to help rebuild the community in Kuala Geris. Apart from other social work carried out in the area, Sekolah Kebangsaan Kuala Geris (SKKG) was adopted as a recipient for the rebuilding project. Based on a preliminary study after the initial phase of work was completed, the students’ attendance to school was reported to be very poor, especially among the pre-school students. It was reported that many of these young children lost their homes and had difficulty going to school; some for the fear of being separated from their families after the flood traumatic experience.

Project Aim and Objectives

Project Aim is to elaborate on the FLTL development and to evaluate its impact on the preschool students. While the project objectives are to develop a FLTL for STEAM education especially for pre-school; to expose pre-school student to STEAM at an early age with the concept play and learn; and to promote and instill STEAM among the pre-school as grooming young scientists and engineers.

Novelty (New Ideas)

The FLTL project, which focuses the concept of STEAM at the pre-school level, has also received attention from the industry, the Academy of Sciences Malaysia, and Deputy Minister 1, Ministry of Education Malaysia. As such, the team believes that through FLTL it can be a positive “platform” to continue serving the community and sharing knowledge expertise through FLTL developed. This efforts and contribution is in line with the National Education Philosophy and meet the educational objectives of STEM itself.

Thus, this project of developing and implementing the Fun Learning Toy Library seems to fill in the gap of the national aspiration. By inculcating motivation and interest in STEAM education at the pre-school level, it is hoped that these students will be embarking into STEAM for their future endeavour. The long-term benefit of the FLTL implementation at preschool level is grooming future scientists and engineers from the root.

Creativity (Design of Ideas)

Early exposure to STEM education is critical to later academic achievement (Raja & Bahari, 2017). The blueprint also emphasizes on the “cradle to career” framework where the process starts from pre-school (cradle) to career as shown in Figure 1. The main objectives in the childhood stage are to nurture and inspire the interest (Shahali et.al., 2017). It is a very important stage to be able to trigger and foster students’ interest through activities that can stimulate their curiosity. The decline of interest in STEM in secondary and tertiary levels of education shows that there is still a gap in the early stage of the framework, which is at the preschool level.
Combining playing and educating for preschool children before they enter primary school through fun learning concept is what the Fun Learning Toy Library (FLTL) is developed for. The key concept that is being promoted is the STEM elements integrated with the important skills mentioned earlier for human development at a very young age. It is evidenced that STEM education is able to stimulate the interest in learners to pursue their study and have a career in STEM related fields (Cevik, 2018; Mustafa et al. 2015). Exposing children to STEM at an early age can help instil a love for the subject and increase the likelihood for them to fill up the ever-expanding pool of STEM jobs in the future (Brenna et al., 2018); thus, grooming scientists and engineers from the root. The objectives of this paper are to elaborate on the FLTL development and to evaluate its impact on the preschool students.

Methodology

Selected one rural school at Dabong, Kelantan, Sekolah Kebangsaan Kuala Geris is one of 39 preschools in the area of Kuala Krai District of Kelantan. SKKG has two preschool classes, Class Arif and Class Bijak, with 25 students each. The students are in the ages of 5 and 6 years old. Each class has a teacher and a teacher assistant. The data were collected through observations, interview and document review. Analysis of the data collected elaborates the development of FLTL and shows the impact of the FLTL, expressed in terms of students’ motivation, attendance, performance, and in the networking established.

After the development and setting-up of FLTL completed, teachers are requested to carry out the implementation and help with data collection during the on-going school semesters. Observations on students’ learning interest and quantitative evaluation of their performance in STEAM subjects are reported to us quarterly. Teachers and preschoolers were interviewed to evaluate the impact of the FLTL on the students. The outcome from the impact study is analysed in terms of student motivation and performance, the attendance to school and networking among teachers and parents. Therefore, there are two sources of data collection for identifying the impact of FLTL: reports from the teachers and interviews carried out during the impact study visit.

Impact/Feedback/Result of FLTL Development on Pre-School Achievement

- Teachers highlighted that students are very creative in exploring the toys
- The toys are a great tool that helps the teaching and learning process.
- The students were reported to enjoy the hands-on activities, and that over 50% of them met the practical skills objectives.
- The teacher also reported that attendance to school show an improvement.
- The student performance was analysed in terms of their understanding of STEM subjects before and after FLTL was implemented.
- This implies that the toys in this specific example has impacted them to appreciate the application of science and technology
- Certain toys can be used for more than one themes
- The preschool students are happy to come to school, looking forward to play with the toys and not worried about being away from home to go to school.
- They are able to provide answers to STEM questions and expressed that the learning environment is conducive.
- The students also show confidence in communicating with us, being ‘an outsider’ to their remote community. Although the teachers are concerned with the over enthusiastic preschool students that require more attention, on the whole, the FLTL has a very positive impact on students’ performance and motivations.
General implementation of FLTL approach but it was innovating with the element of science, technology, engineering, arts and mathematics (STEAM) in the framework. This is aligning with the Ministry of Education, pre-school curriculum that consists of six (6) thrusts. The thrusts are: i) Humanities, ii) Communication, iii) Spirituality Attitudes and Values, iv) Self-skill, v) Physical and Aesthetic Development and vi) Science and Technology.

Awards Received (Title of Project, Exhibition And Year)

5 Star CCIN award for 2016 and 2017. FLTL projects run by the USR Razak: Adopt a Kampung Team has been awarded 5 stars by CCIN, UTM for 2016 as well as 2017 on project achievements and project management. Moreover, one of the key people for FLTL development, Dr. Habibah @ Norehan Hj Haron was win the Khidmat Masyarakat Award during the Majlis Anugerah Citra Karisma UTM 2018 for her full support and contribution to the team, FLTL and USR activities.

Acknowledgement (if any)

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Effects of collaborative video assignment towards students’ interest and motivation in engineering service courses

Morina Abdullah
Universiti Teknologi Malaysia
morina.kl@utm.my

Kamilah Radin Salim
Universiti Teknologi Malaysia
kamilah.kl@utm.my

Sya Azmeela Shariff
Universiti Teknologi Malaysia
azmeela.kl@utm.my

Key words: collaborative video assignment; peer instruction; active learning; peer assessment; engineering service course

Introduction

There is a lack of interest and motivation among undergraduate mechanical engineering students in taking other engineering service courses at UTM. Due to the lack of interest and motivation, students come late to class or do not attend class at all. Also, for these classes, students do not have a practical class in the lab. Therefore, their learning experiences are very much limited. In order to overcome this limitation, an intervention was designed to help students explore learning in a service course, specifically for Electronics SMJP 2143. In this intervention, students are given the opportunity to create a video presentation of the related practical work they should be doing in the labs. As an assignment, students had to explain the conversion from AC to DC which comprise of components and measuring instruments used.

Project objectives

• To analyze the nature of students learning environment in engineering service courses.
• To identify factors that affect students learning in engineering service courses.
• To design activities that supports students learning in engineering service courses.
• To assess students’ performance in engineering service courses.

Novelty

Mechanical engineering students are able to explain topic on conversion from AC to DC through a collaborative video assignment using a variety of tools of their choice. The video produced by the teams of students are presented to class for feedback and assessment and later on uploaded on YouTube.

Creativity (Design of Ideas)

Students are given the opportunity to be creative with delivering their contents and explaining the concept of AC to DC conversion via video. They need to be able to transfer the concept and knowledge of electronics to mechanical engineering students through multimedia, without giving a lecture.

Innovativeness (Changes/Improvement)

By completing this collaborative video assignment, mechanical engineering students are able to gain an interest and increase in attitude towards learning Electronics. By the end of the semester, students’ performance in Electronics course have also shown to be improved.

Applicability (Relevant to New Academia Learning Innovation Model (NALI))

Peer instruction, active learning, blended learning, peer assessment

Impact to Students’ Learning (Engagement and Empowering)

In this project, students’ work collaboratively in teams to produce a video to teach others about AC to DC conversion. They are able to present their videos in class and obtain feedback from their
peers. At the same time, students are able to explore tools and technologies used for developing a video for learning purposes.

Research Methodology

The project was done using qualitative method. These include observation and reflection after the course. The students are the second year mechanical students from MJJIT total of 34 students. These students are divided into groups of four and each group is given an instruction set to follow. Observation was done during the activity in the lab by two lecturers. This is to assist students in constructing the circuits and using the measuring instruments. The video presentation of the activities is presented at the end of the semester. The reflection on the teaching method was also done at the end of the final week of the class.

Findings and discussion of the project or innovation

The comments on their learning: encouragement on group discussion, promote cooperation and fun learning process. Their comments on teaching: not stress while learning, teaching method is good and involve hands-on activities (practical) which give us clearer image on what we are learning.

Commercialization Potential

There is a commercial value to the videos that is produced by the student teams.

Acknowledgement

We are grateful to the Mechanical Head Department of MJJIT, the students who register the course, SMJP2143, second semester for the session 2017/2018. Acknowledgement is also given to the technical staff at the Electronics Laboratory.
Adaptation Guideline for Different Type of Learners in Online Learning System

Halina Mohamed Dahlan  
AHIBS (Information Systems), Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor Bahru, Johor, Malaysia  
alina@utm.my

Ab Razak Che Hussin  
AHIBS (Information Systems), Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor Bahru, Johor, Malaysia  
abrazak@utm.my

Highlights

In developing online learning system, the different type of learners must be taken into account to ensure learners are totally engaged in the learning process. Currently, various online learning systems were developed, however, most of them failed to satisfy different type of learners and not considering their differences in learning; therefore the online learning systems developed are not adaptive in the actual sense. Hence, there is a need to propose a guideline for an online learning system that will accommodate for all learners regardless of their differences.

Key words: online learning system; adaptation; guideline; learning style

Introduction

The appearance and enhancement on technology has transformed the way of conducting the process of teaching and learning in the education (Tsai, 2004). Learners are moving towards online learning where the concept of learning anywhere and anytime becomes a new trend in education field. However, the concept of online learning is not simple as putting the course content or information through the online platform. It should consider how individual are difference in their learning in order to improve the overall quality of online learning (Dabbagh and Kitsantas, 2012). Furthermore, most of the existing online learning failed to satisfy different type of learners and not considering their differences in learning by presenting the same kind of course material through online system to all learners as in the traditional classroom approach where “one size fits all”, thus the difference only through the medium of learning delivery of its course content is through online. Individual differences in the learning context refers to the individual uniqueness, differ in their cognitive, and learning style (Retalis et. al., 2004). By accommodating the individual differences in learning can narrow down the gap between individuals and increase their abilities and performance in learning. The development of online learning should consider those individuals are difference between each of them. In order to accommodate the diverse type of learners in online learning environment, personalized online learning environment should provide learner with their appropriate learning material suitable with their learning needs and preferences. The problem in existing online learning is lack of system adaptation. Adaptation refers to the concept of make an adjustment to the learning environment so that it can accommodate different type of learners (Magoulas et. al., 2003). Through adaptation, learning system will provide learners with only appropriate course material or content that adapt with their differences in learning. However to make the changes of learning environment that adapt and match with diverse type of learners is a challenging task that need the synergy of combining the adaptation technology, and organizational presentation of course material in order to suit with learners needs in their process of learning. These are what this research tries to address.

Proposed Adaptation Guideline

Component of Adaptation Guideline

The main components of the adaptation guideline are: Individualized Content and Adaptive Presentation. Individualized Content refers to the process of matching the presentation of Education Material (EM) with type of learners. The aim of this process is to match learning preferences of learners to appropriate EM. The concept of this process is provided all learners with the same knowledge, however the content and order of the presentation is adapted differently based on learners type. Adaptive Presentation refers to how the online learning system adapt with appropriate presentation for different type of learners.

Adaptation Strategies

Strategy 1: Generation of Adaptive Lesson Course

The main objectives of the first strategy is to creates and structures an adaptive or personalized lesson course in online learning environment appropriately for each individual learner with individual differences in learning. This strategy involves two steps which are Step 1: Creating and Structuring
Adaptive Lesson Course and Step 2: Personalizing Adaptive Lesson Course.

Step 1: Creating and Structuring Adaptive Lesson Course
The general creation of standard curriculum structures is being created and structured by the teacher or educators. It can be structured by using the standardized curriculum structures that is provided by the expert from education field. In this research, the lesson course structure is created by adopting the standard curriculum structures created by Magoulas et al. (2003) in INSPIRE that consists a set of Learning Goal (LG), Learning Concept (LC), Outcome Concept (OC), Prerequisite (Pre), and Educational Module (EM) that consist a set of Learning Material (LM).

Step 2: Personalizing Adaptive Lesson Course
The objective of this step is to make the lesson course personalized for each individual learner with different needs and preferences in learning. The lesson course is adaptive for each individual learner that is achieved using two processes which are: Process 1: Identification of the learners personalized features and Process 2: Personalizing the lesson course by make the appropriate selection of LM in EM for each LC in the lesson course.

Strategy 2: Adaptive Representation
The main objective in this strategy is to design a mechanism that consist a set of adaptation rules that includes the adoption of teaching and learning strategies in order to set up the rules. Adaptation rules will be applied for the system in order to build the relationship that exists between students and their match course content and EM in the lesson course. The development of this strategy involve 2 main steps which are: Step 1: Setting the Adaptation Rules and Step 2: Setting the Adaptation Mapping Rules

Step 1: Setting the Adaptation Rules
This step will involve the creation of Instructional Rules in order to connect the relationship between learners adaptation features with their tailored of lesson course content and learning material. To setup the adaptation rules, there are two processes involved which are: Process 1: Setting Adaptation Rules for Learner and Process 2: Setting Adaptation Rules for Teaching Strategies.

Step 2: Setting the Adaptation Mapping Rules
Setting Adaptation Mapping Rules for Adaptive presentation is been done in this step.

Significant of the Research
The significant of this research mainly focus into difference type of users which are:

Learners
Learner with different learning styles may view the different presentation of the same EM on the online learning system. The concept of this process is to provide all learners with the same knowledge, however the method and order of the presentation is adapted differently based on learners type. Thus in the end, learners are accomplish their learning goal.

Instructor / Educator
Helping the educator to prepare and develop most appropriate learning environment that support the different type of learners. It can be used as a best medium of learning platform using technologies to adapt educational content, presentation, navigation support and education services that match the uniqueness and specific needs, characteristics and preferences of learners.

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USING ARCGIS ONLINE AS AN INTERACTIVE MAPPING AND ANALYSIS TOOLS FOR URBAN AND REGIONAL PLANNING EDUCATION

Noordini Che’Man
Universiti Teknologi Malaysia
b-noordini@utm.my

Ahmad Nazri Muhamad Ludin
Universiti Teknologi Malaysia
b-anazri@utm.my

Foziah Johar
Universiti Teknologi Malaysia
b-foziah@utm.my

Josephine Lee Siaw Ling
Wan Muhammad Aqib b Wan Muhammadashaary
Nagananteni a/p Subramanian
Universiti Teknologi Malaysia

Highlights
This study relates to online teaching approaches using existing platforms provide by ESRI (Environmental Systems Research Institute) for the purpose of analysing and providing proposal plans for selected research areas case studies. Students work in a team and as an organization to make recommendations for possible solutions and publish their data and analysis in their own web page. Peer studies for two consecutive semesters are used to see the success of group engagement for the GIS Application course.

Key words: ArcGIS Online; Interactive Mapping; Urban and Regional Planning

Introduction (Project or Innovation)
The increased use of internet has made the usage of online interactive digital map more convenience instead of cartography on paper. One of the best solutions of digital and spatial mapping is by using Geographic Information Systems (GIS). GIS is a tool which gives people the ability to create their own digital map layers to help solve real-world problems. Learning with GIS gives graduates a competitive edge in many fields. Considering the philosophy of heutagogy in teaching, it is seen to provide better exposure to students to better understand the use of technology in urban and regional planning. Urban and regional planning field require solutions that address day-to-day works while also fostering the ability to effectively predict and respond to chronic urban problems and future market fluctuation (Esri, 2011). The success of planners in combating chronic urban problems is largely determined by their ability to utilize effective tools and planning support systems that allow them to make informed decisions based on actionable intelligence and help to generate development proposals and evaluate alternative scenarios. The use of computer-based models in urban planning practice and planning education has experienced a major change due to IT technology. GIS, developed since 1960s can provide the necessary urban planning platform for visualization, modeling, analysis, and collaboration. There are many different GIS packages available around the world which vary in their capabilities and features. With the requirements for using GIS in urban and regional planning field, ArcGIS Online from Esri (Environmental Systems Research Institute) was chosen as the platform to gives exposure to students to create maps and apply tools as well as perform analyses online in an interactive manner. The GIS Application course using ArcGIS Online has been implemented for two academic semesters in session 2016/2017 and 2017/2018 as an elective course offered to the third-year students by the Department of Urban and Regional Planning at the Universiti Teknologi Malaysia (UTM). The course in regularly attended by 10-20 urban and regional planning students. In this course the students will create, design and customize their own map page by utilizing the ArcGIS Online for Organization platform. Students will work in a team as an organization to develop proposals, conduct survey/research, analyze and evaluate alternatives, make recommendations for possible solutions and publish their data and analysis in their own web page to given theme problems.

Learning by using ArcGIS Online

Features of ArcGIS Online
ArcGIS Online is a cloud-based mapping and analysis solution. It is a collaborative web GIS that allow users to use, create, and share maps, scenes, apps, layers, analytics and data (Esri, 2018). The user could get access to workflow-specific apps, maps and data from around the globe, and tools for being mobile in the field. The data and maps are stored in a secure and private infrastructure and can be configured to meet individual/group mapping and IT requirements. ArcGIS Online can
be used immediately in the classroom with no software installation required. Students can form groups to create and share content in a secure, online environment.

ArcGIS online provides experimental platform and exposure to students in choosing the tools offered by ArcGIS Online webpage (Figure 1). In the course, students worked in a group of 3 and required to choose relevant sector related to urban and regional planning. They need to determine the study area and prepare a proposal which include the type of analysis and tools which they will apply in the course. On the 14th week, each group will present their project and submit the final report in the final week. Figure 2 and 3 show examples of maps published by the students in ArcGIS Online web and examples of presentation slide.

![Figure 1: Ready Apps tools in ArcGIS Online web.](image1)

![Figure 2. Examples of student’s work published in ArcGIS Online web](image2)

![Figure 3. Examples of student’s final presentation slide.](image3)

**Methodology**

For this study, a comparison of achievements over the CLO for two semesters have been carried out followed by a study on the level of achievement against CLO5 which involved peer assessment.
Results and Discussion

Comparison of CLO

In order to see the overall achievement of the course, an assessment for two academic semesters in session 2016/2017 and 2017/2018 were made on students’ performance with respect to the attainment of course learning outcome (CLO) 1 to 5. The CLOs are as follows:

CLO1: Apply knowledge for the planning of an efficient urban environment and knowledge of efficient GIS implementation
CLO2: Analyze and synthesize urban issues and problems
CLO3: Propose solutions through the integration of planning and information technology knowledge
CLO4: Communicate the solutions to an audience through report, oral presentation and web customization page
CLO5: Demonstrate consistently collaborative working attributes in group work

While students showed improvement of CLO 1, 2 and 3, which give better solution for urban planning meanwhile the attainment of CLO 4 and 5 have declined. The attainment of CLO5 which dropped from 94 percent in 1617 session to 76 percent in 1718, was further examined using students peer assessment.

Students Peer Assessment

Referring to Mauger (2015) there are number of strategies to help promote one’s own development, and peer-assessment is an excellent one. Thus, a survey has been carried out to study the effectiveness of group work for their project. The students are required to answer a short survey which consist of 5 questions using Likert scale of 0 to represent no contribution of work, 1 much less than rest of group, 2 less than rest of group, 3 same as the rest of group, 4 higher than rest of the group and 5 for much higher than the rest of the group. Each student is required to assess the performance of group’s member based on their task. In addition, students are also required to give overall comment regarding the course. 12 students in semester session 2016/2017 and 18 students in session 2017/2018 participated in this study. Figure 5 shows the average score of each students peer review assessment based on team performance for their project. Overall, it can be seen that students in semesters of 1617 evaluated their peers higher than those in the 1718 sessions which were in line with CLO 5 results. This is likely because students are skeptical of giving high marks to other members although they have shown a better performance from the previous groups.
Limitation

To get access to the full range of capabilities on the ArcGIS platform to create rich, dynamic maps and apps, the license need to be renewed every year and come with a cost. Esri offers special licensing terms and pricing to qualified educational institutions and individuals for use in learning, scholarly research, and the administration of these institutions. Ahrs Yaakup Lab at Faculty of Built Environment and Surveying purchased the license. Cost for the license per year is around RM8,000 using maintenance budget from University Laboratory Management Unit. Currently, the numbers of trainers or lecturer who are available to give hands-on training on ArcGIS Online are also limited. The comments of students regarding the course, generally suggest that most students enjoy the course and help them not only in understanding of mapping but also provide avenues to explore methods of spatial analysis required for urban and regional planning.

Conclusion

Implementing the technology and online mapping for urban and regional planning education is really interesting although the processes are quite challenging and costly. While there are some limitations in continuing the implementation of ArcGIS Online in the future, various other methods will be explored to ensure that urban planning students to keep abreast with the technology in the generating spatial plans and analysis.

References


Assessment of Professional Skills through A Capstone Project Based Learning (CPrBL) Model for Electrical & Electronics Engineering Program

Suhana Mohamed Sultan  
School of Electrical Engineering, UTM  
Shuman  
Mitra Mohd Addi  
School of Electrical Engineering, UTM  
mitra@utm.my  
Norhafizah Ramli  
School of Electrical Engineering, UTM  
e-hafizah@utm.my  
Naziha Ahmad Azli  
School of Electrical Engineering, UTM  
nazih@utm.my

Highlights

21st Century skills are required to prepare students to face the changing environment with complex challenges and to enable them to apply core skills to everyday tasks. The Accreditation Board for Engineering and Technology (ABET) emphasizes six (6) ‘professional’ skills to be integrated in the undergraduate curriculum, on top of the ‘hard’ skills. These ‘professional skills’ include communication, teamwork, understanding ethics and professionalism, engineering within global and societal context, lifelong learning, and knowledge of contemporary issues, project management and critical thinking.

Capstone Project Based Learning model is conducted as an engineering project conducted in a small team under the facilitation of an academic staff and an industry partner as advisor whenever possible. Preparations as well as the tools required, in terms of project management, facilitation, activities, and assessment criteria were developed to support the implementation of the Capstone Project-based learning.

Analysis on the performance of the students who have undergone the Capstone Project has shown that it has the potential to become an effective approach in enhancing professional skills which includes modern tools usage and solution design/development, team working, lifelong learning and project management and finance, among the electrical-electronics engineering students.

Implementation of the Capstone Project laboratory course has managed to make the students experience the conceiving process in defining issues related to the given project themes. In addition, the students are able to apply the project based learning strategies in producing the project solutions while improving their design and generic skills.

Key words: capstone project; project based learning; engineering professional skills; assessment;

Introduction

In facing the Grand Challenges for Engineering in the 21st Century (National Academy of Engineering, 2018) there is an increasing requirement for graduate engineers to have firm foundational literacies, competencies and character (World Economic Forum, 2015). These 21st Century skills are required to prepare students to face the changing environment with complex challenges and to enable them to apply core skills to everyday tasks. To achieve these intentions, the Accreditation Board for Engineering and Technology (ABET) emphasizes six (6) ‘professional’ skills to be integrated in the undergraduate curriculum, on top of the ‘hard’ skills. These ‘professional skills’ include communication, teamwork, understanding ethics and professionalism, engineering within global and societal context, lifelong learning, and knowledge of contemporary issues (ABET, 2015, Shuman et al, 2005 and Pasha-Zaidi, 2015). Addition to that, project management, critical thinking and entrepreneurial skills were also highlighted in the professional skills matrix for engineering students (Pasha-Zaidi, 2015). These professional skills were found to be efficiently mastered by students from creative learning pedagogies that utilizes active and cooperative learning, teaching engineering within relevant context and acknowledging differences in students’ learning styles (Shuman et al, 2005).

Capstone projects are interdisciplinary projects, where students, preferably from various background, are required to apply skills and investigate issues across many different domains of knowledge to solve community or industry problems (Kim, 2016). Ultimately, the capstone projects does not only allow students to apply knowledge and skills gained throughout their tertiary education but the completion of the capstone projects will be beneficial for their future.
The Capstone Project Based Learning (CPtBL) model serve as one of the crowning academic and intellectual experiences for the final year students in the Faculty of Electrical Engineering (FKE), Universiti Teknologi Malaysia (UTM). The capstone experience involves identifying a real-world problem, designing and developing the means to address it through tangible products, which are to be completed within the given specifications, time and budget. A motivating factor that promotes the implementation of CPtBL model in FKE is for it to be used as an assessment for students’ proficiency (in the acquisition of knowledge and skills) and readiness (for college and work) by requiring them to demonstrate what they have learned over the progression of the project. In addition, it requires students to take on new responsibilities, be more self-directed, set goals, and follow through on commitments. Thus, completing a capstone project could boost self-esteem, build confidence, and teach students about empathy, discipline, and team working.

Capstone Project Description

The CPtBL course is offered during the 1st semester of the undergraduate final year, as a 2 credit-hour laboratory course, starting from the 1st semester of the 2015/2016 academic session. It was implemented to comply with the requirements set by the Engineering Accreditation Council (EAC 2012) and to replace the previous 4th year Electrical Engineering Laboratory that employed Problem-Based Laboratory (PBLab) model.

The CPtBL course is conducted based on the 4-year Bachelor of Engineering (Electrical-Electronics) program (SKEL) and Bachelor of Engineering (Electrical) program (SKEE) curriculum. It provides students the opportunity to apply their professional skills developed throughout the earlier undergraduate years. This is to be achieved within the context of an engineering project conducted in a small team (four students) under the supervision of an academic staff and with an optional industry partner as advisor. The students’ grouping for CPtBL promotes diversity from different gender, race and discipline (from SKEL and SKEE program). Topics supplementing this course include project management tools and practices, financial management, organizational structures, engineering standards as well as the social and environmental responsibility of professional engineers (covered in the Professional Ethics and/or Engineering Management courses offered prior to or concurrent with the course).

The CPtBL model is conducted in two stages: The first stage is the conceiving process (4 weeks) where students need to identify focused person or groups (personification) for the identified problems, approach relevant users through surveys and interviews to gather relevant information on their needs, and finally produce a conceptual prototype or model. The task is conducted within the scope of a given project theme which varies among students’ groups. On the fifth week, each team are required to present their proposed solution (conceptual prototype) along with the estimated bill of material (BOM) and project management timeline.

In the second stage, students are required to conduct project planning, engineering drawing, engineering design which describes processes or system to be implemented, project management and project costing to produce a final working product. The students are required to transform the design into a tangible product, including hardware manufacturing, software coding, testing, analysis and validation. During this process, students are located in one of the designated laboratory, normally according to the project theme.

On the 13th week, each team is required to present and demonstrate their final product to a panel of evaluators which consist of a faculty member (besides their facilitators) and one or two invited industrial panels. In the final week, students submit their technical reports according the given format template. The overall CPtBL process is illustrated in Figure 1.
Facilitation & Laboratory Activities

During the first five weeks, students focus on understanding the project themes requirements, identifying user and market survey, creating the design concept and costing, and delivering the conceptual prototype.

Each teams is given a Student File that contains the assigned Design Sheet, a Student Pack, Individual Report form, Individual Minutes form, Technical Report forms, sample of Gantt chart and Bill of Material (BOM) to assist student in the financial and project management. The file is kept with students throughout the semester and returned to the lab at the end of the semester. The Design Sheet describes the project themes, scope of work, and the compulsory design elements such as microcontroller, sensors, Internet of Things (IoT) platform, as well as the budget given. The Student Pack provides a more detailed guidelines of activities, assessments schedule, and links to available resources.

Each student is required to submit the Individual Report on scheduled weeks to the facilitator which in turn will assess and return the report with some remarks on the student's task completion. Each team is also required to record their task distribution and project activities outside the lab session in the Minutes of Meeting form. It is prepared individually according to the appointed individual member’s schedule and to be submitted on a weekly basis to their appointed facilitator as one of the assessment.

The role and responsibility of the facilitators is to facilitate the students towards the completion of the project and to assess students’ achievement individually and as a team. The facilitator is supplement with a Facilitator File that consist of a Facilitator Pack which provides additional information related to the design sheet. The file is also used to keep records on the weekly student assessment and kept in the designated laboratory.

The activities and assessment forms, as well as the rubrics are designed to measure the achievement of each course learning outcomes (CLO) of the CPbBL model. The CLOs are mapped to align with the program learning outcomes (PLO), teaching and learning (T&L) approaches as well as the assessments. This is in accordance with the constructive alignment theory developed by Biggs10. Measurement of the CLOs achievement for the Capstone projects directly reflects the achievement of the SKEL PLOs. More importantly, the measurement of students’ professional skills acquirements is mainly obtained from Capstone Project as many of the courses in the program curriculum do not focus on some of these aspects.

Assessment

Table 1 lists the CPbBL assessment distribution which involves evaluation of students’ performance as a team, and as an individual. Students also evaluate the contribution of their team members through a confidential online peer review form, which are submitted three times throughout the semester. Individual marks and Team Marks are 50% each. Based on the evaluation rubrics filled by the facilitators, the Key Performance Index (KPI) of each CLO achievement is calculated by averaging the marks obtained by all students in a particular assessed item (PLOs) and dividing it with the number of students.

Table 1. Capstone Project Assessment
Research Impact

Based on the data taken, all the PLOs related to the professional skills exceeded the 0.65 KPI limit set by the faculty as the achievement of a PLO for all program. All the assessed PLOs showed improvement compared to the previous semester as shown in Fig. 2. The ability to recognize the need and engage in lifelong learning is represented as PLO8 have the highest average performance index. The life-long learning skills is contributed by the marks obtained from the minutes of meetings, in Lab Performance and partly from the technical report. As specified in a study [1], lifelong learning includes the ability to demonstrate reading, writing, listening, and speaking skills; demonstrate an awareness of what needs to be learned; follow a learning plan; identify, retrieve, and organize information; understand and remember new information demonstrate critical thinking skills; and reflect on one’s own understanding. This achievement for PLO8 is 12.4% higher from the achievement in the previous semester. Lifelong learning has been attributed as one of the professional skills required by engineering graduates.

Apart from lifelong learning, team working skills as in PLO7, and engineering management skills as in PLO12 also improved. This improvement can be largely attributed to the feedback received by the industry on the students’ ideation, design and implementation process. The engagement with engineers from the industry on the 1st, 5th and 14th week enhanced the students’ ability in these professional skills.

Overall, the average students’ performance was between 81% - 96% across all sections. Based on the end of course survey, students’ in general gave rating between 3 (fairly accomplished) to 5 (accomplished well) on the effectiveness of the course and programme outcome. Students agreed that the themes given were interesting, related to real-world application and rather challenging.

Conclusion

The analysis on the performance of students who undergone the CPrBL model showed that the project has the potential to become an effective approach in enhancing professional engineering skills (PLO4 – using modern tools, and PLO5 – design/development of solutions) and usage of generic skills (PLO7 - team working, PLO8 – lifelong learning, and PLO12 – Project management and finance) among the electrical-electronics engineering students.

The implementation of Capstone Project had managed to make students explore the conceiving process in defining issues in project themes and apply project based learning strategies that improved their design and soft skills, despite their feedbacks that it was very challenging and time demanding.

Acknowledgement (if any)
We are grateful for the support given by Intel Malaysia and the The Great Lab team.

References


STEM interest-ignition program by School of Education, UTM and Sultan Ismail Library, Kg Melayu

Marlina Ali  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
p-marlina@utm.my

Corrienna Abdul Talib  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
corrienna@utm.my

Norulhuda Ismail  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
p-norulhuda@utm.my

Dayana Farzeeha Ali  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
dayanafarzeeha@utm.my

Nornazira Suhaimi  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
p-nazira@utm.my

Nurul Farhana Jumaat  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
nfarhana@utm.my

Highlights

STEM activities at PSI Kg Melayu provides a platform to work with students to help them learn and be curious about STEM. The program also gives PSI staff the opportunity to learn from UTM how STEM activities are carried out and they will be able to continue this activity in the library in the future. It was found that students who came to the Sultan Ismail library (PSI) Kg Melayu branch to study was very few even though the facilities available at the Library were very good. Students in that area do not seem to see the presence of the library as beneficial. If this problem persists, the PSI branch in Kg Melayu will be shut down. Thus, FP UTM’s Learning Club will collaborate with the Johor Bahru Foundation to carry out STEM activities at PSI Kg Melayu branches. It aims to promote libraries and also foster student interest in STEM subjects in schools. Students from around Kg. Malay Majidi was selected to participate in the STEM activities held once a month at PSI Kg Melayu branch. Various activities will be organized throughout the year to ensure the program objective is achieved. The Education School of UTM with the cooperation of the Sultan Ismail Library will create profiling students to explore the effectiveness of STEM PSI Kg Melayu activities on the interests, career options, and achievement of students in Science and Mathematics subjects. The selected students will follow various activities planned by UTM and PSI every month. All activities involve hands on and require students to use their thinking skills. Student achievement before joining the program and after following the program will also be recorded and monitored. Based on the observation, all students were actively involved and showed an interest in STEM activities. This activities is hoped to produce training module and also copyright for the survey and program

Key words: Mentor Mentee program; interest towards STEM; non-formal learning

Introduction

Science, Technology, Engineering and Mathematics (STEM) education has become an important topic for researchers currently because of its vital role in the country’s economic growth and nation building. Malaysia need to produce high quality STEM talented students because STEM is the future of the world and nation. Malaysia need to get more students interested in STEM and to enter STEM stream. Three essential skills that guarantee a job according to Bill Gates is science, engineering and economics. It is estimated that there will be one million STEM careers in Malaysia by 2020. However, Educational Planning and Research Division (MOE) [2018] reported in 2016, 21.7% of UPSR students did not master math and in 2017, 18.6% of UPSR did not master math. Also, student enrollment of form 4 and 5 in STEM stream from 2013 to 2017 are still below the target (60%) for example, in 2013 the percentage is 47%, in 2014 it slightly decreased to 46.3%, in 2016 increased slightly to 47.6% and in year 2017 the percentage dropped again to 45.7% [Educational Planning and Research Division (MOE), 2018]. In addition, there was a decrease in graduation rates in STEM fields according to Ministry of Education of Malaysia (2013). Those who were trained for STEM-related careers were not sufficient to meet the country’s needs (Ministry of Science Technology and Innovation [MOSTI], 2012). A national study, Science and Technology (S&T) Human Capital: A Strategic Planning Towards 2020 (Ministry of Science Technology and Innovation (MOSTI), 2012)
confirms that Malaysia needs at least 1.0 million S&T human capital by 2020 based on a 6% annual economic growth and the emergence of EPPs (Entry Point Projects) under the NKEAs as well as the emergence of new technology-driven sectors. 50% of this number are high skilled workers. However, it would only comprise 3% (500,000) of our expected total workforce of 15 million in 2020. All these data show that more efforts need to be done to prepare more students to enter STEM fields. This data shows Malaysia was having a serious leaking STEM pipeline.

According to the National STEM Movement (2016), STEM is referred to disciplines of knowledge consisting of Science (physics, chemistry and biology) and mathematics with the integration of various technologies and engineering. STEM incorporates all the technologies that engage science and mathematicians. The ultimate goal for STEM education is to produce STEM-literate who are capable of thinking in logical manner, using technology, solving problems, creating new ideas, and designing/ inventing new products through an integrated learning encompassing STEM which applies real world context into teaching and learning process and immerse students in hands-on inquiry and open ended exploration (Educational Planning and Research Division (MOE), 2018). In order to sustain interest towards STEM subjects, students should be involved with STEM active learning activities regularly. According to Mohd Shahali, Halim, Rasul, Osman, and Mohamad Arsad (2018) the possible reasons for the decrease in interest towards STEM subjects could be due to the quality of teaching and learning that students experienced in the classroom. This is because Malaysia is having a content heavy curriculum (Educational Planning and Research Division (MOE), 2018). The heavy emphasis on content caused teachers imply fast teaching mode to finish the topic and limit hands-on activities. As the teachers having difficulties to finish the syllabus, therefore STEM related activities can be done after class. According to Sahin (2013), by carrying out various activities such as science fairs, after school activities, engaging students with STEM related clubs can often develop positive attitudes towards STEM fields. In Malaysia, there are many non-formal activities organized by the schools and industries such as school lab competition, Petro Science show, National Science challenge, Science and Engineering Innovation competition, STEM+ club, STEM mentor mentee programme, F1 in schools and STEM Icon (Educational Planning and Research Division (MOE), 2018). Student participation in STEM non-formal activities are quite impressive and increases every year (Miller, Sonnert, & Sadler, 2018). According to Sahin (2013), by carrying out various activities such as science fairs, after school activities, engaging students with STEM related clubs can often develop positive attitudes towards STEM fields. Student participation in STEM non-formal activities are quite impressive and increases every year (Miller et al., 2018).

Objective

Based on the observations it was found that students who came to the Sultan Ismail library (PSI) Kg Melayu branch to study was very few even though the facilities available at the Library were very good. The Library is equipped with air conditioning and the books available are new books and are constantly updated from time to time. Students in that area do not seem to see the presence of the library as beneficial as they always spend time playing futsal in front of the library. If this problem persists, the PSI branch in Kg Melayu will be reduced. Thus, FP UTM’s Learning Club will collaborate with the Johor Bahru Foundation to carry out STEM activities at PSI Kg Melayu branches. It aims to promote libraries and also foster student interest in STEM subjects in schools. Then increase the science ratio to non-science that is 60:40.

The main purpose of STEM activities at PSI Kg Melayu are to enhance students' interest and attitudes towards STEM subjects in schools, to increase students’ interest in the STEM field, to improve the STEM subject examination results, to strengthen their relationship with UTM students’ community. Students from around Kg. Malay Majidi was selected to participate in the STEM activities held once a month at PSI Kg Melayu branch. Student selection also does not count the race. Various activities will be organized throughout the year to ensure the program objective is achieved. The Education School of UTM with the cooperation of the Sultan Ismail Library will create profiling students to explore the effectiveness of STEM PSI Kg Melayu activities on the interests, career options, and achievement of students in Science and Mathematics subjects. This program is in line with the National Education philosophy reaching the 60:40 science field versus literature (Malaysia Education Blueprint 2015-2025).

Methodology

STEM activities at PSI Kg Melayu uses New Academia Learning Innovation (NALI) approach which is service learning. Service learning is a teaching and learning methodology which nurtures civic responsibility and applies classroom learning through meaningful service to the community. It also integrates community service projects with academic studies to enrich learning, teach civic responsibility, and strengthens the communities in which we live and work. Service learning integrates academic theory with practical real-life experience, provides students with a broader and deeper understanding of the course content, fosters their sense of civic engagement, and enhances their insights about themselves and their place in the community. STEM activities at PSI Kg Melayu provides a platform to work with students to help them learn and be curious about STEM. The program also gives PSI staff the opportunity to learn from UTM how STEM activities are carried out and they will be able to continue this activity in the library in the future. Sultan Ismail's library staff are very committed and are always present in every organized activity.
Findings and discussions

The program has started since May 2018. Form four students from two schools around Kg Melayu were selected to participate in STEM activities at PSI Kg Melayu. The selected students will follow various activities planned by UTM and PSI every month. There are 4 programs that have been held such as super science (May), computational thinking (Jun), building a passion for engineering (July) and let’s be an architect (August). There are four more planned activities for September to December. All activities involve hands on and require students to use their thinking skills. Student achievement before joining the program and after following the program will also be recorded and monitored. Based on the observation, all students were actively involved and showed an interest in STEM activities. Here is the initial achievement of the students. This achievement will be monitored until the end of the year. Interests and career options of students will be asked through questionnaires and interviews at the end of the program.

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Initial Exam Results [March]</th>
<th>Midterm Exam Results [June]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student 1</td>
<td>M3 – 80</td>
<td>M3 – 91</td>
</tr>
<tr>
<td>2</td>
<td>Student 2</td>
<td>M3 – 46</td>
<td>M3 – 41</td>
</tr>
<tr>
<td>3</td>
<td>Student 3</td>
<td>M3 – 70</td>
<td>M3 – 76</td>
</tr>
<tr>
<td>4</td>
<td>Student 4</td>
<td>M3 – 62</td>
<td>M3 – 42</td>
</tr>
<tr>
<td>5</td>
<td>Student 5</td>
<td>M3 – 56</td>
<td>M3 – 56</td>
</tr>
<tr>
<td>6</td>
<td>Student 6</td>
<td>M3 – 78</td>
<td>M3 – 65</td>
</tr>
<tr>
<td>7</td>
<td>Student 7</td>
<td>M3 – 46</td>
<td>M3 – 27</td>
</tr>
<tr>
<td>8</td>
<td>Student 8</td>
<td>M3 – 44</td>
<td>M3 – 25</td>
</tr>
<tr>
<td>9</td>
<td>Student 9</td>
<td>M3 – 48</td>
<td>M3 – 47</td>
</tr>
<tr>
<td>10</td>
<td>Student 10</td>
<td>M3 – 28</td>
<td>M3 – 25</td>
</tr>
<tr>
<td>11</td>
<td>Student 11</td>
<td>M3 – 60</td>
<td>M3 – 44</td>
</tr>
<tr>
<td>12</td>
<td>Student 12</td>
<td>M3 – 56</td>
<td>M3 – 27</td>
</tr>
<tr>
<td>13</td>
<td>Student 13</td>
<td>M3 – 70</td>
<td>M3 – 57</td>
</tr>
<tr>
<td>14</td>
<td>Student 14</td>
<td>M3 – 50</td>
<td>M3 – 47</td>
</tr>
<tr>
<td>15</td>
<td>Student 15</td>
<td>M3 – 56</td>
<td>M3 – 47</td>
</tr>
</tbody>
</table>

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References


Cultivating social entrepreneurs through experiential education: A multi-stakeholder collaboration

Phuah Kit Teng, Siti Intan Nurdiana Wong Abdullah
Bernard Lim Jit Heng and Umi Kalsom Kassim
Faculty of Business, Communication and Law, INTI International University
kitteng.phuah@newinti.edu.my
sitiintan.abdullah@newinti.edu.my
bernard.lim@newinti.edu.my
ukalsom.kassim@newinti.edu.my

Highlights

The International Commission on Education for the 21st Century developed four pillars of education—learning to be, to know, to do and to live together. Therefore, fostering social entrepreneurship is important in the age of automation. Social entrepreneurship is a simultaneous pursuit for economic, social and environmental goals by addressing social / environmental problems and holds huge potential for sustainable socio-economic development. Thus the aim of this project is to provide experiential learning opportunities through social entrepreneurial projects and collaboration between government agencies, NGOs and private institutions.

Key words: social entrepreneurship; entrepreneurial skills; multi stakeholder collaboration; experiential learning

Introduction

The responsibilities of education are important in the development of a nation. In the business context, company’s main objective is for profit but the emerging trend for corporate social responsibility has gained popularity especially among private organisations. As such, education institutions need to develop social entrepreneurial skills among students.

This social collaborate project includes mentally challenged children and women. Mental illness is expected to be the second biggest health problem affecting Malaysians by 2020 (National Health and Morbidity Survey, 2015). About 1.4 million children in Malaysia have mental health difficulties that interfere with normal functioning and development (Peters, 2010). Generally, the Intelligence Quotient (IQ) of a healthy person is about 100. Yet, the IQ of mentally challenged group is usually below 70 due to congenital disorder developed through various psychology and growth conditions.

On the other hand, World Economic Forum’s Gender Gap Report (2017) predicted that gender equality can only be achieved in another 200 years. The Ministry of Women, Family and Community Development launched the International Women’s Day 2018 campaign in Malaysia to reduce the gap in gender equality. The 2018 theme #2GetHER calls out the need for gender collaboration and action to forge a more gender inclusive working world. With these two issues in mind, it creates an importance to raise awareness about the inclusivity of mentally challenged children and women if we want to see significant progress in our society.

Project objectives

Main Objective: To inspire students to make a difference and empower them to create awareness on contemporary social issues.

Specific Objectives:

1. To cultivate collaboration with multi-stakeholders
2. To engage students in experiential learning
3. To develop lifelong-learning skills

Novelty (New Ideas)

The pedagogy of service-learning represents a substantial change of the traditional lecture-driven and faculty-centered curriculum. Through service-learning, students able to deal with issues which challenge their competency and expose to meaningful experiences. These experiences create perplexity/ dissonance, which is the beginning of learning process. Service-learning will provide meaningful learning leading to actual understanding of academic concepts.

Creativity (Design of Ideas)
The service learning approach seeks to build social collaboration that benefits the students’ learning and the community.

1. Learning Plan and Learning objective: Learning plan is a “blueprint” that maps out the expectation from service learning project. It includes specific learning objectives that measures completion of educational goals. Learning objectives are statements that define expected results in a specific time. Learning objectives include knowledge (problem solving, pattern recognition, etc.), communication (interviewing and counseling), data analytics skills and formulation of personal ideals.

2. Choosing Project’s Theme: Lecturers are required to select the service learning project that provides a meaningful experience for the students.

3. Mentoring: In the service learning project, lecturer is the instructor who support the transition from theory to practice. Lecturer plays an important role in providing active learning through interactive mentorship, feedback and knowledge to students.

4. Reflection: Keeping track of students’ learning exposure through personal journal or log of their activities. This will encourage students to think about their experiences and emotion.

5. Analytical Paper Guidelines: Analytical Paper is the summary of the students’ service-learning experience being reflected in their journal.

Innovativeness (Changes/Improvement)

INTI International University is committed to create an equitable culture among the students and community. Thus, this project aims to educate students who are aspired to be socially responsible citizens. The students experienced the role of a social entrepreneur and utilizing knowledge for actual practice. Throughout the entire project, students’ curiosity was aroused through self-directed social goal. Students can expand their knowledge and attain “deep learning” through meaningful learning experiences.

Applicability - Relevant to New Academia Learning Innovation Model (NALI)

Learning Pedagogy:

Service Learning

Service learning is an enriching learning experience that combines learning goals and community service to enhance students’ personal growth and develop social responsibility skills.

High-Impact Educational Practices (HEIP)

HEIPs includes desired learning outcomes such as global knowledge, self-direction, critical thinking, adaptability, communication, reasoning, social responsibility, ethical judgment and teamwork.

Digital resources:

Wix Artificial Design Intelligence & Wix Editor – Designing professional-looking and mobile-friendly website with functional online store
BlackBoard Kaltura – Creation of video content and webcam recordings.
Group Wiki – Social interaction tool for groups exchange information and interaction
M-Learning – Usage of whatsapp for collaboration and discussion
Appy Pie – tool to develop mobile application that enhance students’ coding skills

Impact to Students’ Learning (Engagement and Empowering)

Service learning is a community-based learning that provides the opportunity for students to apply what they learnt in a real-world setting and reflect in a classroom setting on their experiences. This project enables the students to contribute to the community through engagement with stakeholders and community partners that empowers them to be a good citizen. This project also aims to enhance adaptability by harnessing strengths from technology that allows students to gather immediate feedback and reflection through group Wiki. Collaborative learning enables them to solve social problems by developing greater insights from the community.

Research Methodology
Figure 1 shows the design of service learning where the academic and social entrepreneur are able to plan and facilitate appropriate learning experiences that link the community and university contexts. The framework includes four domains which are inquire, investigate, innovate and impact (4I’s). Each domain has a set of outcomes that faculty assess within their units. Students discover about identities, cultures and diversity through inquiry and investigation. They analyze how respective experiences and cultures influence people perspectives. By valuing the existence of multiple perspectives, students develop critical thinking skills and empathy. Students also develop a sense of responsibility as global citizens and empowered to reduce negative externalities.

The social learning in this study is implemented through collaborative social entrepreneurship project. Data were collected from 450 students who went through the projects for 14 weeks with social establishments; which are Malaysian Association for The Welfare of Mentally Challenged Children (IQ70PLUS), Pertubuhan Pelindung Khazanah Alam Malaysia (PEKA), Breast Cancer Welfare Association (BCWA) and Women’s Aid Organization. Students and entrepreneur’ feedback were collected through interview (qualitative). In addition, total number of social entrepreneur collaborated with Faculty of Business from 2017 to 2018 (quantitative) is recorded.

**Finding and Discussion**

The collaborative social entrepreneurship projects are successful as the collaborative social entrepreneurship projects enhanced students’ personal, civic engagement and social skill development. Students gain increased knowledge of academic materials, their communities, and themselves. Table 1 clearly shows that there is an increase of skills after completing the project.

<table>
<thead>
<tr>
<th>Skills</th>
<th>Expectation BEFORE the project</th>
<th>Perception AFTER the project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soft Skills</strong></td>
<td>Teamwork</td>
<td>Teamwork</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Critical thinking</td>
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<tr>
<td></td>
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<td>Communication skill</td>
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<td></td>
<td>Creativity</td>
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<td></td>
<td></td>
<td>Public relation skill</td>
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<td></td>
<td></td>
<td>Leadership</td>
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<tr>
<td><strong>Technical Skills</strong></td>
<td>Report writing</td>
<td>Report writing</td>
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<tr>
<td></td>
<td></td>
<td>Photoshop editing skill</td>
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<tr>
<td></td>
<td></td>
<td>Website design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advertisement design</td>
</tr>
<tr>
<td><strong>Personal Attitude</strong></td>
<td>Negative attitude due to heavy workload</td>
<td>Confidence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co-operative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respectful</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intention to help others</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-reflection</td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td>In class</td>
<td>Networking - Build connection with outsiders</td>
</tr>
</tbody>
</table>

Upon completion of this project, social entrepreneurs also provided positive feedback as shown below:

“Lift as you rise event is a very successful event with very good result. Thank you very much for the contribution.”

Mr. Chang Ming Kiet, Chairman, Persatuan Kebajikan Kanak-kanak Terencat Akal Malaysia (IQ70PLUS)

“Thank you to INTI International University for giving me and PEKA the opportunity to share
experiences and creating awareness.”

YBhg. Pn. Sri To’ Puan Datuk Shariffa Sabrina Syed, Founder of Pertubuhan Pelindung Khazanah Alam Malaysia (PEKA)

“Thank you so much for the contribution.”

Breast Cancer Welfare Association Malaysia

Other Relevant Information

Commercialization Potential: The t-shirt on the left which created by the students is being commercialized and 400 t-shirt were sold within 2 weeks with the profit of RM 2,400.

TalentCorp is in discussion with this group of students who created the “Nemow” website for further development of this social business idea.

Awards received: Gold Medal, Putra Innovative in Teaching and Learning, 2018.

References


KESAN BAHAN PEMBELAJARAN BERASaskan WEB ‘E-PEDAGOGI’ DENGAN HIBRID 3K TERHADAP TAHP KEYAKINAN DAN TAHP KREATIVITI GURU PELATIH

Ngau Chai Hong,
Universiti Teknologi Malaysia
ngauchaihong@ipgm.edu.my

Jamalludin bin Harun, PhD.
Universiti Teknologi Malaysia
p-jamal@utm.my

Highlights

Key words: ‘e-Pedagogi’; Strategi Hibrid 3K; Model Kreativiti ICEDIP; Keyakinan; Kreativiti.

Introduction (Project or Innovation)


Guru-guru pelatih pra-perkhidmatan merupakan satu golongan yang sangat sesuai untuk dijadikan sebagai sampel kajian yang berkaitan dengan tahap keyakinan dalam bidang pendidikan. Ini adalah kerana mereka bukan sahaja dapat melibatkan diri secara langsung dalam kajian sebagai "pelajar", malah mereka juga boleh melihat proses kajian tersebut secara holistik daripada kaca mata mereka sebagai ‘guru’. Perkara ini bersesuaian dengan kajian Helenrose dan Michelle (2010) yang memberi kenyataan bahawa guru-guru permulaan ini harus diberi peluang untuk melibatkan...
diri secara langsung dalam bidang pendidikan sebagai titik perumpamaan mereka dalam pengalaman pembelajaran (Rong-ji Chen, 2010). Oleh itu, bagi menyahut seruan kerajaan ke arah p&p yang lebih kreatif, kita perlu mengenalpasti tahap keyakinan dan tahap kreativiti bakal-bakal guru yang bakal akan menjadi pelaksana kurikulum.


Dapatan kuantitatif kajian ini telah menunjukkan kesignifikan ‘e-Pedagogi’ dalam meningkatkan tahap keyakinan ((min ujian pra, 3.82 (0.83) dan min ujian pasca, 4.35 (0.70)) dan tahap kreativiti ((min ujian pra, 3.78 (0.62) dan min ujian pasca, 4.42 (0.61))). Selain daripada itu, data kualitatif daripada penulisan refleksi dan temu bual kajian ini masing-masing mengekspresikan lapan tema dalam meningkatkan tahap keyakinan dan tahap kreativiti dalam mengintegrasikan teknologi dalam pengajaran dan pembelajaran. Hasil daripada dapatan kualitatif juga menunjukkan bahawa strategi Pembelajaran Berasaskan Projek dan Pembelajaran Berasaskan Inkuiri yang diperkenalkan melalui web telah mampu memudahkan kefahaman dan penguasaan pedagogi, terusnya menyumbang ke arah meningkatkan keterampilan dan tahap kreativiti guru pelatih. Dapatkan kualitatif juga menunjukkan bahawa garis panduan dan fasad kerja dengan Strategi Hibrid 3K yang lebih jelas dan sistematis dapat membantu dalam pengorganisasian maklumat dengan telliti dan ringkas yang berperanan meningkatkan tahap keyakinan dan tahap kreativiti.

Di samping itu, dalam memperkenalkan pembelajaran aktif yang kompleks iaitu Pembelajaran Berasaskan Projek (PBP), penyelidik telah mencipta PBP dengan langkah 5P1R (Pengenalan, Perancangan, Pembangunan, Pelaksanaan, Penilaian dan Refleksi) yang bertujuan untuk memudahkan guru-guru pelatih melaksanakan PBP dalam p&p mereka. Selain daripada itu, dapatan pada akhir kajian telah menghasilkan satu kerangka kerja dan garis panduan (garis panduan yang berasaskan ke arah meningkatkan tahap keyakinan dan tahap kreativiti).


Web pembelajaran ‘e-Pedagogi’ memenuhi ciri kebolehgunaan Akademik baru iaitu Model...
Pembelajaran Inovasi (NALI) yang terdiri daripada pembelajaran aktif yang berpusatkan pelajar. Dalam konteks ini, bahan pembelajaran yang digunakan dalam ‘e-Pedagogi’ adalah terdiri daripada sumber digital, manakala mod pembelajaran yang diaplikasikan dalam ‘e-Pedagogi’ adalah pedagogi, andragogi dan heutagogi.


Walau pun web pembelajaran ‘e-Pedagogi’ yang dibangunkan oleh penyelidik hanya terhad kepada pengenalan dua jenis pembelajaran kompleks iaitu Pembelajaran Berasaskan Projek (5P1R) dan Pembelajaran Berasaskan Inquiri (6 kerangka kerja WebQuest). Namun masih terdapat banyak contoh Pembelajaran kompleks yang boleh dibuat inovasi dan diperkenalkan kepada para guru pelatih pra perkhidmatan.

Hasil daripada data-data kuantitatif dan pengesahan dengan data kualitatif, kajian ini telah menunjukkan bahawa web pembelajaran ‘e-Pedagogi’ dengan 3K mampu untuk meningkatkan tahap keyakinan dan tahap kreativiti guru-guru pelatih pra perkhidmatan dalam mengintegrasikan teknologi dalam p&p. Oleh itu, bahan pembelajaran dengan hibrid 3K ini boleh dikatakan sebagai salah satu cara yang berkesan untuk meningkatkan tahap keyakinan dan tahap kreativiti pelajar. Tambahan lagi, kajian ini juga telah menghasilkan garis-garis panduan dan carak kerangka kerja yang dapat membantu para pendidik dalam membina keyakinan diri dan bersifat kreatif dalam kalangan generasi muda.

Oleh yang demikian, berdasarkan latar belakang masalah dan penyataan masalah kajian ini, terdapat keperluan untuk memperbanyakkan bahan pembelajaran terutamanya pendekatan melalui teknologi yang dapat membantu para pendidik khasnya guru-guru pelatih pra perkhidmatan dalam menguasai pengetahuan pedagogi melalui teknologi bagi tujuan meningkatkan kualiti pengajaran guru.

Harapan penyelidik web pembelajaran ‘e-Pedagogi’ ini bukan sahaja akan dijadikan sebagai bahan rujukan alternatif dan garis panduan dalam pelaksanaan pembelajaran aktif oleh guru-guru abad ke-21, malah ia juga sesuai dijadikan sebagai salah satu contoh sumber bahan pembelajaran dengan menggunakan kerangka kerja TPACK. Di samping itu, diharapkan dengan kerangka kerja yang telah dihasilkan melalui kajian ini seterusnya boleh memberi motivasi dan galakan kepada lebih ramai pendidik dalam menghasilkan bahan pembelajaran yang kreatif, inovatif dan sama-sama memberi manfaat kepada dunia pendidikan.

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An evaluation on students’ perspective towards Kelab Suka Belajar UTM

Corrienna Abdul Talib  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
corienna@utm.my

Marlina Ali  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
p-marlina@utm.my

Shahrin Hashim  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
p-shahrin@utm.my

Hanifah Jambari  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
hanifah-j@utm.my

Noor Dayana Abd Halim  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
noordayana@utm.my

Mohd Rustam Mohd Rameli  
Faculty of Social Science and Humanities, Universiti Teknologi Malaysia  
mustam2@utm.my

Highlights

Science, Technology, Engineering, Arts and Mathematics (STEAM) education has become an important topic for researchers currently because of its vital role in the country’s economic growth and nation building. Malaysia need to produce high quality STEM talented students because STEM is the future of the world and nation. Malaysia need to get more students interested in STEM and to enter STEM stream. However, data shows Malaysia was having a serious leaking STEM pipeline. This paper describes how Kelab Suka Belajar outreach program able to affect the participants’ perspective towards their engagement in STEAM activities. The evaluation on students’ perspective towards STEAM engagement was conduct using survey method. This questionnaire consists of 11 items. Eight items were likerts scale items and another three were open ended questionnaire. The data were analyzed by using PSPP. The data shows students’ perspective towards Kelab Suka Belajar Program is at high level.

Key words: STEAM outreach program; STEAM, Mentor Mentee program; interest towards STEAM; non-formal learning

Introduction

Science, Technology, Engineering and Mathematics (STEM) education has become an important topic for researchers currently because of its vital role in the country’s economic growth and nation building. Malaysia need to produce high quality STEM talented students because STEM is the future of the world and nation. Malaysia need to get more students interested in STEM and to enter STEM stream. Three essential skills that guarantee a job according to Bill Gates is science, engineering and economics. It is estimated that there will be one million STEM careers in Malaysia by 2020. However, Educational Planning and Research Division (MOE) [2018] reported in 2016, 21.7% of UPSR students did not master math and in 2017, 18.6% of UPSR did not master math. Also, student enrollment of form 4 and 5 in STEM stream from 2013 to 2017 are still below the target (60%) for example, in 2013 the percentage is 47%, in 2014 it slightly decreased to 46.3%, in 2016 increased slightly to 47.8% and in year 2017 the percentage dropped again to 45.7% (Educational Planning and Research Division [MOE], 2018). In addition, there was a decrease in graduation rates in STEM fields according to Ministry of Education of Malaysia (2013). Those who were trained for STEM-related careers were not sufficient to meet the country’s needs (Ministry of Science Technology and Innovation (MOSTI), 2012). A national study, Science and Technology (S&T) Human Capital: A Strategic Planning Towards 2020 (Ministry of Science Technology and Innovation (MOSTI), 2012) confirms that Malaysia needs at least 1.0 million S&T human capital by 2020 based on a 6% annual economic growth and the emergence of EPPs (Entry Point Projects) under the NKEAs as well as the emergence of new technology-driven sectors. 50% of this number are high skilled workers. However, it would only comprise 3% (500, 000) of our expected total workforce of 15 million in 2020. All these data show that more efforts need to be done to prepare more students to enter STEM fields. This data shows Malaysia was having a serious leaking STEM pipeline.
According to the National STEM Movement (2016), STEM is referred to disciplines of knowledge consisting of Science (physics, chemistry and biology) and mathematics with the integration of various technologies and engineering. STEM incorporates all the technologies that engage science and mathematics. The ultimate goal for STEM education is to produce STEM-literate who are capable of thinking in logical manner, using technology, solving problems, creating new ideas, and designing/ inventing new products through an integrated learning encompassing STEM which applies real world context into teaching and learning process and immerse students in hands-on inquiry and open ended exploration (Educational Planning and Research Division (MOE), 2018). In order to sustain interest towards STEM subjects, students should be involved with STEM active learning activities regularly. According to Mohd Shahali, Halim, Rasul, Osman, and Mohamad Arsad (2018) the possible reasons for the decrease in interest towards STEM subjects could be due to the quality of teaching and learning that students experienced in the classroom. This is because Malaysia is having a content heavy curriculum (Educational Planning and Research Division (MOE), 2018). The heavy emphasis on content caused teachers imply fast teaching mode to finish the topic and limit hands-on activities. As the teachers having difficulties to finish the syllabus, therefore STEM related activities can be done after class. According to Sahin (2013) by carrying out various activities such as science fairs, after school activities, engaging students with STEM related clubs can often develop positive attitudes towards STEM fields. In Malaysia, there are many non-formal activities organized by the schools and industries such as school lab competition, Petrosains Science show, National Science challenge, Science and Engineering Innovation competition, STEM+ club, STEM mentor mentee programme, F1 in schools and STEM Icon (Educational Planning and Research Division (MOE), 2018). Student participation in STEM non-formal activities are quite impressive and increases every year (Miller, Sonnert, & Sadler, 2018). This is despite the fact that little is known about the effect of STEM competition participation and career interest in STEM.

Kelab Suka Belajar uses New Academia Learning Innovation (NAU) approach which is service learning. Service learning is a teaching and learning methodology which fosters civic responsibility and applies classroom learning through meaningful service to the community. It also integrates community service projects with academic studies to enrich learning, teach civic responsibility, and strengthens the communities in which we live and work. Service learning integrates academic theory with practical real-life experience, provides students with a broader and deeper understanding of the course content, fosters their sense of civic engagement, and enhances their insights about themselves and their place in the community. Kelab Suka Belajar is an inspiration of a lecturer from the School of Education in promoting the interest of students in learning from various environments such as residential flats and housing estates in urban and suburban areas. The project aims to reach out and create awareness and interest in STEM education among primary and secondary school students, as well as their parents. Kelab Suka Belajar provides a platform to work with students to help them learn and be curious about STEM. Apart from that, Kelab Suka Belajar collaborates with the community to create a comfortable space for helping students to study in groups. Kelab suka belajar activities is able to promote the interest of studying STEM from primary school level until secondary level. This is in line with the philosophy of Malaysia Education to achieve 60:40 Science/Technical: Arts target. The program prepares students with the skills to meet science and technology challenges and also to ensure that Malaysia has a sufficient number of qualified STEM graduates. This program is designed to empower thinking skills among students. It also involves parents in encouraging and inspiring their children to learn together with peer groups in the community. For UTM, the direct involvement of the School of Education students in this project will provide opportunities for them to share their knowledge and skills to the local community. The students will also have the opportunity to conduct educational activities in a relaxed and fun environment besides having the opportunity to communicate with UTM staffs as well as local communities.

STEM outreach programs have become an increasingly popular out-of-school activity over the past century. According to Sahin (2013), by carrying out various activities such as science fairs, after school activities, engaging students with STEM related clubs can often develop positive attitudes towards STEM fields. In Malaysia, there are many STEM outreach activities organised by the schools and industries such as science fair, school lab competition, Petrosains Science show, National Science challenge, Science and Engineering Innovation competition, STEM+ club, STEM mentor mentee programme, F1 in schools and STEM Icon (Educational Planning and Research Division (MOE), 2018). Student participation in STEM non-formal activities are quite impressive and increases every year (Miller et al., 2018). This is despite the fact that little is known about the students’ perspective towards STEM engagement.

Objective
The purpose of this study is to determine the distribution of the participants and also evaluate on students’ perspective towards Kelab Suka Belajar program. It addresses the following research questions. Does participating in a STEM competition influence students interest in STEM and in pursuing a STEM career?

Methodology
The research methodology is quantitative study with survey method as the main research method. Questionnaire are used as instrument for data collection through purposively sampling for the
representative population selected among STEM outreach participants. The questionnaire was
developed by the researchers using Likert Scale 1 to 5. The Likert scale rating represents (5) strongly
agree (4) agree, (3) neutral (2) disagree, (1) strongly disagree. There are 11 items consists in the
questionnaire includes eight Likert scale items and three open ended items. The questionnaire was
distributed during activities. This research population consist of year 6 up to higher secondary
schools students. A total of 66 respondents participated in this study. Data were analysed
descriptively using PSPP. To determine the perspective of students towards STEM engagement in
STEM outreach program, the researcher categorises and interprets the scores into three levels as
displayed in Table 2 below. Mean scores 1.00-2.39 indicate a low level, mean scores between 2.40
and 3.66 indicate average level and mean scores 3.70 to 5.00 indicate high level. The analysis
process is done through the computer using PSPP software. No negative items in the questionnaire.
A descriptive analysis of the mean score is an accrued way portrays the real value of the
perspective towards STEM whereby the lowest mean score reflects the lowest level of STEM interest
while the highest mean score reflects the higher level of STEM interest. Analysis of the research is
divided into two parts, namely descriptive analysis and inferential analysis between parameter
variables used in this research.

<table>
<thead>
<tr>
<th>Mean</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00-2.39</td>
<td>Low</td>
</tr>
<tr>
<td>2.40-3.66</td>
<td>Average</td>
</tr>
<tr>
<td>3.70-5.00</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 2. Interpretation of average score (Likert Scale 5)

Findings and discussions

Table 7. Frequency of answer to items on students’ perspective on STEM Outreach Program

<table>
<thead>
<tr>
<th>No</th>
<th>Students’ perspective towards STEM engagement in STEM outreach program</th>
<th>Frequency and percentage</th>
<th>Mean</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STEM activities conducted in this program is interesting</td>
<td>SDA DA N A SA</td>
<td>4.42</td>
<td>0.58</td>
</tr>
<tr>
<td>2</td>
<td>My interest towards STEM is increasing after take part in the activities</td>
<td></td>
<td>4.17</td>
<td>0.67</td>
</tr>
<tr>
<td>3</td>
<td>Facilitator performed very well in STEM activities</td>
<td></td>
<td>4.22</td>
<td>0.76</td>
</tr>
<tr>
<td>4</td>
<td>This activity makes me more likely to learn STEM field in the future</td>
<td></td>
<td>4.33</td>
<td>0.64</td>
</tr>
<tr>
<td>5</td>
<td>The time allocated to carry out STEM activity is sufficient</td>
<td></td>
<td>3.86</td>
<td>0.89</td>
</tr>
<tr>
<td>6</td>
<td>I am interested to explore this STEM activity further in the future</td>
<td></td>
<td>4.32</td>
<td>0.71</td>
</tr>
<tr>
<td>7</td>
<td>I would recommend this STEM activities to my friends</td>
<td></td>
<td>4.24</td>
<td>0.75</td>
</tr>
<tr>
<td>8</td>
<td>This activity influence me to choose a career in the STEM field</td>
<td></td>
<td>4.17</td>
<td>0.67</td>
</tr>
<tr>
<td>Overall Total</td>
<td></td>
<td></td>
<td>4.21</td>
<td>0.71</td>
</tr>
</tbody>
</table>

The analysis findings above on Table 7 display the students’ perspective towards STEAM
engagement in Kelab Suka Belajar program. On the whole, all of the items are at high level. Item 1
“STEM activities conducted in this program is interesting” \(M=4.42, SP=0.58\) is recorded as the item
with the highest mean value. Research findings also show that the overall mean for the students
perspective towards Kelab Suka Belajar program is 4.21 \(SP=0.71\). To answer the first research
questions of this study, item 2 “My interest towards STEM is increasing after take part in the activities”
shows the mean is at high level. This results show that students’ interest in increasing after take part
in Kelab Suka Belajar program. For second research questions, item 8 “This activity influences me to
choose a career in the STEM field” also show the mean at high level. This results show that students’
interest in STEM career is increasing after take part in STEM outreach program. This results show that
participating in a STEM competition influence student’s interest in STEM and in pursuing a STEM
career.

Conclusion

As a conclusion, this study shows that participating in a STEM competition influence student’s
interest in STEM and in pursuing a STEM career. Research findings also show that the overall mean
for the student’s perspective towards Kelab Suka Belajar program is at high level \(M=4.21, SP=0.71\). This
results shows that students’ perspective towards Kelab Suka Belajar Program is very good.
The authors would like to thank Zaleha Ismail, Nurbiha A. Shukor, Noor Dayana Abd Halim, Hanifah Jambari, Nornazira Suhairom, Nur Husna Abd Wahid, Dayana Farzeeha Ali, Nurul Farhana Jumaat, Mohd Rustam Mohd Rameli, Fatimah Puteh & Farhana Diana Deris for their contribution in Kelab Suka Belajar.

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The Conceive-Design-Implement-Operate Framework in Geographic Information System Survey Camp

Nurul Hawani Idris
Department of Geoinformation, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Malaysia
hawani@utm.my

Nurul Hazrina Idris
Department of Geoinformation, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Malaysia
nurulhazrina@utm.my

Highlights

The Conceive-Design-Implement-Operate (CDIO) framework is an innovative educational framework that has been adopted by the Department of Geoinformation under the bachelor program of Geoinformatics to produce the next generation of geospatialist in Malaysia. The framework has been applied in the third year student course, namely Geographic Information System (GIS) Survey Camp to practice the geographic information science and technology (GIS & T) fundamental within the context of actual process that may involve in development. This paper shares our experience in adopting the framework in this specific course.

Key words: Geographic Information System, Capstone, CDIO, Geoinformation, Geospatial

Introduction

Geoinformatics is a domain of science that emerged after the raising of fundamental significant issues in the implementation of geospatial (or location based) technologies to solve geographic related problems (Goodchild, 2009). The Bachelor of Science Geoinformatics program in the Faculty of Built Environment and Surveying (formerly known as Faculty of Geoinformation and Real Estate) is intended to produce professionals who are capable of using geospatial technology to handle geospatial information for the economic, social and physical development of Malaysia. Geospatial technology comprises of the use of remote sensing, global positioning system (GPS) and Geographic Information System (GIS) for gathering, managing, and analyzing data. According to Harder and Brown (2017), GIS is about uncovering meaning and insights from within data. It is rapidly evolving and providing a whole new framework and process for understanding. With its simplification and deployment on the web and in cloud computing as well as the integration with real-time information (the Internet of Things), GIS promises to become a platform relevant to almost every form of human endeavor—a nervous system for the planet.

Conceive-Design-Implement-Operate (CDIO) framework is a model pioneered by the Massachusetts Institute of Technology (MIT) in the late 1990s to address the gap between the fundamental theory that taught to engineering students with the real environment implemented in industries (Melanie Yong Ze Siin et al., 2018). The Department of Geoinformation has utilized this framework to produce graduates that are prepared with the skills and abilities to success in the field of geoinformation science in a three weeks’ intensive course, namely GIS Survey Camp. This compulsory course is a part of the courses that offers in the Bachelor of Science Geoinformatics program. The course is offered during the fifth semester of 4-years program and is purposely designed so that the students have acquired and attended the fundamental courses including data acquisition using geospatial technologies, designing and developing a database and GIS application. In this course, the students practice the set of skills that graduates would need to have upon graduation, particularly in designing and developing suitable and sustainable GIS application for addressing geospatial challenges in real context. Therefore, instead of emphasizing on problem-solving in a theoretical realm, students participate in a team based project where require them to go through the cycle of conceiving, designing, implementing and operating the proposed solution to address geospatial related issues.

CDIO framework in GIS Survey Camp

The purpose of this course is to provide students with the opportunity to integrate technical knowledge and generic skills attained in the previous semesters. The students are given a Capstone project where they will define a problem according to a specified theme and finding a suitable solution to address the issue where the end output is a GIS application. A small team (typically five or six students) is formed under a supervision of an academic staff, will conduct a survey to identify the needs of potential end users, conceiving the potential solutions, designing and developing a GIS application. In this course, the students practice the set of skills that graduates would need to have upon graduation, particularly in designing and developing suitable and sustainable GIS application for addressing geospatial challenges in real context. Therefore, instead of emphasizing on problem-solving in a theoretical realm, students participate in a team based project where require them to go through the cycle of conceiving, designing, implementing and operating the proposed solution to address geospatial related issues.
customizing GIS software. The CDIO framework is implemented throughout the course is shown in Figure 1.

![CDIO framework](image)

**Figure 1: The CDIO framework that has been applied in this course**

1. **Conceive**

   At the beginning of course, students will be given a briefing related to the course as stated in the course information (formerly known course outline) and the tentative activities that has been designed by a group of coordinators. Students are given a theme that is required to be discussed in a group. Each group is assigned with a supervisor that will assist the group to accomplished the project.

   Invited speakers will give a lecture related to the specified theme so that students will have a basic background with the topic that has been introduced. With the help from supervisors and literature reviews, students will define a problem to be solved. A one-hour lecture related to how to conduct user need assessment will be introduced. Each group will conduct brainstorming to generate creative questions for interview session. Then, students will conduct a survey (or interview) to collect as many information to understand the issue(s) and user needs through the proposed innovation. Then, they will analyze the user requirements and documented in a report. Each group will present the output to the others in front of a group of panel.

2. **Design**

   At this stage, students will conduct brainstorming sessions within their group members to propose innovative solution using geoinformation technology to meet the client needs. At the end of the creative session, students will produce a design of the proposed application according to the user needs that has been documented by considering the functions that will be provided through the application. Each group will present the design of proposed application in front of panels. Then, students will produce a design of the proposed system database by translating it into an Entity-Relationship diagram (ER). Each group will present the output of system design in front of panels.

3. **Implement**

   At this stage, student will develop a database using a specific spatial database by incorporating the entities that have been defined in their pre-design conceptual database stage. Then, students will develop the graphical user interface of their proposed application by customizing a specific GIS software. Each group will present the output of system design in front of panels.

4. **Operate**

   At this stage, students will test the functionality of application that has been developed. The final product will be assessed by a group of examiners during final oral presentation.

The novelty of this innovation is on the adoption of CDIO framework, as to date, we believe our program is the first undergraduate geoinformatics program in Malaysia that implementing the C-D-I-O (Conceive – Design – Implement – Operate) framework through a capstone project in a single course, namely GIS survey camp. At the end of this course, it is expected a student has applied and practiced the basic skills in developing a GIS application that comprises of understanding end user needs, proposing a GIS solution through system and database design, developing and
customizing GIS application using relevant geospatial technologies. The NALI approach that has been applied in this course has given a high impact and added value to student experience, particularly for finishing individual final year project and as the first exposure before starting a career as geospatialist.

References


Framework of Survey Camp Course in Civil Engineering Program using Project Based Learning

Muhammad Azril bin Hezmi1, Mushairly bin Mustaffar2, Radzuan bin Saari3, Azmahani bt Abdul Aziz4, Erwan Hafizi bin Kasiman5, Muhammad Nassir bin Hanapi6

School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
azril@utm.my, mushairly@utm.my, radzuan@utm.my, azmahani@utm.my, erwanhafizi@utm.my nassir@utm.my

Highlights

This paper seeks to present the framework of teaching and learning Survey Camp course using project based learning in enhancing engineering professional skills among civil engineering students. This study was conducted at School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia. The Survey Camp is designed as a package of ten days which consists of surveying activities such as levelling, traversing and detailing, and also introduces the usage of latest technologies of surveying tools in civil engineering projects. Project Based Learning is implemented as teaching and learning approach to enhance students’ content knowledge and professional skills development. Online assessments and feedback from students are used as tools to evaluate the outcome of the course. It was found that the learning environment has positively enhanced students’ professional skills as needed for engineer of 2020. The impact on teaching and learning will be beneficial to student, educator, educational institution and employer/industry. Furthermore, it will produce high quality of graduates with the ability to integrate knowledge, skills and attitudes associated with the requirement in preparation as a future engineer. For commercialization prospect, this framework could be packaged and offered to other institutions through licensing, offer courses or workshop on the designing and conducting the survey camp and being as a facilitator.

Key words: Project Based Learning; Professional Skills; Online Assessments;

Introduction

The current demands from various stakeholders such as the industries, local governments, employers, alumni, parents and students themselves and implementation of Outcomes Based Education(OBE) especially in civil engineering field, needs a transformation from teacher centered learning to student centered learning has become a major concern in the 21st century education. Furthermore, student centred learning environment has been proven to enhance students with higher levels of critical thinking, problem solving, improvement of attitude to learn, as well as an increase in overall attendance (Nguyen, 1998 & Liang et al., 2010). Meanwhile, OBE implementations often incorporate a host of many progressive pedagogical models and ideas, such as reform mathematics, co-operative learning, project-based learning and problem based learning. In civil engineering programme, the implementation of Survey Camp course is based on the Civil Engineering Handbook and Survey Camp Handbook published by Faculty of Civil Engineering. Another reference documents is the Engineering Programme Accreditation Manual 2012 (EPAM). Students who are attending this camp have successfully completed the theory and practice of Engineering Surveying course. Nevertheless, the surveying projects that were undertaken are ‘stand-alone’ projects with emphasis on the understanding of the concepts involved. Since the course have been carried out for several years, there is a lack of empirical evidence whether the learning environment could enhance students’ professional skills after attending the course. Therefore, a comprehensive and innovative course contents and teaching techniques should be designed to provide quality education and prepares engineering students for the 21st century society. This study attempted to assess the development of engineering professional skills among the civil engineering students before and after attending the Survey Camp course. The Survey Camp is designed as a package of ten days which consists of surveying activities such as levelling, traversing and detailing, and also introduces the usage of latest technologies of surveying tools in civil engineering projects. Project Based Learning is implemented as teaching and learning approach to enhance students’ content knowledge and professional skills development. Online assessments and feedback from students are used as tools to evaluate the outcome of the course.

Educational Theories

Experiential learning theory is underpinning in this study to investigate the effectiveness of Survey Camp course in enhancing engineering professional skills among civil engineering students (Jose et el. 2017). The theory defines learning as ‘the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience and fulfill the six characteristics of experiential learning. One of the ways that the students can obtain valuable and impactful experience is by going through educational
fieldwork. An effective learning can be obtained when a student is going through four processes which are: 1) Experiencing; 2) Reflecting; 3) Thinking; and 4) Acting. This is the same cycle that the student goes through during the ‘Survey Camp’. They will experience and observe by themselves the theories that has been taught in class and also during the ‘Survey Camp’. Next, they will reflect on information that they receive and make better judgment on the reflection (conceptualize). The next cycle is that they are ready to use and test the information they receive on other examples and also they are ready to be tested on the knowledge that they received. This model of learning was implemented to discover the effectiveness of implementing Survey Camp using project-based learning in enhancing students’ professional skills. First year students are compulsory to attend this camp which purpose to give in-depth knowledge of surveying engineering.

The design of Survey Camp course integrates the three principles in constructive alignment which are learning outcomes, teaching and learning activities and assessment. Project-Based Learning (PjBL) and Cooperative Learning (CL) environment are implemented as the teaching and learning approach. Project-based learning has been defined as a systematic teaching method that engages students in learning knowledge and skills. While, Cooperative Learning comprises of “instructional methods in which teachers organize students into small groups, which then work together to help one another learn academic content”.

Design of Survey Camp Course

This course involves a ten-day fieldwork in which the students would carry out an engineering survey project in a group of five to six. It consists of three inter-related projects as shown in Figure 1. These projects involved typical surveying and design work supervised by the academic staff assisted by non-academic staff. It gives a holistic view of the surveying activities needed prior to and during the construction stages of a civil engineering project. Furthermore, the Survey Camp activities will train the students in planning and executing survey work on a larger scale. The surveying work involved depends on the type of project undertaken, but normally it includes establishing horizontal and vertical controls, detailing, earthwork calculations and setting out. Students were assessed based on their oral presentation and written reports submitted at the end of the camp. The basic and concepts of surveying with emphasis towards engineering surveying were introduced. Common methods of field procedures, bookings and reductions of observation were adopted. By end of the course, students should have the ability to apply theory into practice; identify and solve surveying problems in civil engineering; communicate effectively when presenting results and ideas; think positively and make sound decisions by upholding ethics and function effectively in a team to achieve a common goal (Hezmi et. al., 2015).

Course Project

A scenario was designed for the purpose of practical training, to simulate an actual engineering surveying project. Teluk Gorek Chalet and Camp Site (TGCCS) as a client had requested a proposal of land reclamation on existing site. The site was located about 30 km from Mersing, a city in Johor, Malaysia. The Survey Camp students was appointed to carry out engineering surveying work (traverse, levelling and detailing) on a piece of land of about 0.6 hectare and to submit a survey plan that will be used in expansion of existing Chalet and Camping site.

The course project consists of course implementations, course outputs and course assessment and evaluation.

(a) Course Implementations

Survey Camp group consists of 5 to 6 students from various background i.e gender and ethnicity. Total number of survey group is based on numbers of student registered for the course. A group leader was appointed to each team while the others member must take parts in all projects activities as a team member. However, each team members were appointed as project leader for different project. The daily routines start with a morning briefing by the Survey Camp coordinator (academic staff) followed by group discussion to plan and execute the project activities. The results from discussion were reported to the facilitator in-charge for the particular project by project leader
and all team members should present during this session. After checking process, the group then execute their survey work for the particular task. During the initial few days, the whole group went out to carry out the field work. However, if they face any problem or any obstacles in completing their projects task, the project leader have to discuss with team members to review existing planning and project execution. The group leader might decide to leave some members behind to do the calculation, data processing, data analysis, plotting and preparation of presentation materials.

(b) Course Outputs

The course outputs required from each group were the group report, the survey plan and the conceptual design plan of the proposed reclamation project. The group report including of daily survey field books, calculation sheet, reclamation volume estimations and the write-up for conceptual engineering design. These outputs or products formed the basis for the assessment of the individual and team performance. It was the duty of the team leader and project leader to ensure that the team daily activities and projects were carried out accordingly and any problems were solved collectively. The team leader and project leader had to ensure that each team member worked as planned. In a way the appointment of a daily report was a check and balance measure to ensure that the survey team work together. Based on the progress of work, it had to be assumed that this strategy worked. During the evening oral presentation, the group matters, problem encountered and related issues were discussed

(c) Course Assessment and Evaluation

The assessment of student’s performance was conducted through written report (i.e field work books and calculation) and oral presentation by academic staff. It should be pointed out that the students were not graded but rather they were assessed either to have met the requirement of passing the course or the contrary. Effectiveness of the course was evaluated through survey questionnaire. The questionnaire focused on the implementation of a Project Based Learning approach in an effort to develop students’ skills development in tandem with technical or professional skills. The entry and exit survey questionnaire for Survey Camp were handed to all participants at the beginning and the end of the course.

Research and Findings

In semester 3, 2016/2017 session, the Teluk Gorek Chalet and Camp Site (TGCCS) was selected as the proposed project of land reclamation on existing site. The site is located about 30 km from Mersing, a city in Johor, Malaysia. The Survey Camp students was appointed to carry out engineering surveying work (traverse, levelling and detailing) on a piece of land of about 0.6 hectare and to submit a survey plan that will be used in the expansion of the existing Chalet and Camping site.

A mixed method research methodology was conducted to assess the effectiveness of the Survey Camp course. In quantitative study, students are required to attempt online survey at the beginning and end of the course. Five elements in civil engineering professional skills were identified , namely i) problem solving; ii) communication; iii) team working; iv) leadership; and v) modern tool usage. On the other hands, in qualitative study, students need to submit a reflection journals at the end of the course. A reflection journal is one of qualitative instruments that could give feedback on the implementation of the course and what should be improved. Data were analyzed using SPSS (quantitative study) and thematic analysis (qualitative study). The obtained results shown a strong impact on students’ knowledge and professional skills development. The implementation of project based learning as a learning environment in conducting Survey Camp course successfully shows the enhancement of the students’ attainment in developing the selected engineering professional skills.

Other relevant information

1. Commercialization potential
   - Designed module can be packaged and offered to other institutions through licensing
   - Offer courses or workshop on the designing and conducting the survey camp
   - As a facilitator.

2. Awards received

   Title of project: Innovative Design of Survey Camp Course for Civil Engineering Program
   Exhibition: Innovative Practices in Higher Education Exhibition (IPHEX)
   Year: 2017
   Award: Gold
Acknowledgement

The authors would like to thank Universiti Teknologi Malaysia (UTM) for supporting this project through Research University Grant vot no. Q.J130000.2522.11H07.

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Petak Pecahan Ajaib

Dr. Noradzimah bt. Abdul Majid
Institut Pendidikan uru, Kampus Ipoh
norad.1507@gmail.com

Highlights

The innovation is about solving problem on 4 operations of fractions that are plus, minus, multiple and division of two fractions, which was not solved or easily understood by using traditional method. The the kit is called the Petak Pecahan Ajaib, designed to help improve the pupil’s overall ability, especially Year 4, Year 5 and Year 6 students on fractional topics. Students are guided to understand the concept by using different alternatives to traditional methods to ensure that they are able to master the basic concepts and procedures and at last can solve the given questions by using this incredible teaching aid. Some of the schools which were selected, among them SK Manjoi2, SK Pos Raya, and SK Polis Hutan Ulu Kinta involving 4th year students. This innovation adopted Behaviorist Learning Theory and Assure Model approach with data collection using pre and post test and descriptively analyzed to obtain overall mean for each test. This kit at first were made by using folded papers, which was later updated using transparent plastic, coloured plastic strip and a square foot base.

Key words: Petak pecahan ajaib; traditional method; innovation; folded papers; coloured plastic strips.

Introduction (Project or Innovation)

Analysis of learning and learning of fractional topics found that many students face difficulty in mastering plus, minus, multiplication and division operations of two desirable fractions. Various types of errors can be detected through diagnostic tests, observations and document analysis such as worksheets and student exercise books. Among the mistakes identified are lack of skills to the operation process, mistakes when changing to the same denominator and wrong concepts on the four operations. Therefore, the kit called the Petak Pecahan Ajaib is designed to help improve the pupil’s overall ability, especially Year 4, Year 5 and Year 6 students on fractional topics involving add-on, subtraction, multiplication and division operations. Therefore, the researcher come out with the new ideas to help students master the four operations by using other alternatives rather than tedious algorithm and procedures which were hard to understand by the students, especially low learners. The new approach uses an effective teaching aid which is called petak Pecahan Ajaib and are applied to some of the schools. This innovation adopted Behaviorist Learning Theory and Model Assure approach with data collection using pre and post test and descriptively analyzed to obtain the overall mean for each test. This kit at first were made by using folded papers, which is later updated by using transparent plastic, coloured plastic strip and a square foot base. By using this effective teaching aid, students are guided to understand the concept of fraction, and the four operations to ensure that they manage to solve the given questions easily and in enjoyable manner. The innovativeness of this teaching aid is that the method of gaining the answer of plus, minus, multiple and division operations of two fractions is very easy and interesting by using different colours of plastic stripes. Students can work together by playing with the stripes in enjoyable manner and this improves group collaboration. The applicability of this innovation is it does not conflict with the traditional approach to algorithms and allow the students to choose the suitable method that best adapt to the problems that they are addressing, allows the students to improve their flexibility and at the same time enriches the students understanding on this topic. The operating costs estimates shows that this kit has reduced the cost up 85.7 % (price of the tools), and 50% (time taken). The findings of the study found that Petak Pecahan Ajaib has successfully helped the students to understand the concept and master the addition, subtraction, multiplication and division of two fractions which can be shown by the difference in the average mean of pre and pos test. With the success of this innovation, the researcher would like to thank the headmaster, and the students of SK Manjoi 2, Ipoh, SK Pos Raya, Cameron Highland and SK Polis Hutan, Ulu Kinta and also to all group members of Alpha Mind.

Content (Project or Innovation)

The objective of this innovation project is to meet the National Transformation Goals 2050 (TN50), with teachers playing an important role in educating innovative and competitive human capital in various fields globally, lift pupil cognitive performance against international standards with emphasis on Mathematics subjects. The creation of new teaching aids is also help to improve student quality in examinations especially in international assessments such as Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (Timms) with the use of interesting teaching aids. This innovation project is also to be shared to educators especially lecturers and teachers and also to the students to enhance the spirit of innovation in teachers and student life to solving problems with various ways. This project innovation is parallel with KSSR objectives to apply competitiveness skills in the students mind as well as building logical minded skills students, solve problems creatively, develop high level of thinking among the students and increase self-development while producing original inventions recognized by society and country.
Research Methodology

Basically teaching must include two major components sending and receiving information. Ultimately, a teacher must deliver knowledge by using certain method, recognized by the schools. Therefore, any communication methods that serve this purpose without destroying the objective could be considered as innovative methods of teaching. The use of innovative methods in educational institutions has the potential not only to improve education, but also to empower people, strengthen governance and galvanize the effort to achieve the human development goal for the country.

In this project innovation, the researcher focuses on a new teaching aid in Phase 3 which is named Petak Pecahan Ajaib as an innovative teaching and learning strategy in teaching fractions. The traditional method which was applied earlier and the innovative methods of teaching are critically examined, and evaluated by using pre and pos test results. As such, the strengths and weaknesses of the traditional teaching methodology in the topic of fraction (addition, subtraction, multiplication and division of two fractions) are identified based on the results of pre-test. The students involved were Year 4 students in various school which covered three phases, first phase using folded papers, second and third phase using transparent plastic, coloured plastic strip and a square foot base.

Finding and discussion of the project or innovation

Here are the results of pre and post tests of the 4 operations in Phase 3, which was held at SK Polis Hutan, Hulu Kinta, on Julai, 2018.

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Pos-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>10.5</td>
<td>89.5</td>
</tr>
</tbody>
</table>
### Subtraction Operation of Two Fractions

<table>
<thead>
<tr>
<th>Name</th>
<th>Pre-test</th>
<th>Pos-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurul</td>
<td>10.5</td>
<td>86.5</td>
</tr>
<tr>
<td>Hariez</td>
<td>40.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Aqil</td>
<td>40.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Siti</td>
<td>60.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Wan</td>
<td>80.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Th.</td>
<td>60.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Ainun</td>
<td>60.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Arifa</td>
<td>60.0</td>
<td>61.25</td>
</tr>
</tbody>
</table>

### Multiplication Operation of Two Fractions

<table>
<thead>
<tr>
<th>Name</th>
<th>Pre-test</th>
<th>Pos-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurul</td>
<td>6.75</td>
<td>61.25</td>
</tr>
<tr>
<td>Hariez</td>
<td>6.75</td>
<td>61.25</td>
</tr>
<tr>
<td>Aqil</td>
<td>20.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Siti</td>
<td>40.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Wan</td>
<td>40.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Th.</td>
<td>40.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Ainun</td>
<td>60.0</td>
<td>61.25</td>
</tr>
<tr>
<td>Arifa</td>
<td>60.0</td>
<td>61.25</td>
</tr>
</tbody>
</table>
Traditional approaches have resulted in low achievement in the pre-tests, showing that it could be modified in the delivery of knowledge. By using Petak Pecahan Ajaib, the increasing of student’s performance could be seen through the Pos-test results. The findings show that Petak Pecahan Ajaib is a solution to student’s weaknesses and at the same time producing students who are creative; think critically and analytically to solve problems. Another advantage of using Petak pecahan Ajaib is that the students tend to solve the given questions in a group environment where they learn to work cooperatively and collaboratively, using their group skills and a variety of activities to accomplish the project’s overall objectives.

Other relevant information (e.g. commercialization potential, awards received (title of project, exhibition and year))

**Awards Received**

   Tool Name: Petak Pecahan Ajaib (Addition operation of two fractions)

2. Creativity and Innovation Competition 2016. Organized by IPGKI: Gold Award
   Tool Name: Petak Pecahan Ajaib (Addition operation of two fractions)

   Tool Name: Petak Pecahan Ajaib (Addition and Subtraction Operation of two fractions).

   Tool Name: Petak Pecahan Ajaib (Addition, Subtraction, Multiplication and division of two fractions)

**Dissemination**

1. Paper presentation (Dr. Noradzimah bt. Abdul Majid)
   Place: The 2017 International Conference on Global Education, Universiti Ekaakti Indonesia
   Date: 10-12 April, 2017 Title: The Effectiveness of “Petak Pecahan Ajaib’ In Solving Addition and Subtraction Fractions.

2. Paper presentation (Dr. Noradzimah bt. Abdul Majid)
   Place: Seminar Pendidikan Kebangsaan Matematik 2017, IPGKDRi, Terengganu.
   Date: 15 Ogos, 2017 Title: Keberkesan Petak Pecahan Ajaib Dalam Menyelesaikan Operasi Tambah Tolak, Darab dan Bahagi 2 Pecahan Wajar).
3. Regional Innovation Exhibition, Perak

Place: Sultan Azlan Shah University (USAS), Kuala Kangsar
Date: 21 April to 22 April, 2017

Commercialization potential

This effective teaching aid is in the process of commercialization through:

1. Facebook
2. YouTube (Title: Petak Pecahan Ajaib)
3. On-Line Kit through CDs

Figures

Phase 1: SK Manjoi, 2016

Figure 1: Application of Petak Pecahan Ajaib at SK Manjoi, 2016.
Phase 2: SK Pos Raya, Cameron Highland

Figure 2: Application of Petak Pecahan Ajaib at SK Pos Raya, 2017.

Phase 3: SK Polis Hutan Hulu Kinta

Figure 3: Application of Petak Pecahan Ajaib at SK Pos Raya, 2017
PETAK PECAHAN AJAIB

<table>
<thead>
<tr>
<th>Base</th>
<th>Transparent Plastic</th>
<th>Colourful plastic Stripes</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Base Image]</td>
<td>![Transparent Plastic Image]</td>
<td>![Colourful Plastic Image]</td>
</tr>
</tbody>
</table>

References


Buku Teks Matematik, Tahun 6.


DSKP Matematik KSSR, Tahun 4.


A Model for Continual Quality Improvement Implementation in
Academic Programs

Naziha Ahmad Azli
School of Electrical Engineering
Faculty of Engineering
Universiti Teknologi Malaysia
nazih@utm.my

Leow Pei Ling
School of Electrical Engineering
Faculty of Engineering
Universiti Teknologi Malaysia
leowpl@utm.my

Highlights

Continual Quality Improvement (CQI) is an important element in Outcome-Based Education (OBE). A proper CQI implementation will ensure better understanding by academic staff on the philosophy behind OBE, as they are given the opportunity to become part of the CQI process. It will also promote sense of responsibility among academic staff to continuously seek for ways of improving course delivery so that the learning outcomes can be achieved. The proposed CQI Implementation Model has been conducted since 2014 at the School of Electrical Engineering, Faculty of Engineering at Universiti Teknologi Malaysia (UTM). The well-structured CQI process based on the proposed model thus far has promoted better understanding among academic staff on their role as a course lecturer in OBE, particularly on the aspect of continual quality improvement in an academic program.

Key words: Continual Quality Improvement; Outcome-Based Education, Program Learning Outcomes, Learning Outcomes, Course Learning Outcomes

Introduction (Project or Innovation)

Continual Quality Improvement (CQI) is an important element in Outcome-Based Education (OBE) that is often neglected in the running of academic programs. Figure 1 shows the typical CQI cycle in OBE at course and program levels respectively. The inner most loop is considered as the most dynamic, which involves frequent measurement on the achievement of the course learning outcomes (CLO). This loop relates to the teaching and learning experience of the academic staff and students of the respective courses in the academic program curriculum. The CQI process in this loop is crucial to identify the gap between the teaching and learning experiences of the academic staff and the students. Analysis on the achievement of the CLO helps identify the course of actions that need to be taken in improving the course in terms of teaching and learning activities and assessment for better outcomes achievement. A CQI Coordinator is appointed for each academic program to monitor and manage the CQI process at the course level. A model for CQI implementation is proposed that involves face to face interaction between the CQI Coordinators and the academic staff teaching the courses. This in turn, promotes accountability and sense of responsibility among them in ensuring that CQI initiatives as previously agreed are duly carried out the next time the courses are offered.

Figure 1. CQI cycle in OBE

CQI Implementation Model

The proposed CQI Implementation model is presented in Figure 2. The School of Electrical Engineering offers three undergraduate programs, each of which has its own CQI Coordinator. The three CQI coordinators report to the respective Program Directors. One of the main responsibilities of the CQI coordinators is to ensure that constructive alignment is implemented in all courses in the academic program curriculum. This can be observed by referring to a document known as Course Information as shown in Figure 2 that presents the mapping between the CLO, teaching and learning activities and assessment methods. At the end of each semester, all academic staff
assigned to courses are required to prepare and submit a document known as Course Assessment Report (CAR) to the Course Coordinators. All Course Coordinators in turn prepare a document known as Course Assessment Summary Report (CASR) to the CQI Coordinators. CASR summarises the CAR as submitted by the various academic staff teaching the same course. Both documents are important to capture the overall achievement of the learning outcomes of the courses offered every semester. The documents also include feedback from the students as well as the academic staff’s reflection on the course performance.

The proposed model extends the CQI process to another level by introducing a session that requires all Course Coordinators and the academic staff teaching the course to present the CASR to a panel consisting of all CQI Coordinators. This session allows direct interaction between both parties, with the course team presenting the course performance and any issues related to it while the CQI Coordinators provide the relevant feedback and comments. This session allows for fruitful discussions between both parties until certain CQI initiatives are agreed upon for implementation in the next course offering as a continual quality improvement effort for the course. More importantly, the session also creates awareness, accountability and sense of responsibility among academic staff on their role as course lecturers in the CQI process of the respective academic programs. On the part of the CQI Coordinators, the outcomes of the presentation are documented in the form of a CQI report for each program which is submitted to the Director of Program for the preparation of the Program Review Report (PRR). Record keeping on the CQI initiatives that have been carried out throughout the years since 2014 is put under the responsibility of the CQI Coordinators.

In OBE, CQI is an ongoing process. Courses that show achievement in the learning outcomes as a result of the CQI initiatives proposed in the previous semester are considered as those that have “closed the loop” at the course level, as shown in Figure 1. These courses can maintain the same CQI initiatives in the following semester but if at the end of that semester, other issues arise that affects the achievement of the learning outcomes, other CQI initiatives can be proposed for implementation in the following semester. Based on the proposed CQI implementation model, this process is made very apparent through the face to face interaction between the course team and the CQI Coordinator as highlighted earlier.

The proposed CQI implementation model has been a practice at the School of Electrical Engineering, UTM for the past 5 years. It has been proven to be beneficial particularly during the auditing process conducted by the Engineering Accreditation Council on all three programs.
offered by the school. The CQI process can be clearly explained with the evidence provided through the CQI report produced every semester for all the programs. This innovation can be easily transferred to other academic programs as a best practice on CQI implementation.

Acknowledgement

The authors would like to extend their appreciation to the Program Coordinators at the previously known as Faculty of Electrical Engineering (FKE) UTM namely Dr. Puspa Inayat Khalid, Dr. Rashidah Arsat and Assoc. Prof. Dr. Md. Pauzi Abdullah for their contribution in terms of ideas and effort in ensuring successful implementation of the CQI process at FKE.

References


Teaching and Learning Innovative using a Novel Pico Hydro Turbine Kit

Shamsul Sarip
Razak Faculty of Technology and Informatics, UTM, Kuala Lumpur
and
OTEC UTM, Kuala Lumpur
shamsuls.kl@utm.my

Mohamed Azlan Suhot, Mohamad Zaki Hassan, Mohd Nabil Muhtazaruddin, Nurul Aini Bani, Hazilah Mad Kaidi and Noor Hamizah Hussain
Razak Faculty of Technology and Informatics, UTM, Kuala Lumpur
azlans.kl@utm.my, mzaki.kl@utm.my, mohdnabil.kl@utm.my, nurulaini.kl@utm.my, hazilah.kl@utm.my

Abstract
A pico hydro turbine kit which is an electric power system has been created specifically for the STEM-based education system. This turbine kit was created to give students exposure to science, technology, engineering and mathematics (STEM) as well as deepening knowledge in renewable energy based on hydropower sources as a major energy source. Its small and portable size allows this turbine kit to be a complete reference source in enhancing students’ understanding and interest on renewable energy sources. This turbine kit is provided along with a guidebook containing some simple, fun and different experiments with existing experiments in school. The pico turbine kit is made from easily obtainable materials such as water container as the turbine housing, turbine blades made from 1/2” pipes and a generator that can be purchased from local suppliers. It requires a head of 7-10 m and produces 30W power output. It only requires pipe water source as a source of water and can be used to generate electricity for basic use such as lamps, televisions, laptops and mobile phones. This kit is small, portable and maintenance-free. Its production costs are low compared to existing products in the market that are imported from abroad. This pico turbine kit has been successfully used for demonstrations in several programs in schools. At present, there are six schools involved, four from Jelebu, Negeri Sembilan, SMK Undang Jelebu, SMU DUSAJ, SMK Jelebu and SMK Triang Hilir, one from Kuala Lumpur, SK Intan Baiduri and one from Kelantan, SK Bukit Marak. The programs were conducted without involving huge costs and participants are expected to be able to share the knowledge acquired to other students. The time taken for the learning session is short, only involving four meetings equivalent to 96 hours for all components. All the students have welcomed the use of this turbine kit where learning activities have become more fun and interactive.

Key words: Renewable, energy, STEM, pico turbine, teaching and learning

Introduction
Pico means very small quantities where the value is smaller than micro or in a measurement system with a factor of 10-12. Pico hydro turbine means a very small turbine output power of below 1kW. Hydro turbine is a water machine used to generate electricity. The hydro turbine consists of several blades known as turbine blades made of stainless materials such as plastics and steel. The pico hydro turbine kit is a mobile power generating system created specifically for the STEM-based education system. The pico hydro turbine kit is produced from easily available materials such as water reservoirs as turbine housings, turbine blades are produced from 45 degree bent pipes and generators that can be purchased from local suppliers. The kit has five main components as follows;

- Turbine blades
- Jet nozzle
- Generator
- Inlet pipes
- Turbine housing

Product Features
Pico Hydro Turbine Module contains STEM concepts, fundamental of renewable energy, procedures of carrying out the experiments and its assessment tool to evaluate understanding and motivation of the pupils.

Objectives
1. To provide students with knowledge in renewable energy.
2. To inculcate creative and innovative skills in design and development.
3. To provide students with hands-on experience in producing renewable energy.
4. To understand water flow rate concept and electrical power generated using Pico Hydro Turbine.
Methodology

This fun effective learning project has been planned to assist in the development of science, technology, engineering and mathematics for all form two students in four secondary schools in Jelebu District, Negeri Sembilan and two national schools in Kuala Lumpur and in Kelantan. The list of names of schools involved in teaching and learning activities is as below:

a. Sekolah Menengah Undang Jelebu (SMKUJ)
b. Sekolah Menengah Kebangsaan Dato’ Musa Al-Haj (SMKDUMA)
c. Sekolah Menengah Kebangsaan Dato Undang Syed Ali Al-Jufri (SMK DUSAJ),
d. Sekolah Menengah Kebangsaan Teriang Hilir (SMKTH)
e. Sekolah Kebangsaan Intan Baiduri Kuala Lumpur
f. Sekolah Kebangsaan Bukit Marak Bachok Kelantan

![Figure 1: Teaching and learning using Pico Hydro Turbine kit](image)

Discussion

Motivate and balance the students in learning the subjects of Science, Technology and Mathematics. The students were exposed to more fun teaching methods using experimental experiments. The module can be used as a reference to school teachers in the teaching of Science, Technology, Engineering and Mathematics.

Advantages of the product and key features capabilities,
1) low cost, 2) free maintenance and portable.

Commercial value in terms of marketability or profitability of the product innovation.

The potential customers

a. Jabatan Kemajuan Orang Asli (JAKOA)
b. Orang Asli settlements
c. Kementrian Pendidikan Malaysia
d. Primary schools
e. Secondary schools
f. Resorts
g. Individual

The important customer need

Orang Asli in remote areas need electricity, bringing electricity to the Orang Asli. 50% Orang Asli in Peninsular Malaysia located in the remote or interior areas used oil lamps and other types of lamp. Each house will have this product to supply electricity to residential houses.

STEM Education

Customer Value Proposition

- prices are the lowest
- manufacturing locally
- product is uniquely better
- make things easier-plug and play
- portable and lightweight
- maintenance free

Conclusion
STEM education needs to be highlighted early in advance especially in primary schools to attract students in Science, Technology, Engineering and Mathematics. Increased motivation among students in Science, Technology, Engineering and Mathematics Enhanced students’ knowledge in Science, Technology, Engineering and Mathematics. Provide interesting and effective teaching and learning environment. The result of the teaching auxiliary tool which is a pico hydro turbine Kit is best suited to STEM learning to attract students especially primary and secondary students. The concept is learning and playing by touching the tool while taking experimental data and interacting with the group members. The innovation of pico hydro turbine kits also produced a handbook titled ‘Renewable Energy STEM Education’. The content of this book covers Science subjects that relate to the topic of Scientific Skills, measurements, solar systems, energy, light, electricity, heat and Technology. This book will help students to explore renewable energy knowledge, especially hydroelectric power generation systems such as hydro power. Content also involves Engineering where Kit is used as a real tool on how an electric power station works. This kit can attract students to produce a simple tool that can generate electricity for daily use. To establish pico hydro turbine for teaching and learning as an important brand that represents quality in electrification Renewable Energy. We will accomplish this using high quality manufacturing and research, a creative marketing program, and a comprehensive distribution network using retail outlets, internet presence, and a consumer catalogue.

Acknowledgement

This work is supported by the Razak Faculty of Technology and Informatics, GUP Tier 1 (Vote: 17H56) grants scheme and the Centre for Community and Industry Network (CCIN), Universiti Teknologi Malaysia, and in collaboration with UTM Ocean Thermal Energy Centre.

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Embracing Education 4.0: Credit Transfer MOOC for Technical Communication English

Azwin Arif Abdul Rahim  
Universiti Malaysia Pahang  
ariftesl@ump.edu.my

Nor Yazi Khamis  
Universiti Malaysia Pahang  
ariftesl@ump.edu.my

Mohd Shafeirul Zaman Abd Majid  
Universiti Malaysia Pahang  
shafeirul@ump.edu.my

Farah Liyana Ahmad A’azmey  
Universiti Malaysia Pahang  
farahliyana@ump.edu.my

Wan Jumani Fauzi Fauzi  
Universiti Malaysia Pahang  
jumani@ump.edu.my

Highlights

This project conceptualizes the idea of making MOOC course entitled ‘Becoming Efficient Technical Communicator’ to be a credit transfer course in Universiti Malaysia Pahang (UMP). The in-session MOOC course resembles the current physical course offered at the university which is the UHL 2422 English for Technical Communication. This project also highlights the MOOC course assessments that allow, be it UMP or not yet UMP students to transfer credit without enrolling into the mainstream class. In this MOOC, the assessments for learning is heavily focused on task-based learning and instructor – peer and peer – peer interaction.

Key words: credit transfer MOOC; alternative assessment; peeragogy

Introduction (Project or innovation)

The copula of teaching and engaging learning have always been an interesting subject of research in education. Teaching and learning faces series of revolution from the classical chalk and talk, pen and paper to the introduction of computers, later to wired and now wireless, mobile and connected. The 21-century learning also sees the prologue of 4th Industrial Revolution that technology, robotics and artificial intelligence would impact highly on human being.

The introduction of MOOC in year 2008 and gradually expands has change the learning curve around the world ever since. The massive participation and learning technology rouses numerous possibilities for lifelong learning in formal and informal channels. In universities, MOOC has given new perspectives for educators to address student’s engagement via cybergogy and peeragogy with the epistemology andragogy and heutagogy.

This project sightsees the opportunity of making in-session English for Technical Communication MOOC course to be credit transfer as part of innovation in students’ learning in Universiti Malaysia Pahang (UMP). To ensure learning occurs over the platform, assessment for learning is heavily focused as this will help the students and the educators evaluates their current progress. The infuse of peer to peer learning and collaboration helps their learning engagement occurs with the direction and somewhat provocation by educators as an alternative assessment.

Since Universiti Malaysia Pahang (UMP) has practised open registration, students tend to have issue in registering for compulsory English courses i.e. UHL2422 English for Technical Communication. The credit transfer MOOC – Becoming Efficient Technical Communicator (CTM-BETC) is seems a perfect innovation and platform to cater students who are having issue to register in the mainstream class due to several reasons; conflict of timetable with other subjects and class is full due to open registration. However, before being able to offer CTM several issues need to be addressed and resolved.

Content (Project or Innovation)

1. This project aims to prepare the CTM-BETC to cater students who are having difficulty to register in the mainstream class.
2. The connectivism theory falls heavily in this project as the central idea of MOOC is social learning in which students learn from their peers or members of the same course (Siemen, G. 2014). This project addresses the novelty of making a MOOC course to be a transfer credit course as it is proposed to be offered in session with the mainstream course. On an immediate impact, it attempts to infuse the innovativeness by reducing multiple cost and issue such as extra workload by the instructor to offer new section or class as well as reducing cost by students by enrolling to an online class.

3. CTM-BETC is designed according to the criteria outlined by MALAYSIA MOOC Quality Practices (MEIPTA 2018). Using the score card proposed by Malaysia Centre of e-Learning (MyCell), the CTM-BETC achieved 44/44 and is applying to be certified for MyMOOC.

4. Numerous changes have been done to BETC MOOC course before ready for proposing for credit transfer. BETC has operating online over the MOOC platform for two semesters with a total number of 2884 students’ enrolment. Based from students’ comments and suggestion over the semesters, instructors and administrators revised the materials, activities and tasks accordingly and in line with the current needs. Figure 1 illustrates how CTM-BETC complies to Markel, M. & Selber S.A. (2018) Technical Communication.

References


Apprehending ESL Practitioners’ Challenges in Teaching Academic English for Technical and Engineering Purposes

Nor Yazi Khamis  
Universiti Malaysia Pahang  
nyazi@ump.edu.my

Azwin Arif Abdul Rahim  
Universiti Malaysia Pahang  
nyazi@ump.edu.my

Supyan Hussin  
Universiti Kebangsaan Malaysia  
supyan@ukm.edu.my

Nor Fariza Mohd Nor  
Universiti Kebangsaan Malaysia  
fariza@ukm.edu.my

Key words: ESAP; practitioners; competency; technical and engineering field

Introduction (Project or Innovation)

The English for Specific Academic Purposes (ESAP) competencies of ESL practitioners teaching at Malaysian engineering and technical (MTUN) universities is vital in ensuring quality learning and teaching of language and communication skills at those institutions. The communication skill is highlighted in the learner centred learning (SCL) environment of engineering outcome based education (OBE). SCL has been emphasised in the Engineering Accreditation Council (EAC) requirements, instigating emphases on competency development to all practitioners teaching in the field. The enhancement is also part of requirements by Malaysian Qualifications Agency (MQA 2011) and Ministry of Education Malaysia (MOE).

The practitioners are specifically responsible in furnishing engineering learners’ academic language and communication skills for their studies of engineering. As such, the practitioners require input from the discipline “to contextualise instruction, make the [ESAP] course as relevant and supportive as possible, create greater equality between subject and language courses and facilitate two-way interaction to ensure that L2 learners’ concerns are considered” (Hyland 2006: 186). The contextualisation of ELT in engineering brings about substantial needs for ESAP practitioners’ competency to bolster a meaningful context for MTUN learners to learn the skills.

However, despite the growing pressures ESAP practitioners in scaffolding the learning of English medium content knowledge, there is scarcity of discussion on the ESAP practitioners teaching ESL engineering undergraduates at MTUN universities. Hence, using Benesch’s Critical EAP Theory (2001) and Hutchinson and Waters’ (1987) notion of ESP approach specificity, this study therefore, calls for an investigation on ESAP practitioners’ learning and teaching of the skills in a learner centred learning (SCL) environment at Malaysian technical and engineering HEIs.

Content

1. This study aims to understand ESL practitioners’ challenges in teaching ESAP for technical and engineering purposes. The specific objectives are to explore the experts’ views on challenges faced by the practitioners in teaching ESAP for technical and engineering purposes. Secondly, this study is to identify the specific competencies required by the practitioners in overcoming the challenges.

2. This study used mixed methods research design which comprised interview data gathered from experts in technical and engineering fields and a survey on ESAP practitioners. A list of semi structured interview questions was used to generate 14 local ESAP experts’ professional viewpoints. Braun and Clarke’s (2006) six-stage method of thematic analysis (TA) has been used to analyse the qualitative and Atlas.ti, a software programme to aid the presentation of data. The quantitative data were analysed using frequencies and percentages, and mean scores.

3. Later, an online survey on the practitioners was carried out to triangulate the findings. A five Likert scale of importance questionnaire which comprised three domains of competencies adapted from Malaysian
Teacher Standards (MTS, 2009) was made available online and had 42 ESAP practitioners participated voluntarily. The instruments went through several levels of checking to ensure its trustworthiness and authenticity, as well as its validity and reliability.

Findings from the qualitative inquiry revealed three major themes. The first theme was on ESAP practitioners’ challenges on the lack of guideline for specific professional values required in the learning and teaching of technical and engineering field. Most of the experts made connections between professional values and soft skills that were needed by the ESAP practitioners in teaching. The values also focused on learners’ needs in learning ESAP courses.

Second theme was on the knowledge and understanding required in the learning and teaching of technical and engineering field. Foremost, majority of the experts were equally insistent of the significance of technical knowledge and understanding. The experts acknowledged that acquiring some technical knowledge of engineering would be an advantage to the practitioners. Nevertheless, some of the experts were concerned on the extent of the required technical knowledge and understanding for ESAP practitioners. Secondly, the knowledge was specifically required in distinguishing General English (GE) and ESAP practices.

As for the third, most of the experts believed the skills of ESAP learning and teaching complimented the other two domains. The experts agreed that ESAP practitioners needed the skills in relating their learning and teaching practices with the engineering academic contexts and in accommodating ESL engineering learners’ workplace requirements.

The experts were aware of the challenges faced by ESAP practitioners and cautioned on its negative effects to the practitioners’ pedagogical practices. Conversely, the challenges could uplift the practitioners’ significance in becoming the language specialist in the field, and for that the experts encouraged the practitioners to undergo ESAP related form of professional development training (PDT). The PDT was in two categories i.e., formal and informal. There were three recommended ways of formal PDT namely through training, attending conferences and seminars, and industrial attachments. The other type was the informal ones which were considered as individual initiatives by the practitioners which could occur at any time or place through reading related materials, working in collaborations with subject specialists and sharing of experiences.

On the other hand, the findings from the quantitative analyses concurred with the qualitative on the importance of ESAP knowledge and understanding as the prevalent competency for the practitioners in overcoming the identified challenges.

4. In understanding ESL practitioners’ challenges in teaching ESAP for technical and engineering purposes, the study identified three domains of competencies that could help the practitioners in facing the challenges. The challenges occurred due to the inadequacy of guidelines for the practitioners’ specific professional values, knowledge and understanding of ESAP and the learning and teaching skills. The guidelines could facilitate the practitioners in preparing suitable communicative activities that centre on learners’ engineering context and purpose of learning the language. This indirectly confirmed the importance of the practitioners’ competency and its contribution in enhancing learners’ interest in learning the skills using content subject field, as well as in elevating the practitioners’ status and recognition as the language specialists in the field of technical and engineering at MTUN institutions. It further implicated the need for the local quality agencies to specify ESAP practitioners’ qualifications, in contrast to other GE practitioners.

Acknowledgement

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References


Industry involvement in academic programme via dyna:mech@UTM

Zaini Ahmad  
Universiti Teknologi Malaysia  
azaini@utm.my

Mohamed Hussien  
Universiti Teknologi Malaysia  
mohamed@utm.my

Highlights

In line with the aspiration of higher institution in Malaysia in boosting university-industry collaboration, Faculty of Mechanical Engineering has initiatively introduced dyna:Mech@UTM programme which aims to strengthen the current Mechanical engineering programme and improve the employability and competitiveness of the graduates. dyna:Mech@UTM is the first of its kind in Malaysia. While other University-Industry collaboration focuses on the technology transfer, research and development, the Mechanical engineering programme in UTM takes one step further by allowing involvement of the industry in designing the curriculum. Our new initiative offers 23 flexible credits which are based on the needs of the industry. The course offered under this programme will be categorized into clusters according to the skillset required by specific industries. By embarking in this programme, students may experience the working world while they are still studying and will be trained with specific skills according to the current needs of the industry. Above all, dyna:mech@UTM programme provides industrial benefit through reducing the period taken significantly to train and prepare the young engineers. The Faculty of Mechanical Engineering, UTM will stop at nothing to ensure its programme always the best in Malaysia to produce outstanding engineers in the country.

Key words: industry; mechanical; flexible

Introduction

dyna:Mech is an initiative by the Faculty of Mechanical Engineering UTM which aims to strengthen the currently available Mechanical Engineering Programme, at the same time improving the employability and competitiveness of the graduates. dyna:Mech is the first of its kind in Malaysia; which no other universities in the country offer a dynamic Mechanical Engineering programme like this. While other University-Industry collaborations involve research funding and technology transfer, the Mechanical Engineering programme in UTM takes one step further, allowing involvement of the industry in the curriculum. Our new initiative offers approximately 20 flexible credits which are based on the needs of the industry; some are taught by lecturers of the faculty, and some others by experienced personnel from the industry. The courses offered under the dyna:Mech programme to Mechanical Engineering students will be categorised into clusters according to the skillset required by specific industries. Students will also experience industrial training with industries related to the respective cluster they had chosen.

Consequently, Mechanical Engineering students can experience the working world while they are still studying, and will be trained with specific skills according to the current needs of the industry. This dyna:Mech initiative provides industrial benefit through reducing the period taken significantly to train and prepare the young engineers. This collaboration between the University and industry will help students in getting an early chance to identify employment opportunities, simultaneously providing industries with the opportunity to select excellent students before they even graduate. The Faculty of Mechanical Engineering at UTM will stop at nothing to ensure its program is always the best in Malaysia to produce outstanding engineers in the country.

Project or Innovation

1. Project or innovation objectives

   i) To create a Mechanical Engineering Program which is dynamic, flexible, and competitive.
   ii) To put forth a sustainable Mechanical Engineering Program which is malleable according to the current needs of the industry
   iii) To boost the marketability and employability of UTM Mechanical Engineering Program graduates

2. NALI approach implemented in the research (e.g. novelty, creativity, innovativeness, applicability and impact)

   The scenario based learning will be implemented in embarking in this programme.
3. Research Methodology

i) Third (3) year and Second semester
   a. Offering Company chooses students during the FME Open Day or interview
   b. Students undergo industrial training at the Offering Company
   c. Offering Company determines students’ FYP topic (optional)

ii) Fourth (4) year and First semester
   a. Students conduct FYP I
   b. Students take 2 Offering Company Elective Courses

iii) Fourth (4) year and Second semester
   a. Students conduct FYP II
   b. Students take 1 Offering Company Elective Course and 1 FME Elective

iv) Graduate stage
   a. Student obtains BSc. Mechanical Engineering
   b. Student is awarded with a certificate from the Faculty, recognizing the dyna:Mech Offering Company Industrial Program they underwent
   c. Possible employment by the Offering Company
   d. Finding and discussion of the project or innovation can be summarized as follows.

The programme has its significances to students and the industry. The significance to the students is as follows.

a. Students will be more focused and passionate about the working world even while still studying
b. Students obtain employment opportunities as early as in their 3rd Year
c. Students can be trained by interested companies through the Industrial Training done at the company
d. Students undergo the Company training program in their Final Year
e. Students are awarded with an added value through the Specialization Programme/Industrial Programme certificates (presented by the faculty) which recognizes the students’ extra capabilities in the respective fields

While the significance of the programme to the industry is as listed below.

a. The industry can select excellent graduates earlier.
b. The industry can train the graduate in advance to fulfill the needs of the company
c. The industry can reduce the time and cost of training fresh graduates

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The authors would like to thank the Universiti Teknologi Malaysia (UTM) and Dyson Manufacturing Sdn Bhd for the support given to ensure this programme run successfully.

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The Different Language Style and Language Function Between Students and Teachers in Updating Their Status In Facebook Webpage (A Case Study of the Topic National Final Examination 2011) [Doctoral dissertation, University of Diponegoro].
GAIMOOC: Adapting Gamification Approach in Massive Open Online Courses to Improve User Engagement

Sarina Sulaiman  
UTM Big Data Centre  
School of Computing  
Universiti Teknologi Malaysia

Nor Anita Fairos Ismail, Nor Bahiah Ahmad, Fiera Mohd Nor Hisham  
School of Computing  
Universiti Teknologi Malaysia

Nurbiha A. Shukor  
School of Education  
Universiti Teknologi Malaysia

Highlights
Traditionally, students learn in school where the learning process conducted in a classroom and students meet their teacher physically. However, today, students can learn without having face-to-face interaction with their teacher. Creating user engagement between students and course are important, especially in online learning. Consequently, this project was conducted to propose an alternative for an online learning course to engage students with courses offered online. Online students can be engaged through multiple ways and most of the teachers that teaching online also applies several ways to engage their students. Moreover, this research proposed to engage online learners by adapting gamification elements. The gamification elements were applied in online courses can be varied according to the type of courses. This research is important because the area of implementing gamification is not restricted towards the type of the courses that were taught by the teacher. Regardless of the courses, the gamification elements can be applied in any courses in an online learning platform. Findings of this research can be benefited to teachers who adapt online learning in increasing user engagement between their students and their course.

Key words: Gamification Approach; Massive Open Online Courses; User Engagement

Introduction (Project or Innovation)
Online learning has a lot of differences compared to traditional education. The differences can be seen from advantages and disadvantages of this two learning method. The advantages of online learning compared to traditional education are the flexibility of learning (Rauch, 2015). The flexibility of learning offered by the online learning means people are allowed to learn at their own pace and it can be anywhere or anytime. People who are enrolled in online courses can choose their own time of learning, unlike traditional education where students need to obey the schedule of teaching and learning process. Moreover, the teachers can provide multiple elements of teaching materials including videos, pictures, texts, animations and so on.

Videos act as the main element in conducting online courses. Instructors of the particular course will upload videos into the course materials that represents lecture as in traditional education. In addition, the online learning nowadays also has offered interactive activities. Not only watching videos to learn but the students also can do some activities inside the online course. This situation can help the students to have a better understanding of what they are learning online (Koedinger et al., 2015). Basically, anybody is able to learn without limitation today especially with the existence of online learning nowadays. People can easily enroll themselves in a course that they interest to follow. Despite, the courses in the online learning also allow students to enrol courses that they follow whenever they want to do so. This situation leads to the low completion rate for online courses where the average of completion rate is only 15 percent (Jordan, 2015). To avoid this from happens, engaging the students are important tasks for each and every instructors of the course. This research was aiming to help engaging the students through the gamification elements adaptation in the online learning courses platform such as Massive Open Online Courses (MOOC). The gamification is a word that comes from the word game. The gamification means to apply game concepts in education to allow learners having fun while learning (Kurshan, 2016).

One of the factors that affect course completion is a student engagement. The student engagement is defined as the degree of attention, curiosity, interest, optimism, and passion that the students show when they are learning and being taught, which extend to the level of motivation they have to learn and progress in their education (Abbott, 2016). A new way to increase the user engagement in education is by adapting
Once there are thousands of students enrol in MOOC, the average completion rate less than 7 percent. Since there are thousands of students enrol in MOOC, the average of students that complete a course is unacceptable. Engagement of the students in online courses is important and if the completion rate is really small, then it shows that online learning is not really effective for them. Hence, in future MOOCs quality and viability will be questioned whether MOOCs give benefit for people (Carolyn, 2014). Despite engaging student in MOOC, the motivation of student also important in order to help the student complete the course (Li, 2015). Motivation can come in many ways and one of it is from instructor’s encouragement. Completing the online courses without motivation is impossible. Self-motivation is an important factor for each individual to drive them in completing things (Williams and Williams, 2011). The student’s engagement is the key factor to make the student engages toward a particular course. To delivered motivation through the online education is not as easy as traditional education since there is no direct contact between instructor and learner.

As conclusion, learning nowadays is a lot easier since anybody is able to learn anywhere and anytime as long as they are connected to the Internet. There is no limitation anymore for students not to seek any knowledge. However, learners still have problems to be faced even though they can gain knowledge whenever they want. This lead to a failure of online learning as people will not see the opportunity to gain knowledge without going to the traditional classroom because of problems mentioned before. The results from the project can determine whether the adaptation of the gamification elements increasing the user engagement in the online courses or not. This will help the instructors that used MOOC platform to apply the concept if the result is positive. Hence, they can attract more students to learn and enrol in their course. Apart from that, students that enrol in the courses that are having the gamification concept will engage and have self-motivated towards the course. Results of this research will also determine that implementing gamification elements will also increase the completion rate the MOOC courses. Thus, the MOOC’s quality and viability will be higher and the future education can be improved (Elmore, 2013). Through the implementation of gamification elements, this project could help in improving students’ completion rates in the online courses. Hence, gamification elements applied in Web Programming course had been chosen as one of the core subject in Computer Science course at Universiti Teknologi Malaysia (UTM).

**Content (Project or Innovation)**

The objectives of this project are to identify the gamification elements that are suitable for OpenLearning MOOC and the parameters of measuring the user engagement through the website. Next, to apply the gamification elements in OpenLearning MOOC for increasing the learner’s engagement level. The last objective to measure the learners’ engagement level towards MOOC by comparing analytics results between MOOC that applied gamification elements and MOOC without implementation of gamification elements.

The aim of this research was to evaluate the effectiveness of gamification elements to be adapted in Web Programming course offered by UTM in OpenLearning platform will increase. The results from the research can determine whether the adaptation of the gamification elements increasing the user engagement in the online courses or not. This will help the instructors that used MOOC platform to apply the concept if the result is positive. Hence, they can attract more students to learn and enrol in their course. Apart from that, students that enrol in the courses that are having the gamification concept are engaged and have self-motivated towards the course. Results of this research also determined that implementing gamification elements increased the completion rate the MOOC courses. Thus, the MOOC’s quality and viability will be higher and the future education can be improved (Elmore, 2013). In this research, there are 5 phases were involved. The phases are described as in Figure 1.
The general idea of the framework to be implemented in UTM MOOC is to experience the learners with the gamification elements. The design of the framework was proposed is depicted in Figure 2.

The first research hypothesis was chosen the progress of overall students increase when the gamification elements are applied. The analytics result shows that students with the gamification elements tend to have more progress to the completion compared to students without the gamification elements applied. Students with the gamification elements have more than 50% of average progress completion while students without the gamification elements have less than 30% of progress completion. The second research hypothesis was the gamification elements affect student’s social participation. For this research hypothesis, the results of total comments for each group depict which group were more engaged in the course. Based on the analytics result, total comments made by the first group which was the group without the gamification elements was only 3 comments throughout the 2 months of the research phase. However, the other group with the gamification elements made total comments of 37. This result shows that students were exposed to the gamification elements did affected the student’s social participation as to gain Kudos they need to comment and other students need to participate by liking other students’ comments. Overall, the research project objectives have been achieved and the research hypotheses show positive results. As a conclusion, gamification elements improve students’ engagement towards the course. More progress of completion was done by the group with gamification elements and students’ social participation increased when gamification elements applied.
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Pembelajaran Berasaskan Komuniti menerusi
Program Lestari Komuniti Kemboja 2.0

Shahrin Hashim
Fakulti Sains Sosial & Kemanusiaan
Universiti Teknologi Malaysia
p-sharin@utm.my

Mohd Hisham Rasidi
Fakulti Alam Bina & Ukur
Universiti Teknologi Malaysia
b-hisham@utm.my

Aminudin Ali
Sekolah Pendidikan Profesional & Pendidikan Berterusan
(UTMSPACE)
Universiti Teknologi Malaysia
b-aminudin@utm.my

Noor Azean Alan
Fakulti Sains Sosial dan Kemanusiaan
Universiti Teknologi Malaysia
azean@utm.my

Nur Azmina Ramli
Fakulti Sains Sosial dan Kemanusiaan
Universiti Teknologi Malaysia

Hasanah Zakaria
Fakulti Sains Sosial dan Kemanusiaan
Universiti Teknologi Malaysia

Highlight/Sorotan

Projek Kembara Lestari Komuniti Kemboja 2.0 adalah sebuah Program Pembangunan Lestari Bersama Komuniti Perkampungan Pendalaman Kemboja berdasarkan strategi Community Based Learning (CBL) yang melibatkan seramai 29 mahasiswa daripada Universiti Teknologi bersama 3 pensyarah serta 10 urusetia dalam menyajakan program Pembelajaran Servis ini. Program ini melibat 4 projek berinovasi yang di cetuskan oleh pelajar Teknikal Vokasional Binaan Bangunan serta pakar daripada UTM serta 2 projek kemanusian bagi pembangunan komuniti di perkampungan tersebut. Tujuan utama pelaksanaan program Pembelajaran Servis ini adalah untuk pembangunan serta kesejahteraan penduduk daif perkampungan dalam di Kemboja terhadap keperluan kehidupan melalui projek berinovasi serta berimpak. Selain itu, program ini juga berinisiatif dalam meningkatkan kerjasama dan koordinasi pelbagai agensi terlibat bagi perkongsian pengetahuan (knowledge sharing), kefahaman dan kemahiran tentang bidang binaan bangunan yang sentiasa berkembang pesat dan berevolusi dengan pelbagai inovasi serta menerusi perkembangannya teknologi yang terkini berdasarkan strategi Pembelajaran Berasaskan Komuniti (CBL). Tambahan lagi, program ini juga adalah untuk membentuk platform dan jaringan bagi membolehkan pelajar berkerjasama dalam aktiviti komuniti serta perpindahan ilmu (knowledge transfer). Melalui program ini, terdapat 4 projek inovasi utama yang dilaksanakan iaitu Projek Telaga Inovasi yang merupakan sebuah projek yang berimpak tinggi dengan menginovasikan telaga seda ada kepada telaga serba guna iaitu mempunyai kelengkapan tempayan untuk menyimpan air yang telah dipamp, beserta tempat deduk berbentuk ‘L shape’ serta tempat deduk bagi kemudahan membubur baik mahupun boleh digunakan untuk mencuci pinggan. Matlamat penyediaan projek pertama ini adalah untuk meningkatkan taraf hidup serta kualiti penduduk tempatan dalam mendapatkan sumber air iaitu keperluan utama untuk kehidupan komuniti pendalaman tersebut. Kedua adalah Projek Profiling di mana bertujuan untuk mengambil data demografi mengenai keperluan sejati yang diperlukan bagi komuniti berkenaan limitasi air, menerusi inovasi hidroponik iaitu Vertiliser yang membolehkan sesuatu keperluan serta sokongan yang diperlukan bagi menambah kehidupan penduduk. Seterusnya, projek inovasi ketiga adalah Industri Kecil Sederhana (IKS) iaitu berdasarkan sumber primar seperti ubi kayu, buah mangga, gajus dan sebagainya yang diinginkan di dalam bentuk penjualan ubi ketuk, kerepek ubi, kerepek pisang serta jeruk manis dengan pengpakej hepat. Selain itu, projek inovasi keempat adalah Projek Kemanusian yang dijalankan di perkampungan pendalaman Kemboja ini adalah Projek Berkhatan menggunakan teknologi laser serta projek Wakaf
Pakaian bagi komuniti disana. Secara keseluruhan, program ini mengambil masa selama seminggu dengan persediaan 3 bulan sebagai perancangan jadual kerja serta pencarian dana yang melibatkan juga industri kolaborasi antaranya daripada CIDB (Construction Industry Development Board), Endowment UTM, Kedutaan Malaysia-Phnom Penh, dan EM Malaysia Groups.

Keywords/Katakunci: Community Based Learning, Lestari Komuniti, Pembelajaran Servis

Introduction/Pengenalan

Kaedah bagi pelaksanaan projek Kembara Lestari Komuniti Kcmboa 2.0 ini adalah berdasarkan kepada Pembelajaran Berasaskan Komuniti (Community-based Learning), merujuk kepada pelbagai kaedah dan program pengajaran yang digunakan oleh pendidik untuk menghubungkan apa yang dipelajari di dalam kelas ke komuniti sekitarnya, iaitu pada keadaan yang sebenar/autentik. Secara umumnya, Pembelajaran Berasaskan Komuniti (CBL) adalah satu amalan pengajaran yang menggabungkan kesukarelawan pelajar, pembelajaran pengalaman, dan kurikulum untuk kredit akademik (Mooney & Edwards, 2001).

Pembelajaran berasaskan komuniti juga didorong oleh kepercayaan bahawa semua komuniti mempunyai aset dan sumber pendidikan yang intrinsik yang dapat digunakan para pendidik untuk meningkatkan pengalaman pembelajaran bagi pelajar (Mooney & Evans, 2001; Gadbury et al., 2006). Pengajaran pengkajian terdahulu terhadap Pembelajaran Berasaskan Komuniti secara amnya berpendapat bahawa pelajar akan lebih berminat dalam subjek dan konsep yang diajar, dan mereka akan lebih terinspirasi untuk belajar, jika kajian akademik dihubungkan dengan konsep, isu, dan konteks sebenar, iaitu dapat difahami, dapat diakses, atau secara peribadi berkaitan dengan mereka. Dengan menggunakan “komuniti sebagai bilik darjah,” penyelidik terdahulu mendapati pengekalan pengetahuan, pemerolehan kemahiran, dan pengalaman untuk kehidupan dapat diperolehi melalui praktikal, pembelajaran bermakna (meaningful learning) (Reed-Bouley et al., 2012). Konsep pembelajaran berasaskan komuniti adalah merujuk kepada empat pendekatan umum:

1. Hubungan pengajaran (Instructional connections): iaitu dalam bentuk pembelajaran berasaskan komuniti, pendidik akan membuat hubungan eksplicit bertujuan untuk menghubungkaitkan antara bahan yang diajar di dalam kelas terhadap isu-isu tempatan, konteks sebenar dan konsep yang realiti.

2. Integrasi masyarakat (Community integration): dalam pendekatan ini, para pendidik mungkin mengambil kesempatan daripada pakar tempatan dalam proses P&P untuk memberi penerangan, berkongsi pengalaman, mengambil bahagian dalam perbincangan panel, atau menjadi mentor pelajar yang sedang menjalankan projek penyelidikan.

3. Penyertaan komuniti (Community participation): dalam pendekatan ini, pelajar akan belajar, sekurang-kurangnya sebahagian, secara aktif mengambil bahagian dalam komuniti mereka.

4. Tindakan masyarakat (Citizen action): pendekatan ini akan diperlumbangkan oleh beberapa pakar dan pendidik untuk mengenalpasti pencapaian pelajar secara “telus” terhadap labasama komuniti iaitu bukan belajar dari dan dalam komuniti mereka, tetapi mereka menggunakan apa yang mereka belajar untuk mempengaruhi, menukar, atau memberi kembali kepada komuniti dengan cara yang bermakna.

Justeru, berdasarkan kepada Pembelajaran Berasaskan Komuniti, pelajar-pelajar yang terlibat ditemuramah dalam kumpulan kecil bagi mendapatkan refleksi mereka terhadap projek yang dijalankan berdasarkan kepada empat pendekatan umum yang dinyatakan diatas.

Content/Kandungan

Bagi mendapatkan maklumat awal terhadap keberkesanan pelaksanaan program ini, refleksi pelajar terhadap program yang dijalankan bersama komuniti di perolehi melalui temubual kumpulan kecil. Hasil daripada dapatan tersebut, memaparkan bahawa pelajar memperolehi pengalaman pembelajaran bermakna dan mengaplikasikannya pengetahuan konsep pembelajaran pada situasi sebenar berdasarkan kepada konteks komuniti. Rajah 1.0 berikut adalah dapatan awal hasil daripada temubual dalam kumpulan kecil.

Rajah 1.0: Dapatan awal hasil refleksi pelajar terhadap Projek Kembara Lestari Komuniti Kemboja 2.0 berdasarkan kepada strategi Pembelajaran Berasaskan Komuniti

Selain itu, hasil daripada pelaksanaan projek ini, beberapa berita/laporan media turut di kumpilasikan bagi mendapatkan maklumat umum daripada masyarakat luar terhadap projek ini. Berikut merupakan sebahagian berita/laporan media yang telah di kumpulkan:

References/Rujukan:


Digital Classroom Handbook for Education 4.0

Aida Hazlin Ismail
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
aidah348@salam.uitm.edu.my

Mohamad Ridhuan Mat Dangi
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
ridhuan@salam.uitm.edu.my

Shukriah Saad
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
shukriah736@salam.uitm.edu.my

Norli Ali
Faculty of Accountancy, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300, Bandar Puncak Alam, Selangor Darul Ehsan
norli170@salam.uitm.edu.my

Highlights
Digital Classroom handbook is a manual of applications for educators. This handbook is user friendly and may ease the burden of users on remembering the procedures of using the digital application. The impact of digital adoption and integration in education has brought the used of many related digital applications in the education world. Hence, this handbook may come in handy as a self-instructed handbook when using the six education applications which are: nearpod, padlet, dojo, QR attendance (Lecturer to student), QR attendance (Student to lecturer) and plickers. The handbook comes with pictures of screen shots for each application with the instructions of what the users should do. The handbook also guides the users with the step by step instructions and procedures on how to use the application. This handbook is most suitable for the “Generation X” lecturers as they are very intense and aggressive with the digital technology. This digital classroom handbook may be useful to the users as it is small, compact and easy to carry around with a practical size and reasonable selling price.

Key words: Digital; handbook; manual; education and application.

Introduction
In education, digital era has become an integral part of student’s life in school, colleges and universities (Marta and Antoni, 2016). Advances in digital technology have opened up many avenues of teaching and learning methodology for the teachers and lecturers. Digital technology has made education method of teaching and learning more flexible and accessible from anywhere and by all groups of people (Juana and Paulo, 2016). Digital classroom is one of the example of using software and applications in teaching and learning (Sutton, 2013). Hence, the usage of software and application for digital classroom in universities has brought demand for the need of having a handbook to transform the traditional classroom to a new digital setting of classroom. This digital classroom handbook serves as a guideline for the users of digital classroom application and software to use the applications. In addition, the handbook is a self-exploratory handbook for users to discover the usage of the applications. Since most of the digital applications are complex and technical, hence this handbook may ease the burden of the educators to self-instructed the applications and may serve as a quick reference of the digital applications. In addition, this digital handbook comes with the package of MRMD digital training workshop at a reasonable cost price. Therefore, the digital handbook is a tool that can assist the educators to know more about digital applications and able to be a guideline to use the digital applications themselves. Collaborate learning with other colleagues may be facilitates with the used of this digital handbook. The digital handbook concept of “Read & Apply” makes it more user friendly and practical as the complex applications were simplified accordingly. Therefore, educators from other generations may be able to understand the applications instructions easily.

Theoretical perspectives of how digital natives learn help us to understand how the educators can facilitate their learning style (Charles, 2014). Past research, indicate that digital learners do not learn by being told what to do and memorizing procedures needed to accomplish a task. Hence, this digital handbook is recommended for digital learners in this new era or education 4.0. The handbook helps the users to understand and facilitate learning on how to use each applications. McNerney (2004) suggests that educators must model instructional methods which may help future students to understand that
technology-based instruction is no longer an option but it is a requirement. Therefore, to engage digital natives and keep them interested in learning, the educators must speak their language (Tapscott, 2009). That means the method of teaching need to rapidly acquire 21st century digital skill so that the educators can catch up and hopefully keep pace with the digital learners.

Content of the Digital Classroom Handbook for Education 4.0

The main objective of this handbook is to guide users step by step of the related applications. Another objective of this handbook is to provide information on the applications for those users whom do not have the chance to attend the digital training workshop. There are five (5) applications in this handbook which are nearpod, padlet, QR code for attendance (S to L) and QR code attendance for (L to S) and dojo. This handbook is one of its kinds which simplify the steps to use the applications accordingly. Users will gain information and apply the steps for each section easily. The handbook comes in the form of printed handbook as well as e-book version. In addition, this handbook is user friendly as it has the print screen pictures as guidance for each part of the applications. The handbook also comes with information on the action that users should take at each step of the applications. Hence, this handbook is suitable for users from all age and definitely may be appealing to the generation Y and generation Z as the handbook can be a general guidance to them. With the concept of ‘Read and apply’, no doubt that this handbook may come in handy to the users whom are new to the education applications. This handbook is individually operated and easily explained, rather than passively acquired (Sheah & Lean, 2016). This handbook has a simplified and colourfull presentation that is attractive and easily to comprehend. In addition, the users may purchase the handbook hardcopy printed or online (e-book). The e-book can be purchased using the QR code scanning with the password and cheaper price as compared to the printed copies.

The digital handbook will be sold separately for each application as there might be some users whom are only interested with certain applications only. Each handbook will be sold at the price of RM20.00 only.
However, attractive price will be offered for those interested to purchase the handbook in the set of ten handbooks. This set of handbooks is nicely pack together and comes in variety of colourful covers and attractive fixtures. Users also has the advantage of keeping them nicely in their book shelf as the set of handbooks is neatly pack together and has a specially design box. Hence, this digital handbook has a commercial potential for marketing strategy.

Besides the set of digital handbook, there are also workshop packages for each application. In addition, special price of e-book will be given to those whom purchase the workshop digital package and the handbook package. During the workshop, users can understand more about the digital applications and will be hands-on with the usage of the applications. The digital workshop includes a speaker and two other facilitators that will ensure that the participants will be guided throughout the workshop sessions. At the end of the workshop, participants will have some ideas on how the applications operate accordingly. Hence, it is advisable for the participants to purchase the handbook as this will be the guidance when they want to use the application later. The team of innovators has conducted nine serial workshops for lecturers and administrators in UiTM Puncak Alam throughout the year 2018. In addition, this handbook has obtained IPR copyright status.

Therefore, this digital handbook is suitable for all teachers and lecturers as a guidance when using the applications that relates to teaching and learning methodology. This handbook is user-friendly, colourful and useful as self-instructed handbook for the users. The handbook comes with simple packaging and handy to bring everywhere. In addition, this handbook is also useful to all administrators as a reference handbook when they are having problems when using the applications such as QR attendance code and Padlet.

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References


Modul Pembelajaran Kendiri Dalam Pembelajaran Berasaskan Senario

Mohd Zulkifli Abd Hamid
Sekolah Pendidikan
Fakulti Sains Sosial dan Kemanusiaan

Noor Azea An Atan
Sekolah Pendidikan
Fakulti Sains Sosial dan Kemanusiaan
azean@utm.my

Sanitah Mohd Yusof
Sekolah Pendidikan
Fakulti Sains Sosial dan Kemanusiaan
p-sanitah@utm.my

Nur Husna Abd Wahid
Sekolah Pendidikan
Fakulti Sains Sosial dan Kemanusiaan
husna@utm.my

Nornazira Suhaimi
Sekolah Pendidikan
Fakulti Sains Sosial dan Kemanusiaan
p-nazira@utm.my

Highlights

Pembelajaran berasaskan senario merupakan satu kaedah pembelajaran kontesktual yang melihat pembelajaran sebagai pengabungjalinan aktiviti rutin sehariharian, penghasilan ilmu dan pembelajaran melalui interaksi sosial serta aspek-aspek material dalam kehidupan. Sebagai satu daripada pembelajaran berasaskan ketrampilan pelajar, Modul Pembelajaran Kendiri (MPK) merupakan pendekatan yang digunakan untuk mengaplikasikan pembelajaran berasaskan senario. Pendekatan ini menekankan kepada pembelajaran aktif yang bersifat latih amal (hands-on). Berfokuskan kepada hasilan tanam-tanaman dan ternak, sebanyak empat MPK berjaya dibangunkan iaitu Hasil Biji-bijian, Pemprosesan Hasil Tenusu dan Telur, Bakeri serta Pemprosesan Konfeksiomeri. Pembinaan MPK ini adalah bersandarkan kepada Modul Teras Cabang Shaharom. Hasil penggunaan pembelajaran berasaskan senario ini telah berupaya meningkatkan pengetahuan dan kemahiran pelajar dalam menguasai subjek tersebut.

Keywords: Pembelajaran berasaskan scenario; pembelajaran konteksual; Modul Pembelajaran Kendiri

Introduction (Project or Innovation)

Penggunaan bahan pembelajaran dan kaedah pengajaran yang sesuai, cekap dan berkesan serta menekankan ke atas penglibatan pelajar dalam proses pengajaran dan pembelajaran adalah amat penting dalam mengembangkan potensi individu (Shahroom, 2000). Antara faktor penyebab terhadap pengajaran dan pembelajaran yang kurang berkesan adalah bilangan pelajar yang terlalu ramai dalam satu kelas, tenaga pengajar yang menggunakan kaedah tradisional dan tidak mempelbagaikan kaedah pengajaran. Sehubungan dengan itu, proses pengajaran dan pembelajaran perlu menekankan proses pembelajaran yang berpusatkan pelajar. Bagi merealisasikan matlamat untuk melahirkan pelajar yang berilmu dan berkemahiran, kurikulum pendidikan teknikal dan kejuruteraan, telah berusaha untuk melahirkan graduan yang berkemahiran dalam bidang usaha yang relevan dan bermakna untuk membolehkan mereka mendapat pekerjaan. Kurikulum yang dibentuk merupakan kurikulum konteksual yang memberi peluang kepada pelajar untuk mengaplikasikan ilmu menerusi latih amal.

Modul Pembelajaran Kendiri (MPK) ini memberi peluang kepada pelajar untuk belajar mengikut kemampuan masing-masing. Pengajaran menggunakan MPK ini memerlukan minat, keupayaan, motivasi serta mengikut kehendak setiap pelajar. Pengajaran bermodul menggunakan MPK adalah satu pakej pembelajaran yang lebih bersifat individu dan menekankan pembelajaran mampu diri. Dengan ini, MPK membolehkan pelajar berpeluang untuk memilih unit-unit pembelajaran tertentu yang bersesuaikan dengan tahap mereka. MPK juga memboleh membantu pelajar mengenalpasti kelebihan dan kelemahan mereka sendiri seterusnya mengambil inisiatif untuk meneruskan aktiviti pengayaan dan pemulihan yang disediakan di dalam modul tersebut.

Kajian ini bertujuan untuk menghasilkan empat MPK berjaya dibangunkan iaitu Hasil Biji-bijian, Pemprosesan
Hasil Tenusu dan Telur, Bakeri serta Pemprosesan Konfeksieneri. Disamping itu, kajian ini juga bertujuan untuk menilai kesesuaian elemen-elemen MPK dalam keempat-empat modul tersebut. Berikut adalah proses pembinaan dan penilaian MPK yang merangkumi aspek penilaian formatif, sumatif, analisis data dan rumusan.

Rangka Kerja Pembinaan dan Penilaian MPK

![Diagram Rangka Kerja Pembinaan dan Penilaian MPK]

Dengan merujuk kepada strategi pembelajaran berdasarkan scenario, maka empat buah MPK berjaya dibangunkan iaitu Hasil Biji-bijian, Pemprosesan Hasil Tenusu dan Telur, Bakeri serta Pemprosesan Konfeksieneri seperti dalam gambarajah di bawah:
Rujukan:

Pendidikan Malaysia.


Pendawaian Domestik pada Peingkat Tingkatan Empat” Tesis Sarjana Muda Teknologi serta Pendidikan,
Universiti Teknologi Malaysia, Tidak diterbitkan.

Fizik di Sekolah Menengah”. Kertas kerja dibentangkan dalam Seminar Pendidikan Sains dan Matematik:
Universiti Teknologi Malaysia, 27 Mei
Students’ Perception towards International Service Learning Program (ISLP): Malaysia and Indonesia

Shahrin Hashim
Universiti Teknologi Malaysia, Johor Bahru
p-sharin@utm.my

Noor Azean Atan
Universiti Teknologi Malaysia, Johor Bahru
azean@utm.my

Marlina Ali
Universiti Teknologi Malaysia, Johor Bahru
p-marlina@utm.my

Zakiah Mohamad Ashari
Universiti Teknologi Malaysia, Johor Bahru
zakiahmah@utm.my

Dayana Farzeeha Ali
Universiti Teknologi Malaysia, Johor Bahru
dayanafarzeeha@utm.my

Muhammad Khair Noordin
Universiti Teknologi Malaysia, Johor Bahru
mdkhair@utm.my

Highlight

Service Learning approach in the learning process gives many advantages to students and communities. This approach allows students to apply the knowledge gained in the lecture hall in their real daily life experience. The aim of this article is to identify students’ perception towards International Service Learning Program (ISLP) known as the International Real-Time Lecture (KKN) which has been organized by the Faculty of Education, UTM in collaboration with Universitas Muhammadiyah Purwokerto (UMP), Indonesia. The perceptions of students involved in the one month program, that has been implemented at the Faculty of Education and Felda Air Tawar 3 and several other agencies. A total of 21 students from Universitas Muhammadiyah Purwokerto (UMP), Indonesia participated in this program and answered questionnaires distributed. 4-point Likert scale were used in questionnaires to obtain data. The questionnaire consists of three constructs which are program implementation assessment, program management assessment and program effectiveness evaluation. The findings show that the overall mean score is 3.25, which shows students have high perception regarding ISLP program. Positive responses from students explain that this program can benefit through the sharing of knowledge, skills and knowledge in specific disciplinary across with students from various disciplines.

Keywords: Service Learning (SL); Real time lecture; International Service learning (ISLP) program; student perception

Introduction

Faculty of Education, Universiti Teknologi Malaysia (UTM) in collaboration with the University of Muhammadiyah Purwokerto (UMP), Indonesia has organized the ISLP Program together with the community of Felda Air Tawar 3, Kota Tinggi, Johor. A total of 21 students and 3 lecturers from the University of Muhammadiyah Purwokerto (UMP), Indonesia participated in this program. In addition, a total of 16 lecturers and 3 students from the Faculty of Education, UTM also participated in the ISLP this as a facilitator and speaker. The program has received good support from the Felda Air Tawar 3 community including several schools involving 410 secondary school students and 100 primary school children, as well as EM Group Malaysia as a strategic partner. A total of 50 residents with 60 youths and 8 families involved in contributing significantly to the success of the program.

ISLP is implemented to empower the implementation of the New Academic Learning Innovation (NALI) framework of Universiti Teknologi Malaysia through the Learning Services approach. Therefore, through this program, various activities are provided such as Bio Village Seminars, Bio Agro Community Activities, LOHAS Community Activities, close school activities, Learning Fun Club Activities, ICT Integration for 21st Century Learning, Kulinar Johor, Believers Program, Prime Forum and Kuliyyah Dhuha. At the end of the program, ISLP
seminars are held to provide students with the opportunity to present and share information and exhibit the results of community service activities that have been successfully implemented with the Felda Air Tawar 3 community, schools and EM Group.

This program (ISLP) receives positive responses from students and the community as it brings many benefits to them through the sharing of knowledge, skills and knowledge gained in the lecture hall. Local residents welcome the program to continue in the future and hope sharing of knowledge and cooperation between the two parties will further deepen the relationship between institutions of higher learning and the community in various contexts in producing holistic and balanced students. Hopefully this collaboration program will be an example of future programs in improving NALI UTM through Service learning (Noor Azean & Shahrin Hashim; 2017).

Background of the problem

Service learning (SL) aims to enable students to understand the courses learned and engage themselves in community (Lin et. al; 2014). SL approach in the learning process furnishes many advantages (Najah Nadiah Amran, 2016). Among the benefits are the science knowledge or theories they have learned in the lecture hall are relevant and can be applied in daily experiences. SL can help academic improvement, develop student proficiency (Weiss et. al; 2016) and give students exposure on the reality of life.

The ISLP program involves UMP Indonesia is the second program ever organized by the Faculty of Education UTM. Previously, the same program was implemented with the University of Technology of Yogjakarta, Indonesia. There were various activities conducted by students such as Bio Village Seminars, Bio Agro Community Activities, LOHAS Community Activities, Learning Fun Club Activities, ICT Integration for 21st Century Learning, Kulinar Johor, Believers Program, Prime Forum and Kuliyah Dhuha. Therefore, it is important that assessment is made to assess the perception of UMP, Indonesia’s students on this program for future program improvements.

Research methodology

This study uses descriptive quantitative design. A total of 21 respondents consists 5 men and 16 women participated in this study. Likert scale 4-point questionnaires were used in this study to obtain data. The questionnaire consists of three constructs namely program implementation assessment, program management assessment and program effectiveness evaluation. Questionnaire in the form of Likert scale rating as which (4) represents strongly agree, (3) represents the agree, (2) represents disagree, (1) represents strongly disagree.

Table 1: Interpretation and level of Mean tendency

<table>
<thead>
<tr>
<th>Min</th>
<th>Tahap</th>
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<tr>
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</tr>
<tr>
<td>2.00-2.99</td>
<td>Moderate</td>
</tr>
<tr>
<td>3.00-4.00</td>
<td>High</td>
</tr>
</tbody>
</table>

Research findings and discussions

Based on the following questionnaire, based on item A: Assessment of program implementation it was found that 61.90% of students strongly agreed on international service learning program should be held in the future with mean 3.57 (high). For item B: program management assessment, 42.86% of students disagree that the time allocated for each activity is appropriate with mean 2.57 (moderate). Next item C: appraisal of program effectiveness, 80.95% of students strongly agree that students’ interest in international real time lecture programs increases by min 3.81 (high). 80.95% of students agree that this program can strengthen the relationship between UMP Indonesia students and the community of Felda Air Tawar 3 with min 3.90 (high). 85.71% of students strongly agree that the international real time lecture program is successful and benefits with a mean of 3.86 (high). 80.95% of students strongly agree that this international service learning program will be attended by other Muhammadiyah University students of Purwokerto in the future. 80.95% of students strongly agree ISLP program shows that community activity is fun with mean 3.81 (high).
Table 2: Evaluation of students on the implementation, management and effectiveness of international service learning (SL) programs

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
<th>Agree (%)</th>
<th>Strongly agree (%)</th>
<th>Mean</th>
<th>SD</th>
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<td>.51</td>
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References


Design thinking and ideation approaches for innovative product development experience via Capstone Project

Lim Cheng Siong  
Department of Control and Mechatronic Engineering,  
School of Electrical Engineering, UTM Johor Bahru  
lcsiong@utm.my

Rashidah@Siti Saedah Arsat  
Department of Communication Engineering  
School of Electrical Engineering, UTM Johor Bahru  
rashidaharsat@utm.my

Zulkarnain Ahmad Noorden  
Institute of High Voltage and High Current,  
School of Electrical Engineering, UTM Johor Bahru  
zulkarnain-an@utm.my

Suhana Binti Mohamed Sultan  
Department of Electronic and Computer Engineering  
School of Electrical Engineering, UTM Johor Bahru  
suhanasultan@utm.my

Highlights
With the utilization of design thinking and IDEO’s idea generation approaches, Capstone Project provides opportunity for students to experience a comprehensive and systematic way of solving real engineering-related industry or community problem.

Key words: integrated design project; Capstone project; design thinking; industry; community

Introduction
The School of Electrical Engineering (SKE), UTM Johor Bahru requires students for all programs to undergo four laboratory courses (8-credit hours in total) throughout the four-year study. The laboratory courses are offered to comply with the current requirement from industries and the Engineering Accreditation Council (EAC). Laboratory course for the 4th year students in particular is given the highest priority since at this level, the students have covered most of the courses in the program. Starting from session 2013/14, in order to accommodate one of the EAC requirement, which requires engineering students to experience an integrated design project during the study, Capstone Project was introduced as the laboratory course for all 4th year students, replacing the previously implemented laboratory course known as Problem-Based Laboratory. In Capstone Project, the students are required to utilize design thinking and ideation approaches in solving an open-ended problem from either industry or community. The project provides opportunity for the students to systematically demonstrate their problem-solving skills - with all the knowledge obtained during the study - to solve a real industry or community problem.

Content
Figure 1 illustrates the revolution of the 4th year laboratory course in SKE. Prior to 2007, the laboratory course for all SKE’s 4th year students was carried out based on 10 sessions of instructional experimental work in 12 weeks period. On weekly basis, the students were required to complete all the electrical-electronic experimental works based on the given instruction. Such laboratory implementation however lacks on critical-thinking process whereby the students were obliged to the instruction. To address this limitation, problem-based laboratory (PBL) course was implemented starting from 2007/2008 session. PBL course consists only 3 sessions with 4 weeks’ period for each session. The students were given an electrical-electronic problem in each session with minimal instruction. Although the PBL course gives the students some flexibility in choosing solution for the given problem, yet its practice was still lacking of problem-solving elements in terms of project management, financial and socio-technological issue.

To provide a comprehensive problem-solving experience for the students, Capstone Project was introduced - replacing the PBL course - for the first time by the Department of Control and Mechatronic Engineering in 2013/14 session, followed by other departments (Electrical Power Engineering, Communication Engineering...
and Electronic & Computer Engineering) in the following sessions. The project is carried out within the same duration of 12 weeks. The students are divided into groups (4 students per group) and each group is assigned under supervision of an academic staff called facilitator. In contradiction to the PBL course that provides the students with problems to be solved, in Capstone Project, each group is given a theme and required to conceive problem to be solved from any targeted end user either community or industry and create an innovative solution accordingly.

Figure 2 and Figure 3 show the activity framework of Capstone Project and its flow of activities involved, respectively. In general, from Week 1 to Week 4, the students need to identify their targeted end user based on the given theme and collect related useful information from them via interview session, site survey or questionnaire. With the assistance of the facilitator, the students are properly guided on how to understand and engage the end user to obtain any potential problem to be solved in accordance to the theme. Then, based on the feedbacks and data acquired from the end user, each group has to carry out a group activity called data clustering process, whereby the students have to analyze the available information and come out with user profile and design statement. Such components not only lead the students to design a product that focus on the user’s need but also to avoid any design pitfalls in their end product. Based on the design statement, the students then carry out the next group activity called brainstorming, where they are properly guided using IDEO’s ideation approach to generate ideas for the product design. The design should consider social/culture, technological analysis, economic, environmental, ethical, health, safety, sustainability, political and social impacts. At the end of this activity, each group requires to develop with a conceptual prototype of the product.

Figure 1: Evolution of 4th Year Laboratory in the School of Electrical Engineering UTM

Referring to Figure 2 and 3, in Week 5, the developed conceptual prototypes are presented to demonstrate the working principle and function of the proposed design during the first evaluation session. At this stage, the students learn on how to decently create a conceptual prototype and the way to demonstrate convincingly the product’s features to potential collaborators, stakeholders or investors. The students are required to improve the end product design based on evaluators’ comments and feedbacks. From Week 6 to Week 12, the students start to develop the end product. The development process not only covers engineering design works such as simulation, programming, technical drawing, assembling and fine-tuning the product but also on the financial aspect as well. In Week 13, the developed end products are presented and demonstrated by all groups during the second evaluation session. The end product evaluation is carried out as a mini poster exhibition in 1 venue, involving evaluators from community/industry as depicted in Figure 3. Finally, in Week 14, each group is required to submit a complete technical report to the respective facilitator.

In term of assessment, the processes are carried out throughout the semester. Engineering design skills such as problem solving, computer literacy, teamwork, communication skills, and even the readings of professional material are assessed. For individual assessment, each student is assessed in four categories; in-lab performance (5%), minutes of meeting (15%), individual report (15%) and interview (15%). Each student prepares and submits 2 minutes of meeting and 3 individual reports, besides 3 times of interview sessions by the facilitator throughout the project duration. Assessment by peers (15%) is done on Week 5, Week 9 and Week 13. For group work, allocation of marks is 50% and the assessment involves these three items; conceptual prototype (10%), end product (10%) and technical report (30%).
As a conclusion, the implementation of Capstone Project provides a new innovative learning experience for the students on how to comprehensively and systematically design a solution or product that address the end user – either community or industry - needs. Such experience may prepare the students with valuable engineering skills such as design thinking, prototyping and demonstrating end product - in facing the more challenging workplace after graduating from the university.

**Acknowledgement**

The authors would like to thank the School of Electrical Engineering, UTM Johor Bahru for the continuous support on the Capstone Project implementation.

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Innovative Low-Cost Housing for Indigenous People's Village using Interlocking Brick System

Shek Poi Ngian
UTM Construction Research Centre, Institute for Smart Infrastructure and Innovative Construction, School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
shekpoingian@utm.my

Mahmood Md Tahir
UTM Construction Research Centre, Institute for Smart Infrastructure and Innovative Construction, School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
mahmoodtahir@utm.my

Arizu bin Sulaiman
UTM Construction Research Centre, Institute for Smart Infrastructure and Innovative Construction, School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
arizu@utm.my

Che Ros bin Ismail
School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
cheros@utm.my

Abdullah Zawawi bin Awang
School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
abdullahzawawi@utm.my

Ahmadon bin Bakri
School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
ahmadon@utm.my

Mohd Yunus bin Ishak
School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
yunus@utm.my

Ain Naadia Mazlan
School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia
ainnaadia@utm.my

Highlights

The indigenous people at Pos Bersih, Ulu Slim, Perak are living in poor condition and lack of basic facilities. The government is working hard to improve people’s living standard by introducing low cost yet sustainable construction materials to reduce the price of the house. The university’s research and development in line with faculty’s mission to involve more active student participation in service learning and government policy by enhancing the construction material and construction technique to reduce the construction cost. The research output proven to solve the community problem by reducing the overall construction cost and speed up the construction time.

Key words: Service learning; low cost housing; sustainable construction; indigenous people; interlocking brick system.

Introduction

Buildings in Malaysia are mostly designed and constructed using timber, steel or concrete (Badir et. al., 2002). With the rising material costs, it becomes crucial to seek for more cost saving alternatives to keep purchasing prices of houses and buildings affordable to clients. This also includes identifying faster construction methods to shorten project time and cost. In relation to this, the concept of interlocking bricks has been a topic of research. This project is in collaboration with Jabatan Kemajuan Orang Asli (JAKOA), Hadi Legacy and School of Civil Engineering to construct 20 units low cost semi-detached house for indigenous people in Pos Bersih, Ulu Slim, Perak. The aim of this project is to complete 20 units house in 4 and half months using the interlocking brick system and the cost of each house is not more than RM40 000. The project is awarded to Hadi Legacy with the assistance of students and academic staff from School of Civil Engineering, Universiti Teknologi Malaysia. A total of 63 students, 5 technicians and 8 academic staff get involved in this project to ensure the completion of this project by 15th March 2018.
Innovative Low-Cost Housing

Service-learning integrates community-based projects with academic studies to enrich learning and teach civic responsibility (Hashim et al., 2016). This project is designed via collaboration between faculty and community partners. The project requires students to apply classroom lessons to community-based activities. This gives students experiential opportunities to learn in real-world contexts and develop skills of community engagement, while affording community partners opportunities to address significant needs. It benefits students in ways that create positive impact on students’ academic learning, improves students’ ability to apply what they have learned in “the real world” and also their ability to understand complexity and ambiguity technique. Study also shown that the experiential learning acquired through service appears to compensate for some pedagogical weaknesses of classroom instruction (Markus, 1993).

This project embarks on construction of 20 units low cost house using interlocking brick system for indigenous people at Post Bersih, Ulu Slim, Perak. The main aim of this project is about knowledge transfer to local community regarding the technology of interlocking brick system in detail construction method and application (Tahir et al., 2013; Shek and Lee, 2015; Lee et al., 2017). The team intend to introduce new technology on construction using interlocking brick system for future application and development of young generation with knowledge and skill. This project prepares a platform for students and local community to practice the construction method and technique in house construction using interlocking bricks. Moreover, this project enhances the knowledge and experiences in community service responsibility (CSR) program and to fulfill the university’s mission in knowledge transfer to local community.

65 students were involved from the early stage of this project until completion. The students are expected to perform several method of construction such as rough foundation, ground beam, frame reinforcement placement, brick laying, filling the void with mortar, and install/erect frame and door and prepare the wiring, piping and sewerage (infrastructure). To increase efficiency, these 65 students were divided into several groups to perform different kind of construction phase alternately. The service-learning experience provide more valuable on-field exposure which beyond any classroom learning. This project begins with data collection on research data, manufacturer and industry collaborator. Then, the team prepare a design manual of low cost house construction using interlocking brick system and meet with government agency and presentation on the proposal. Upon approval of the proposal, the team conduct meeting with manufacturer, industry collaborator and university on project implementation.

The construction begins with preparation of resources for project (Eg. Materials, workers, transportation etc.). Next, announcement through faculty is carried out to engage university staff and student to get involved in the construction of low cost house using interlocking bricks. The announcement attract the interest of a lot of student volunteers especially from PEKA (Persatuan Kejuruteraan Awam). However due to financial restriction, the project only able to accommodate a number of student volunteers only. Upon completion of the project, the team compile all the documentation for reporting purposes. This exposure not only involved students, but also technicians and academic staffs from department of material and structures. The safety and welfare students were under the responsibility of the technicians and academic staff which include everyday meals and accommodation all through the project.

Upon completion of the project, an assessment is carried out right after the project conducted. The participants especially student exhibit the expected changes based on the objectives of the project such as change of attitude or increment of knowledge/skills/aspiration. Interview session with indigenous people shows that improvement in the standard of living and living condition as well as the trust to the government. The impacts from this project include the completion of 20 units of low cost house for indigenous people at Pos Bersih, Ulu Slim, Perak; knowledge sharing on technology and construction method using interlocking brick system; development of young generation with knowledge and skill; site and construction experiences to UTM staff and students; implementation of construction using low cost and sustainable method and promotion on UTM’s product and technology. Based on the successful completion of the project, it is hopeful that there is more opportunity for similar service learning in the future.

Acknowledgement

We are grateful for the Jabatan Kemajuan Orang Asli (JAKOA), Hadi Legacy and School of Civil Engineering, Universiti Teknologi Malaysia for providing the funding and facilities to carry out the project.

References


Triggersing Learning of Service Innovation by Visualizing the Client-Host Relationships via Convention Innovation Service (CIS) Blueprint

Hamrila A. Latif
Faculty of Economics & Business,
Universiti Malaysia Sarawak (UNIMAS)
alhamril@unimas.my

Highlights

The Convention Innovation Service (CIS) Blueprint is a visual or graphic interpretation of the overall processes related to convention tourism industry that explains client-host relationships. It is created using narrative, text-based approach to describe nuances and details associated with a client experience, to portray the important intersections between user expectations and business requirements. This invention relates to the need for a learning aid that can model the key players’ interactivity, and to visualize a complicated process and tasks in specific industry. The visual landscape could also benefit the society to understand the functional interactions that exist in the convention tourism industry.

Key words: client-host relationships; convention tourism; blueprint; focal business requirement

Introduction (Project or Innovation)

The Convention Innovation Service (CIS) Blueprint is a visual or graphic interpretation of the overall processes related to convention tourism industry that explains client-host relationships. It is created using narrative, text-based approach to describe nuances and details associated with a client experience. In management perspective, the blueprint serves as a tool to portray the important intersections between user expectations and business requirements.

Inspired by user research, the visual landscape could also benefit the society to understand the functional, transactional interactions that exist in the convention tourism industry. A purposeful, useful training tool that is needed for identifying the focal players in business networking, examining their needs and expectations, specifying the interconnectivity of the event organizer-host-delegates from initial contact, through the process of engagement and into a long-term relationship, as well as strategizing for value-creation in service. It provides a straightforward yet transparent reference that can be used internally across teams, as well as externally with advisors, investors and partners. This work can be adopted as a teaching material for university level or company training. It promotes student-centered learning by understanding and adopting active synergy by focal players in real industry. Thus, it encourages meaningful learning experience via online or classroom discussion, particularly in training.

Content (Project or Innovation)

In management perspective, the Convention Innovation Service (CIS) Blueprint serves as a tool to portray the important intersections between user expectations and business requirements. This convention innovation service blueprint is useful tool for specifying the interconnectivity of the event organizer-host-delegates from initial contact, through the process of engagement and into a long-term relationship, in the specific context of convention tourism industry. It provides a straightforward yet transparent reference that can be used internally across teams, as well as externally with advisors, investors and partners.

A purposeful and useful training tool that is needed for identifying the focal players in business networking, examining their needs and expectations as well as strategizing for value-creation in service. This work can be adopted as a teaching material for university level or company training. It promotes student-centered learning by understanding and adopting active synergy by focal players in real industry. Thus, it encourages meaningful learning experience via online or classroom discussion, particularly in training.
Figure 1. Convention Innovation Service (CIS) Blueprint

Acknowledgment

This work is related to the FRGS grant: FRGS/SS05(03)/1147/2014(14) and supported by the Universiti Malaysia Sarawak (UNIMAS).
Permainan Lompat-Lompat Panjat – Integrated Quizizz and Mediation Online Edugames

Mohamad Termizi bin Nurdin¹, Hanany binti Mohamad Yazid², Mohamad Firdaus bin Harun³
Kolej Matrikulasi Kejuruteraan Kedah
mizkmtk@gmail.com¹, nany_my@yahoo.com², firdaus.harun87@gmail.com³

Fauziah binti Abdul Rahim
Universiti Utara Malaysia
ziah@uum.edu.my


Kata kunci: Permainan dalam pendidikan; Quizizz, Ikatan Kimia; Matrikulasi

Pengenalan


Pembelajaran melalui permainan telah dibuktikan berjaya meningkatkan pencapaian pelajar dan kualiti pengajaran guru (Siti Nursaila Alias & Faridah Ibrahim, 2017). Pencapaian dalam sesuatu subjek dipengaruhi oleh minat pelajar dalam subjek tersebut. Oleh yang demikian, permainan yang memasukkan elemen pembelajaran dapat meningkatkan pencapaian pelajar.

Projek Inovasi


Metodologi Kajian

Bagi mengkaji kesan permainan ini terhadap pembelajaran pelajar, reka bentuk kajian ini eksperimental digunakan. Seramai 30 orang sampel kajian yang terlibat dalam kajian ini dan dibahagikan kepada dua
kumpulan iaitu kumpulan rawatan dan kumpulan kawalan secara seimbang. Mereka terdiri daripada pelajar-pelajar program matrikulasi aliran kejuruteraan. Semua pelajar yang terlibat dalam kajian ini akan mengambil ujian pra terlebih dahulu. Setelah itu, kumpulan rawatan bermain permainan secara seimbang dan kumpulan kawalan akan belajar secara tradisional melalui perbincangan dan soalan. Fasa rawatan berlangsung selama dua sesi. Setelah itu kedua-dua kumpulan mengambil ujian pos. Berdasarkan skor yang diperolehi oleh pelajar, analisis ujian 1 dilakukan bagi menentukan sama ada tiga Ho diterima atau ditolak. Berikut adalah hipotesis yang dibina:

Ho 1 : Tidak terdapat perbezaan yang signifikan antara kumpulan rawatan dan kumpulan kawalan dalam ujian pra.
Ho 2 : Tidak terdapat perbezaan yang signifikan antara ujian pra dan ujian pos dalam kumpulan rawatan.
Ho 3 : Tidak terdapat perbezaan yang signifikan antara ujian pra dan ujian pos dalam kumpulan kawalan.

**Dapatan dan Perbincangan Kajian:**

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Since p > 0.05, beza min tidak signifikan, maka Ho 1 diterima.
Ini bermakna tahap pencapaian pelajar dalam ujian pra iaitu sebelum pelajar dalam kumpulan rawatan bermain permainan ini berada pada tahap yang sama.

Since p > 0.05, beza min tidak signifikan, maka Ho 2 diterima
Ini bermakna tidak terdapat perbezaan yang ketara min skor kumpulan kawalan dalam ujian pra dan ujian pasca. Ini bermakna pembelajaran secara tradisional tidak dapat membantu pelajar meningkatkan pencapaian mereka dalam topik ikatan kimia

Since p < 0.05, beza min signifikan, maka Ho 1 ditolak
Ini bermakna terdapat perbezaan yang ketara min skor antara kumpulan rawatan dalam ujian pra dan ujian pasca. Ini bermakna pengalaman yang diberikan kepada kumpulan rawatan dapat meningkatkan pencapaian pelajar dalam topik ikatan kimia.

**Kesimpulan**

Oleh yang demikian, dapatlah dirumuskan bahawa Permainan Lompat-Lompat Panjat- Integrated Quizizz and Online Mediation Edugames berupaya meningkatkan pencapaian pelajar dalam topik ikatan kimia.

**Rujukan**


Photovoltaic Academic Service Learning for Secondary Schools

Shahrin Md. Ayob  
School of Electrical Engineering  
Faculty of Engineering  
Universiti Teknologi Malaysia, 81310 UTM Skudai, JOHOR  
Email: e-shahrin@utm.my

Tan Chee Wei  
School of Electrical Engineering  
Faculty of Engineering  
Universiti Teknologi Malaysia, 81310 UTM Skudai, JOHOR  
Email: cheewei@utm.my

Highlights

This Academic Service Learning (ASL) was implemented in SKEE 4653 (PV and Wind Energy) course in Session 2017/2018 Semester 1. In this ASL, students were assigned to deliver talk on photovoltaic and conduct interactive activities with the pupils of selected secondary schools near by Skudai area.

Key words: photovoltaic; academic service learning; interactive activity

Introduction

The course SKEE 4653 (Photovoltaic and Wind Energy System), has been tasked by the department to implement the Academic Service Learning (ASL) into its Teaching and Learning approach, starting from academic session 2017 / 2018. This is concurrent with Industrial Revolution 4.0 and our Education Blueprint Plan (Wahid Omar, 2018; Kementerian Pendidikan Malaysia, 2015) to have whole-rounded graduates that is balanced between moral and knowledge.

Content

The main objective of this ASL is to engage the student with the community. The engagement is deemed as vital to enhance the student’s soft skill and at the same time promoting the photovoltaic technology and interest to science and mathematics among the pupils.

For this academic session, 54 students (also act as facilitator) of this course have been divided into four groups consisting of 10 to 13 members. They are required to approach several secondary schools and plan a talk and activities for the pupil of the secondary schools. The initial audience target was for the form four pupils but due to several constraints, most of the schools can only provide audience from form three and below. Four schools have agreed to cooperate and they are:

(a) SMK Mutia Rini  
(b) SMK Skudai  
(c) SMK Desa Skudai  
(d) SMK Taman Universiti.

All the planning and execution of the activities were done by the student but closely monitored by Dr Shahrin Md Ayob and Ir Dr Tan Chee Wei. Their content of talk and activity proposals were discussed and evaluated by both lecturers.
As conclusion, the ASL program has been successfully done for all four schools and most of the schools give positive feedback on this program. They insist the same program to be done again at their schools in the future.

Acknowledgement (if any)

Special acknowledgement to our head of department (Session 2017/2018 Semester 1), Assoc. Prof Dr Mohamed Afendi Mohamed Piah for supporting the ASL for SKEE 4653.
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EDUTAINMENT AND INTERACTIVE TEACHING VIDEO (with AR and VR) IN MANAGEMENT ETHICS AND CORPORATE GOVERNANCE COURSE

Nooraisah Katmon, Andrew Marcos a/l Innasemuthu, Asyrafil Iman Sari’at, Mohammad Faizal Mohd Yusof, Muthukumaran a/l Pariban  
Universiti Pendidikan Sultan Idris
nooraisah@fpe.upsi.edu.my  (013-2512468)

Abstract

We developed the EDUTAINMENT videos and INTERACTIVE TEACHING videos in delivering and disseminating knowledge in our Management Ethics and Corporate Governance Course. In line with the INNOVATION WITH SOUL concept, our EDUTAINMENT videos embedded elements that are related to human feelings. We acknowledge that by mixing the educational and entertainment element in the teaching and learning will improve students understanding and increasing student’s engagement in each of the topic and to make teaching and learning experience to be both educational and enjoyable. The Edutainment Videos are fun and full of lesson. It has several elements that touches the heart of the audience with unique blend of comedy, surprise, thrill and sympathy. It tackles human issues such as greediness, equality, transparency and provide audience with additional engagement in understanding the value of life. It includes content intended to teach but also has incidental and occasional entertainment value. And it teaches the value of ethical principle beyond money and gold. In regards to Interactive Teaching Video, we include colorful and useful infographics in our videos to improve student’s understanding on each topics that we delivered to the students. We also equipped our video with augmented reality and virtual reality technology in order to make the lesson more effective and exciting. In terms of usefulness, our videos are able to attract student’s engagement to each topic in an exciting way. It has power to influence viewers’ opinions and behaviors to do good and spread kindness in this world. Discrimination, greediness and poverty are among the main issues in the world nowadays. When we cultivate good ethical principle to the students, it surely helps to make this world a better place of living. In regards to commercialization potential, it is in the process to be registered for intellectual property (IP) given the uniqueness of the elements included in the video. We already submitted the documents required for an IP.

Keywords: Edutainment video, Interactive teaching video, virtual reality, augmented reality.
Go Green School: Community Service Learning

Tantish Kamaruddin, Muzani Mustapa & Faradiva Mustapa
Faculty of Built Environment & Surveying
b-tantish@utm.my

The appreciation of the younger generation, especially school students towards the natural environment, should be taken into account as the lack of awareness of the importance of preserving nature will lead to a tendency to eradicate nature unconsciously. Therefore, an awareness program at school level, ‘School Go Green’, will further educate the younger generation, especially school students in appreciation and care of nature at school and be practiced at home with their families. The objective of the program is to encourage school students to jointly preserve the environment and contribute to their school’s beauty and to ensure that human capital development and student creativity can be enhanced starting from school level. The program was conducted at Infant Jesus Convent National Primary School Johor Bahru, located at Jalan Yahya Awal near Wisma TNB involving 120 PT3 students and 10 teachers. Various activities have been organized for two days not only to cheer the atmosphere of the school but to fill every space with casual activities. The results of the program show the level of student awareness in appreciating and protecting the environment increasingly through their reactions that are increasingly desirable to carry out tree planting work and they are asking to plant more trees in other areas of the school. Therefore, we recommend that the Infant Jesus Convent Johor Bahru Secondary School be one example to other schools in Johor Bahru in creating a more conducive school environment with an effective nature sustainability.
Instilling Soft Skills among Form Six Students

Mazlina Mat Isa, Zainudin Hassan & Hayati Hashim Mohd
School of Education

The role of Form Six in Malaysian secondary schools is undergoing major changes towards equipping students with soft skills. Form Six is one of the educational routes for Malaysian Certificate of Education (SPM) leavers to develop talents and creativity in becoming high-impact, global, and universal young generation that will bring prosperity towards our nation while fulfilling the international standard. Many perspectives have been associated with the efficacy of Form Six students. Therefore, this research was carried out to study the effect of instilling soft skills among Form Six students. There are three research objectives comprising seven soft skills, which are (1) exploring the instillation of soft skills by Form Six teachers, (2) identifying the soft skills equipped among Form Six students, and (3) constructing Form Six’s Soft Skills Framework. This research was done using qualitative method. The 12 respondents from selected zones in Johor were interviewed to obtain the research data in answering the research questions. Based on a thematic analysis, this research has found that there are 24 dominant applications theme used by the teachers in instilling the seven soft skills, and the 24 theme soft skills elements equipped among the Form Six students had clearly constructed the Form Six’s Soft Skills Framework. This framework is able to explain that the Form Six students’ efficacy based on the teachers’ instillation is in line with the soft skills of Diploma or Certificate students. This research has clearly shown that the Form Six students are prepared to step into the university life or get involved in the industry.
Pembelajaran berasaskan senario merupakan satu kaedah pembelajaran konteksual yang melihat pembelajaran sebagai pengabung jalinan aktiviti rutin sehari-hari, penghasilan ilmu dan pembelajaran melalui interaksi sosial serta aspek-aspek material dalam kehidupan. Sebagai satu daripada pembelajaran berasaskan ketrampilan pelajar, Modul Pembelajaran Kendiri (MPK) merupakan pendekatan yang digunakan untuk mengaplikasikan pembelajaran berasaskan senario. Pendekatan ini menekankan kepada pembelajaran aktif yang bersifat latih amal (hands-on). Berfokuskan kepada hasilan tanam-tanaman dan ternakan, sebanyak empat MPK berjaya dibangunkan iaitu Hasil Bijian, Pemprosesan Hasil Tenusu dan Telur, Bakeri serta Pemprosesan Konfeksi. Pembinaan MPK ini adalah bersandarkan kepada Modul Teras Cabang Shaharom. Hasil penggunaan pembelajaran berasaskan senario ini telah berupaya meningkatkan pengetahuan dan kemahiran pelajar dalam menguasai subjek tersebut.
IMPLEMENTATION OF BLOSSOMS MODULES FOR HIGHWAY ENGINEERING COURSE TO ENRICH STUDENTS LEARNING EXPERIENCE

Norhidayah Abdul Hassan  
School of Civil Engineering  
Universiti Teknologi Malaysia  
hnorhidayah@utm.my

Che Ros Ismail  
School of Civil Engineering  
Universiti Teknologi Malaysia  
cheros@utm.my

Noor Azean Atan  
School of Education  
Universiti Teknologi Malaysia  
aazean@utm.my

Mariyana Aida Ab. Kadir  
School of Civil Engineering  
Universiti Teknologi Malaysia  
mariyanaaida@utm.my

Mohd Khairul Idham Mohd Satar  
School of Civil Engineering  
Universiti Teknologi Malaysia  
khairulidham@utm.my

Sarimah Shamsudin  
Language Academy  
Universiti Teknologi Malaysia  
ssarimah.kl@utm.my

Highlights

Blossoms is a scenario-based learning that support active learning strategies which complements the available curriculum to enhance the teaching of certain lessons. The module consists of video lesson that is separated by segments including video presentation and learning activities. With a hands-on teaching strategy, the students are more engaged and retain their comprehension long after a concept’s introduction. Therefore, the blossom video of ‘The Art of Making Layer Cakes: Proper Construction of Bituminous Roads and Highways’ provides an example of how the elements of scenario-based learning can be adapted in teaching the important concept of highway engineering into the classroom. The video introduces students to the concept of road construction and some related issues. Presentation of this concept is made more accessible to students by comparing road construction to the art of baking a layer cake. This comparison can serve to provide personal enjoyment by an active sense of belonging through daily life tasks, thus enrich students learning experience. The student’s activities were designed for them to actively participate and express great ideas using basic materials which can be found in their surroundings. The techniques adopted are not complex but based on a simple approach that could even become an effective tool to educate the public and gain public interest in promoting highway engineering.

Key words: blossoms; active learning; highway engineering;

Introduction

Engineering education involves a variety of theoretical concepts which is built upon scientific principles. Throughout the learning process, it targets a real field problem and students’ engagement holds the possibility of having an impact from the activities provided. According to Rodzalan and Mohamed Saat (2014), students learning context is one of the factors that contributes to generic skills deficiency, particularly towards critical thinking and problem solving skill. For example, teaching and learning process in the classroom which emphasize on rote learning and too focused on the content cause students to memorize the knowledge learned, rather than to analyze and synthesize the knowledge. Since they do not have deep understanding regarding the knowledge learned, it leads to reduce their ability to think critically as well as to solve complicated problems (Shakir, 2009). Within the program of engineering, typically there are courses
that are heavily dependent on fundamental concepts. A lot of active learning can be done in these classes by using the engineering fundamentals to solve engineering problems (Larson and Murray, 2016; Šárka Hošková-Mayerová and Zdena Rosická, 2015). This keeps the students busy and interested in the subject. Teaching such courses to engineering students can be a challenge. This project introduces an innovative method through Blossoms (Blended Learning Open Source Science or Math Studies) that not only engages active learning in such classes, but also critical thinking in classes (Hamoudaa and Tarlochana, 2015). This keeps the students busy and interested in the subject.

Teaching such courses to engineering students can be a challenge. This project introduces an innovative method through Blossoms (Blended Learning Open Source Science or Math Studies) that not only engages active learning in such classes, but also critical thinking in classes (Hamoudaa and Tarlochana, 2015). The blossom video of 'The Art of Making Layer Cakes: Proper Construction of Bituminous Roads and Highways' provides an example of how the elements of experiential learning can be adapted in teaching the important concept of engineering into the classroom. This lesson introduces students to the engineering concept of road construction and some related issues. The module for interactive video lesson provides video presentation and group work activities that require students to answer questions and complete assigned ‘hands-on’ tasks related to the subject. With a hands-on teaching strategy, the students are more engaged and retain their comprehension long after a concept’s introduction. The student’s activities were designed for them to actively participate and express great ideas using commons materials which can be found in their surroundings. The techniques adopted are not complex but based on a simple approach that could even become an effective tool to educate the public and gain public interest in promoting engineering education.

Content

The aim of this video is to introduce high school students to the engineering concept of road construction and to the reasons why problems might arise in road construction. Presentation of this concept is made more accessible to students by comparing road construction to the art of baking a layer cake. This simple comparison can serve to emphasize how important it is to follow proper procedures and to use proper materials for successful road construction. The approach used is highly correlated with the common knowledge of baking layer cakes in Malaysia. Students should be able to relate the procedure of baking a layer cake to the importance of following the correct methods of road construction. An understanding of basic statistics is necessary before starting this lesson. This lesson will take almost 60 minutes to complete. During activity breaks, students are required to answer questions and complete assigned tasks related to the subject. Figure 1 shows the details of the Blossoms interactive video lesson for this project. Figure 2 shows the front page of the video which can be obtained from MIT Blossom website through this link: https://blossoms.mit.edu/videos/lessons/art_making_layer_cakes_proper_construction_bituminous_roads_and_highways

From the website, the user will be guided on how to conduct the activities attached to the video. Detailed guidelines for teachers or lecturers and activity sheets as well as additional online resources can also be downloaded from the website. At the end of the video, the students are expected to understand the concept of the highway construction, materials used and quality control.

Figure 1: Blossoms interactive video lesson
Achievements


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Book Chapter: Buku Panduan NALI (New Academia Learning Innovation), 2015.

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Hamoudaa, A.M.S. and Tarlochana, F. (2015). Engaging Engineering Students in Active Learning and Critical Thinking through Class Debates
Learning Highway Engineering Course Through Massive Open Online Course (MOOC) Platform: Students' Awareness And Accessibility

Norhidayah Abdul Hassan  
School of Civil Engineering  
Universiti Teknologi Malaysia  
hnorhidayah@utm.my

Che Ros Ismail  
School of Civil Engineering  
Universiti Teknologi Malaysia  
cheros@utm.my

Noor Azean Atan  
School of Education  
Universiti Teknologi Malaysia  
azean@utm.my

Mariyana Aida Ab. Kadir  
School of Civil Engineering  
Universiti Teknologi Malaysia  
mariyanaaidi@utm.my

Mohd Khairul Idham Mohd Satar  
School of Civil Engineering  
Universiti Teknologi Malaysia  
khairulidham@utm.my

Sarimah Shamsudin  
Language Academy  
Universiti Teknologi Malaysia  
ssarimah.kl@utm.my

Highlights

Learning through Massive Open Online Course (MOOC) is a complex process. To overcome this problem, instructors should use more effective methods of learning to encourage students to think critically and should often get them engaged in all activities in the classroom. In MOOC environment, compared to conventional classrooms, students tend to be more active, where they will learn independently with the aid of technology while the instructors act as facilitators. However, the implementation of MOOC that meets the needs of students in Malaysia is just starting to evolve and more involvements from instructors are needed. Thus, this project reported on the design and implementation of UTM-MOOC for Highway Engineering course. The feedback gained included such items as students’ awareness, accessibility and readiness. The study was expected to contribute useful information and knowledge pertaining to flexible education in UTM through the implementation of UTM-MOOC, aligned with New Academia Learning Innovation (NALI) framework.

Key words: MOOC, Open Learning, UTM-MOOC, NALI

Introduction (Project or Innovation)

MOOCs entered the mainstream with three major platforms known as Coursera, Udacity and edX in 2012 (Wang, et al., 2014). The edX is a non-profitable organization led by MIT professors who initiated partnership between MIT and Harvard and it is currently in alliance with a number of universities (Sandeen, 2013). Udacity and Coursera, are for-profit organizations founded in California and led by Stanford University professors. In 2013, Coursera had almost 3.7 million students enrolled, as it affords plenty instructional and assessment tools, course development support, format guidelines, marketing and customer and technical support (Sandeen, 2013). This organization uses a dispersive model and comrade with famous brand universities in the United States (Kolowich, 2012).

Until 2013, Coursera had offered plenty of courses (Gaebel, 2014). However, Udacity, tends to provide a large proportion of basic courses, notably in Mathematics and Science areas as it has diligent manufacture method. It has the most vertically integrated of course, which is inviting a high degree of instructional design, integrated feedback and assessment tools within its courses and with afford marketing, platform and student support (Sandeen, 2013). The third platform, edX, with its start-up with a non-profit concept,
formed comrade with universities that afford knowledge, and in 2012, it acquired a new member, Wellesley that became a second liberal art college to jump on MOOC bandwagon (Gaebel, 2014; Guardia et. al, 2013).

Even though a lot of MOOCs have been established nowadays, their components are all quite similar. Lecture is still used as the medium (Pappano, 2012) and usually a MOOC course is designed to run for a few weeks, ranging from 10 to 14 weeks. Generally, the components of MOOCs comprise lecture materials, assessments and social networking. Diagram 1and 2 below show the screen shot from “Introduction to Highway Engineering” in openlearning.com platform.

Diagram 1: Learning Highway Engineering in MOOCs platform

Diagram 2: Learning Activities

Content (Project or Innovation)

The aims of this study was to design and implement a undergraduate course, known as Highway Engineering through a MOOC platform. In addition, this study also aimed to obtain feedback from students, based on four research constructs: students’ awareness, preferences, accessibility and readiness to use. A total of 69 of the respondents, comprising Malaysian undergraduates undertaking Highway Engineering course with various backgrounds, participated in this study. The teaching and learning in the course consisted of blended face-to-face teaching lectures, together with online participation through the university’s MOOC system.

From the result showed that 43% of the respondents were male students and 57% was female students with such previous education backgrounds as Foundation, Form Sixth, Matriculation College, Polytechnic Diploma and University Diploma. For students’ awareness, results obtained showed that, 83% of the respondents were aware about the existence of MOOC and for student preferences in learning through this MOOC are content, followed by video recording of teaching and learning activities. While for understanding students’ accessibilities, they responded positively and showed a high score mean value or 3.61, explaining that, the students were able to control video and web pages for personal interest.
Achievement


Acknowledgement (If any)

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Data analytics of blended learning for Data Structure subject through MOOC

Dr. Nor Bahiah Binti Hj. Ahmad, Assoc. Prof. Dr Dayang Norhayati Abang Jawawi, Dr. Norsham Idris, Dr. Sarina Sulaiman & Ms. Nadirah Binti Mohamad
School of Computing, Faculty of Engineering, UTM

Blended learning which integrates online learning and traditional learning is a common practice nowadays especially with the integration of MOOC which is gaining more attention. MOOC for Data Structure subject has been implemented using blended learning approach for the past three years. The Data Structure subject through MOOC is launched not only for full-time students and part-time students but also open to citizen of Malaysia and people from other countries. Large data about the students’ activities and interactions through MOOCs Data Structure has been collected and it is necessary to perform data analytics on the data in order to know the frequency of students’ usage of the learning materials provided in MOOC. The information can help monitoring the student’s participation and interaction among UTM students and students from other universities in MOOC. In terms of participation in online activities, the analysis shows that there is an increasing trend for both local students and from other countries in term of course completion, course participation and interaction. The students are encouraged to increase their participation and to broaden their network by knowledge sharing and exchanging ideas thru forum. The analytics suggest that careful planning and execution of blended MOOC is essential to ensure the success in implementing the approach in future for the benefits of next generation education.
InMotion - Innovative Teaching and Learning Strategies in Open Modelling and Simulation Environment (CMSE) for Student-Centered Engineering Education

Adi Maimun bin Abdul Malik\textsuperscript{1,2}, Nurbiha A. Shukor\textsuperscript{3}, Kang Hooi Slang\textsuperscript{1,2}, Siow Chee Loon\textsuperscript{1,2}, Ezzul Hanis Othman\textsuperscript{2}, Igor Novopashenny\textsuperscript{4}

\textsuperscript{1}Marine Technology Center
Universiti Teknologi Malaysia
81310 Skudai, Johor Bahru, Malaysia
adi@utm.my

\textsuperscript{2}School of Mechanical Engineering
Faculty of Engineering
Universiti Teknologi Malaysia
81310 Skudai, Johor Bahru, Malaysia

\textsuperscript{3}Department of Educational Science, Mathematics & Creative School of Education
Faculty of Social Sciences and Humanities
Universiti Teknologi Malaysia,
81310 Skudai, Johor Bahru, Malaysia

\textsuperscript{4}Center for Multimedia in Higher Education (ZMML)
University of Bremen
Bremen, Germany

Highlights

As an international joint-project, which is participated by 10 universities from 5 countries, funded by European Union under Erasmus+ framework, the aim of InMotion is to continue the reform of the system of higher education in the Engineering to improve quality of education and teaching to meet the demands of Strategic Framework for European Cooperation in Education and Training (ET 2020). UTM focuses the works to elaborate and implement modern learning approaches for educational materials and qualitative improvement of the engineering education process. The project improves quality of engineering education in Computer Modelling and Simulation (CMSE) in teaching engineering subjects by the development of the new online-based learning and teaching tools. A series of the comparative study of computer simulation and the applicability of this technology will be conducted in the engineering subject areas. The expected project outcome is a network-based model engineering education platform which supports open-learning environment to both students and engineers which in-line with the development of Industry 4.0.

Key words: Education; Engineering; Industrie 4.0; Modeling and Simulation; Open-Learning

Introduction

The project is going to improve the quality of education and teaching by development of the new learning and teaching tools, methodologies and pedagogical approaches based on the implementation of creative learning, innovative teaching approaches, effective assessment strategies and with the active use of mathematical modeling and computer simulation technology, including learning outcomes and ICT-based practices (inter alia, flexible learning paths, blended courses, virtual and real mobility, practical placements etc.). It also works to elaborate and implement modern learning ICT approaches for educational materials such as: Open Learning Environment (OLE), Open Versatile Educational Resources (OVER) and Massive Open Online Courses (MOOC) for qualitative improvement of the engineering education process and for academic workflow support among higher education and research scientific institutions across the PC and EU Member States. Technology-supported learning is well-known to be able to improve students' learning retention (Aleman, de Gea, & Mondéjar, 2011), learning motivation (Rosen, 2009) as well as learning performance (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, & Wenderoth, 2014) compared to traditional learning.

In addition, the project will demonstrate the advantages of the new approaches on the base of the new internationally recognized competence-based Syllabus in "Computer simulation of complex technical objects" (CSCTO), common to all partner universities. A series of comparative study of computer simulation technology and study the applicability of this technology as an educational tool for effective educational process will be conducted in the subject areas such as mechanical Engineering, computer engineering, electronic engineering, robotics, telecommunication technology, chemical and process, motor vehicles,
hips and aircraft, aeronautical engineering. The development of scenarios of training engineering professionals aimed at developing the necessary competencies will be done, taking into account the experience of the EU, Russia and Malaysia in this field. Analysis of the world experience in training engineers in the field of computer modeling will allow the researchers to identify and list of requirements (content and level) to the teaching of fundamental disciplines (mathematics, computer science, numerical methods), to select technologies and software products which are suitable for use in the learning process of the common disciplines and determine the special products that are recommended for the specific field of engineering training, and to create examples of educational projects that help students to gain the skills of collective creation of complex technical systems.

The new approaches the new learning technologies will be realized are the technology of training through research, Scenario Based Learning Approach, usage of Collaboration Learning Platform SAKAI for the blended Learning, and new teaching modules based on Rand Model Designer. The expected project outcome is the network model for the interaction of the participants will be developed based on the collective use of a joint open resource training base, joint innovative research and MOOC.

Content (Project or Innovation)

1. Project or innovation objectives:

   • To improve quality of education and teaching by development of the new Learning and teaching tools, methodologies and pedagogical approaches based on the implementation of creative learning, innovative teaching approaches, effective assessment strategies and with the active use of mathematical modeling and computer simulation technology, including learning outcomes and ICT-based practices (inter alia, flexible learning paths, blended courses, virtual and real mobility, practical placements etc.)

   • To elaborate and implement modern learning ICT approaches for educational materials such as: Open Learning Environment (OLE), Open Versatile Educational Resources (OVER) and Massive Open Online Courses (MOOC) for qualitative improvement of the engineering education process and for academic workflow support among higher education and research scientific institutions across the PC and EU Member States.

   • To demonstrate the advantages of the new approaches on the base of the new internationally recognized competence-based Syllabus in “Computer simulation of complex technical objects” (CSCTO), common to all partner universities.

2. NALI approach implemented in the research

   • Blended learning through using computer-based learning in face-to-face teaching
   • Scenario-based Learning teaching modules

3. Research Methodology

The subject areas that will be focusing in this project are all the Engineering and engineering trades consist of Mechanical Engineering, Computer engineering, Electronic engineering, Robotics, Telecommunication technology, Chemical and process, Motor vehicles, ships and aircraft, Aeronautical Engineering.

The comparative study of computer simulation technology and study the applicability of this technology as an educational tool for an effective educational process will be conducted. In addition, the development of scenarios of training engineering professionals aimed at developing the necessary competencies will be done, taking into account the experience of the Malaysia, EU, Russia in this field.

Analysis of the world experience in training engineers in the field of computer modeling will allow:

   • Identify and list of requirements (content and level) to the teaching of fundamental disciplines (mathematics, computer science, numerical methods)

   • select technologies and software products which are suitable for use in the learning process of the common disciplines and determine the special products that are recommended for the specific field of engineering training

   • Create examples of educational projects that help students to gain the skills of collective creation of complex technical systems
The researchers will review the new trends in the demands of engineering specialties on the profiles of partner universities to determine the list of major professional and general competencies as well as knowledge and skills a student in Computer Modeling and Simulation should possess to be successful in his or her future career and its self-actualization. The “input” requirements to knowledge level and skills of students for the master Study in Computer Modeling and Simulations would be defined.

The PC and the EU universities will carry out the critical analysis of the modern pedagogical approaches in engineering education aimed at different target groups. The new innovative teaching strategies and creative learning approaches will be chosen according to the results of this analysis. A benchmark of the used didactic strategies will be developed to find out the best practices for the adoption in the educational process of PC Universities.

The learning activities will be based on methodical approaches for encouraging creative learning and thinking. The development of the individual structured educational programs for the postgraduate students will be designed to enable concrete scientific exploration under international guidance. The flexible modular structure of the new content will consent to introduce interim mastering assessments for quality control of skills and knowledge which in turn enhance the modelling of the individual optimized learning pathway. Moreover, the introduction of blended learning and educational web services will improve the quality of the education process. Besides that, new teaching technologies will be introduced based on a systematic approach, visual simulation and computer training systems.

According to the results of the analysis of innovative teaching strategies and creative learning approaches will be chosen such as:

- education through research;
- group learning/ personalized learning;
- computer modelling approach;
- case technologies;
- practice of communities & social learning;
- game-based learning & role-playing techniques, etc.;
- blended education model using the best ICT solutions.
- eScience approach
- cloud technologies,
- MOOCs
- methods of dynamic learning gain practical skills e-SMART learning
- Personal Learning Environment (PLE)

On the base of the new approaches the new learning technologies will be realized:

- technology of training through research
- Scenario based Learning Approach
- New teaching modules based on Rand Model Designer (RMD)

4. Finding and discussion of the project or innovation

Project outcomes

The network model for the interaction of the participants will be developed. It would be aimed at the collective use of a joint open resource training base, joint innovative research, as a first step towards the introduction of MOOC. The new e/m-learning applications (Lectures, tests, assessments, etc.) will be developed and loaded in SAKAI and RMD system. The student mobility is a vital factor for multicultural understanding. It will contribute to the better understanding and the comparison of the educational process in PC and the EU. Two summer schools for the students will be organized for the approbation of new educational technologies and related programs of training courses. The results of which will perform the necessary adjustment of teaching technologies and courses. The mutual visits of doctoral students and Supervisors will be organized between EU and PC universities. The retraining of the university staff will be held in areas of practical use of Computing environments simulation of complex engineering tasks and collaborative platform Sakai in the practice of teaching in a blended model. The last 1.5 year of the project lifetime the masters and doctoral students will study according to the new technologies and methods of education. The results of these studies will be reviewed and assessed by consortium teachers and non-academic participants. Staff face-to-face contacts are noteworthy for the joint work on curricula and syllabi. Such contacts are also necessary for the establishment of double or joint degrees.

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Construction Building & Quantification Process: An Interactive Simulation Teaching and Learning Module

Muzani Mustapa
Universiti Teknologi Malaysia
muzani@utm.my

Fara Diva Mustapa
Universiti Teknologi Malaysia
faradiva@utm.my

Rosli Abdul Rashid
ilsorutmmy@yahoo.com

Tantish Kamaruddin
Universiti Teknologi Malaysia
b-tantish@utm.my

Highlights

This research project provides the courseware module for building quantification process via building construction process animation. This module enables the students to understand the 2D drawings in 3D dimension to explain building components for a more accurate quantity measurement extraction process. This research addresses the problems among students especially those with arts streams who have difficulties in visualising construction drawings. This will be an ideal innovative teaching and learning approach for quantity surveying and construction programme designed to cater the Gen-Y students.

Key words: Courseware module; Construction; Building Process

Introduction

Construction Technology and Quantification study are core courses in studying any subject related to construction cost management and construction management at undergraduate level. These two courses are inter-related. Within the construction technology courses, the processes and techniques related to the construction of substructures, frames, enclosure and finishes for medium span, low-rise, commercial, industrial and community building are introduced. The course aimed to provide students with fundamental construction knowledge to be applied in other courses such as measurement and quantification of building works. However, the mixture of both arts & science stream intakes for both programme leads to unbalanced teaching and learning pace. This is problematic as the students from the arts stream faces difficulties in understanding the architectural and engineering drawings for the measurement and quantification for construction projects. Challenged with traditional classroom teaching and hours of requirement and set up, the instructor or course lecturer can utilise limited time to elaborate on the relevant principles of construction process, and illustrate the simple application of the principle. Due to this limitations, this is far from practical ability to meet the needs of students (Chai, 2008).

An interesting study on teaching and learning preference among the generation Y (Gen-Y) showed strong tendency and preference in IT based learning through mobile technology, games technology, 3D virtual worlds and cloud computing (Mustapa F.D & Mustapa, M (2017); Chang and Gueti, 2010). Hence, it is not surprising to learn that academicians need to embrace and equip themselves with new technology to be adopted in their teaching approach to cater for demands from the Gen-Y generation. Additionally, recent advent in multimedia-based contents such as animated stories, digital games and edutainment have been widely used and prove to be of high demand in today’s education. For example, Edutainment makes the learning process more enjoyable and engaging, which is key to effective learning. Effective learning has been the term used to describe teaching and learning content that educates and amuses (Hussain et. al, 2003). This certainly adheres to the New Academic Learning Innovation (NALI) imposed by UTM that envisages continuous improvement on the quality in interactive teaching and learning quality.

With the strength and contribution of edutainment, this research project aimed to design and produce quantity surveying and construction edutainment courseware via innovative self-explanatory, interactive and animated 3-D simulation. The purpose of designing and producing this edutainment courseware will expose the students to self explanatory learning in 3-D animation visualisation so the students can relate and visualize the actual construction process so they can understand and quantify better. The duration for a typical building construction lasts for 12 – 15 months. In which it clearly not ideal for the students to be able to oversee and understand the whole construction process. This is why the proposed 3-D multimedia interactive courseware will help and allow the students to study and understand not only the construction process but also the building components in a more systematic, effective and whenever they want to. This interactive software also intends to address the problems in both building components identification and
quantification among quantity surveying and construction students.

Mareno’s (2009) in his study on creating and using animated videos has a positive impact on the students’ learning and engagement provided that it is well designed and addresses the content and the audience. In addition, it seems important to notice that for the new learners, using text only or unplanned animations for instance is not enough. They will have tendancy to lost focus easily. Hence, instructors requires proper planning and blending several approaches and formats to generate an appropriate multimedia product for their learners. According to Wang (2010) teaching building construction through animation or multimedia courseware plays an important role in helping student comprehend, generate ideas and imagine a concrete situation that reflects the process and products of construction building. However, not many studies delve into the use of of animation and simulation as a production technique to create learning materials for quantification works of building.

Content

This research is well aligned with the mission of the UTM in NALI (New Academia Learning Innovation) to create meaningful and interactive learning activities, materials, environments and systems appropriate to UTM Graduate Student Attributes. The aims of the multimedia courseware design for the course of construction technology and quantification to inspire the students’ interests and enabling the students to have a deeper understanding of the teaching contents. Essential topics in construction project were chosen to be part of digital learning (courseware) materials. Such topics are excavation works, concreting and formwork for forming concrete structures. In order to ensure effective learning outcomes from educational courseware, careful planning are required before the development process begins. The multimedia courseware was designed and developed based on ADDIE (Analysis-Design-Development-Implementation-Evaluation) instructional design model with the integration of constructivist learning theory and visualization characteristics. The ADDIE model has five actions namely analysis, design, develop, implement, and evaluate which are essential steps in instructional design and development processes. Visualization is emphasized due to the finding that most technical students are visual learners (Si Ling, 2017). Visualization is an important part of communication process, and graphical images can be used to add emphasis, direct attention, and illustrate concepts.

The main finding of this research is anticipated to assist in individual learning styles. The courseware created can be used by students and tutors in the process of teaching and learning of construction technology and quantification courses. The students can use the courseware based on their learning pace, according to their preferred learning styles (Si Ling, 2017). The background analysis for the courseware was conducted by interviews with potential users, practitioners and by conducting a survey on related courseware in the market. The requirement analysis obtained include aspects such as target group, course content, learning time, learning style, learning objectives, and learning outcome. The content of the courseware is laid out with simplicity and consistency.

The content of the courseware is divided into three thematic sections: Introduction to the topics; theories and practical aspects; and evaluation for understanding of the topics. Narration and animation are combined to aid students into visual and virtual contexts in order to engage them with real understanding. As examples, Figure 1 show the interfaces of the courseware. Video animation with subtitle on screen is used to explain the contents. The use of the video animation is useful for tutors since it can assist the tutors in explaining certain practical aspects such as scenario on intention to build typical project (Figure 1a) and also how the excavation works in real practice (Figure 1b).

![Figure 1 (a) and (b): Example frame captured from courseware.](image-url)
The student will clearly see a scenario and could enhance their understanding in the subject matter. This innovative part of the courseware combines a few types of multimedia elements such as audio, text, video and image. Links will also be provided to the selected materials and webpage on the internet to expose the users to various related issues. A website is to be made available that enables the teachers to add more materials and exercises related to certain topics in the effort to improve understanding and to fulfill the required learning outcomes. During development process, the user testing was carried out in order to ensure the courseware can be used by the user without have any problems. The user testing is conducted among UTM quantity surveying’s undergraduate students. Students from Year 1 and 2 are selected to test and evaluate the courseware and their feedback is reported. There are two testing in order to evaluate the courseware, which are Prototype Test and Acceptance Test.

A prototype courseware is carried out during development of the courseware. The prototype is evaluated by the students in order to get the feedback on the general look and operation of the courseware. The feedback from the students are used as a guideline to make improvement in term of the functionality and operation. Meanwhile, for Acceptance Test, it aims at measuring acceptance testing is to prove that the courseware conforms the requirement by fit the needs of user. This testing is important in order to know whether target users can accept this courseware. This testing is more focused on the operation and performance of the courseware. The courseware is improved in many aspects especially after get the feedback from the target user through prototype testing. In both user testing, student will use the courseware and give feedback by answering the survey that have been provided. The survey consist several parts such as general question, video and audio usage, courseware design and function. Students need to answer the questionnaire based on their user experience while using the courseware. The survey use Likert Scale concept where student need to choose the answer given which start from 1: Totally Disagree, 2: Disagree, 3: Natural, 4: Agree, 5: Totally Agree. Student has to circle their answer based on the category provided and the answer was reported in statistic graph.

As a result, students agrees that the courseware has suitable and acceptable design button. The image and graphic used also related with road safety education. The font type, size and color also suited their need which big and colorful. However, half of the students disagree that the courseware design distracts their attention while another half students strongly disagree. For 3D rotation image used for building structure, the students strongly agree that it is interesting and great. To conclude, the use of this courseware can attract student’s attention. The use of audio and video also help the student to gain better user experience. Therefore, this courseware really helps the students to understand about building process and quantification works associated with building elements. However, these develop courseware are not intended as a replacement for traditional course delivery. The courseware is complement conventional approaches by providing students with convenient access to repositories of knowledge and procedures.

Acknowledgement

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Innovative Adaptation from The Real Estate Computer Application Subject

Noorsidi Alzuddin Mat Noor
Centre for Real Estate Studies (UTM CRES), Department of Real Estate, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia
noorsidi@utm.my

Department of Real Estate, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia
saadahlomman@gmail.com

Highlights

The Real Estate Computer Applications Subject covers computer hardware and software basics that apply to real estate practitioners. Computer technology has changed the way this country does business, particularly in the field of real estate. Statistics show that buyers now use the Internet during their initial search for a new home or real estate loan. Real Estate Computer Subject provides a broad overview of Internet and software applications used in the day-to-day life of real estate and related professions. This course covers the very simple basics of computer skills and progresses to the more complex tasks such as downloading information and forms and using real estate-specific software for accounting, valuation property management, drawing plan, data analysis and more. This research is using hands-on and livable of discussion towards the students. This research provides a general review of the points of view concerning the student’s improvement due to Innovative Adaptation From The Real Estate Computer Application Subject as well as instruction on how best to access the information that the student from UTM Property Management program will need in the study and future work.

Key words: innovation; real estate; computer application

Introduction

The Real Estate Computer Application subject, seen as one of the elective subjects in the UTM Property Management program. However, this subject is only seen as an alternative subject that does not give the maximum impacts on the students attending it for past few years. Adaptive Teaching and Embodied Learning are the new approached for this subject. Efficiently, 80% of students acknowledge that this approached gives them a very high impact and benefited them clearly to the real world. Instead, 90% of them also agreed, even though those approached a bit tiring, but the results are very beneficial to them. These approaches can be taken to a higher level, through the commercialization of products produced by the students, and even the student’s ability to market them to the industry.

Technology continues to be a catalyst for change in all areas of business and industry, and the real estate market is no exception. Today’s worker is more mobile and more connected than ever before, which means that businesses can operate anywhere. Especially in mature urban centres, the pushback against escalating real estate leasing and ownership costs is escalating.

While telecommuting may not be a viable option for all companies, or even all employees within a company, many organizations have utilized remote work models with great success. Student will have a balance soft skills in term of technology use, and hard skills from report directly at the end of class session. Hence, it will create a job opportunity for the in the future.

Content

Project or innovation objectives

The main objective of this course is to give knowledge, exposure and information skill, computer technology and the usage on information technology within the land administration and development areas of studies. The main content includes data operation, data criteria, information system, computer components, software, computer networking, Internet and networking, database, ethics and safety. By the end of the course, the student should be able to understand the basic concept of computerization and its application in relation to land and properly.

NALI approach implemented in the research

Adaptation of innovation in terms of learning in the classroom is through the use of current technology. However, fundamental learning is still in use but is so embedded with new ones. The impact to the teaching and learning in Real Estate Application Subject will provides real estate student with the information needed
to use the technologies currently employed in the real estate industry.

Research Methodology

There are three methodologies that are using in this research, there are:

1. Hands on
2. Livable or multi-way of discussion
3. Report directly at the end of class session

Finding and discussion of the project or innovation

Course Learning Outcome

1. Describe and provide knowledge on the history of computer technology and components.
2. Ability to illustrate the basic concept of computerization includes data operation, data criteria, information system, computer components, software, computer networking, internet and networking, database, ethics and safety.
3. Ability to construct the computer technology in land and property discipline.

The analysis was through exercises via hands on task and presentation via individual, group and technology (skype).

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>Improvement on attendance in class</td>
</tr>
<tr>
<td>50%</td>
<td>An increment in the subject or class</td>
</tr>
<tr>
<td>30%</td>
<td>Leadership / self-esteem / confidence to discuss, ask or present the exercises or task given</td>
</tr>
<tr>
<td>60%</td>
<td>Engagement between peers (amongst students)</td>
</tr>
<tr>
<td>30%</td>
<td>Engagement between students and lectures</td>
</tr>
</tbody>
</table>

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I Innovation-Based Learning Conceptual Model

Sarimah Ismail¹*, Nornazira Suhaimi¹, Mohamad Fadhli Syahmi Mohammad¹, Siti Hajar Mohd Amin¹, Mohd Najib Abdul Kadir¹ and Zaharah Ja'afar¹
School of Education, Faculty of Social Sciences and Humanities, UTM Johor Bahru, 81310 Skudai, Johor
p-sarima@utm.my

Highlights

This paper explains the development of Innovation Based Learning (IBL) conceptual model and how it accommodates in teaching and learning practical-based course to produce innovative products and reports result of the IBL application from the experience of 30 final year students who enrolled the course. Mixed method research design was used to conduct this study. Qualitative data were collected through classroom observation, interview and documentary evidence while quantitative data were collected using questionnaire. Result of the qualitative data shows that the IBL conceptual model consists yo four phases: preparation, delivery, outputs and outcomes as well as reflection. Those phases were highly applied in the course with mean average value = 4.25 and standard deviation = 0.3430. The IBL is also been adopted in teaching two Technical and Vocational Education and Training courses, which are Fashion Design and Invention that offered by the Technical and Engineering Education program.

Key words: Innovation; Teaching Strategy; Conceptual Model

Introduction

Japan is a developed country that relies much on product innovation which involves innovation process. To be a developed country like Japan, educational practices in education institution of Malaysia should adopt teaching strategy that applies innovation process to expose and educate young Malaysian generation the process of developing innovative products and or services from the early stage.

In 21st century where employment is very competitive, teacher-centered teaching approach that mostly applies lecture-based and dominated by teachers has shifted to student-centered teaching approach that involve students active participation in learning process to provide student with in-depth understanding and competency of technical content knowledge of the subject matter (Robert and Scott, 2009) and gain variety of generic skills (Ruhi and Saemah, 2011). Mastery in technical content knowledge and possess various generic skill are two major employability skills that the employers are looking for employing their new staff.

Teacher-centered teaching approach had been practiced for decades. Therefore, researchers and instructional practitioners consider the student-centered teaching approach that introduced in the 21st century as an innovative teaching approach (Lalima and Kiran, 2017). Among teaching strategies under the student-centered teaching approach are cooperative-learning, collaborative-learning, project-based learning, problem-based learning, blended-learning, scenario-based learning, service-learning, project oriented problem-based learning, Those teaching strategies received vast attention in classroom practices and have long debate in the literature.

For instance, both the cooperative and collaborative-learnings where students learn in small group able to maximize the students’ own and groups’ learning (Robert, 2013). In the project-based learning, students work on a project over period of time (week or up to a semester). This engages the students to produce an authentic and meaningful project in solving a real-world problem (Bass and Larmer, 2018). The problem-based learning allows students to focus on how and what they will learn about unfamiliar problem, situation or task using their prior knowledge related to the problem. They are required to identify gaps in their knowledge as they attempt to solve the problem (Delisle, 1997).

The blended-learning that synoname with flipped classroom describes the way e-learning is being combined with traditional classroom methods and independent study to create a new, hybrid or mixed or integrative teaching methodology (Lalima and Kiran, 2017). The use of technology as a medium in teaching and learning process is a main concern of this teaching strategy. The scenario-based learning on the other hand uses virtual, interactive, problem-based contexts as a way of teaching or practicing a skill. In the teaching, students worki ng through a problem to be solved applying their prior experience, subject knowledge, critical thinking skills and problem solving skills (Dalziel, 2012).

Service-learning that also known as community service-learning or academic service-learning or community based-learning or community experiential learning integrates student experience in the academic learning to community. The objectives are to enrich their learning experience, enhance sence of civic responsibility and strengthen communities (King, 2010). The teaching strategy of project oriented problem-based learning involves classroom g, classroom problem and designing project to solve also the real world problem. This exposes students to the development of analytical skills and communication skills to argue and present
solutions to the problem and answer potential challenging questions (Noraini and Shahliza, 2013).

However, to date, there is no specific structured innovative conceptual model of teaching strategy found in the literature for the development of innovative either product or service or process as an output of the teaching and learning process. Thus, the aim of this paper is to introduce the Innovation-Based Learning (IBL) conceptual model development as well as to report the application of the IBL conceptual model in classroom practices from the experience of student.

Innovation Project

Objectives:

The objectives of this project are to explains Innovation Based Learning (IBL) conceptual model development and to reports result of the IBL application from the experience of 30 final year students who enrolled the Food Technology course.

Novelty, creativity, innovative, adaptability, applicability and impact:

The innovative products, services, and processes of almost all items can be found in the market. Conceptual model to produce those innovative products, services, and processes also have been reported in many literatures. However, to date teaching strategies of innovative process is lacking of attention. The Robert’s (2013) innovation process in business and TRIZ model (1940) for steps in problem solving were adapted to develop the IBL conceptual model of this project for classroom practice. Teaching and learning process in the IBL conceptual model that divided into four phases (preparation, delivery, outputs/outcomes and reflection) have forced students to apply their prior experience and knowledge of other courses to solve the real world problem in a form of innovative outputs. The IBL has straightforward impacts. In the process of solving the problems students will get in depth understanding of technical content knowledge of the subject matter and improve several generic skills like creative thinking and problem solving skills, communication skill, team working skills, entrepreneurship skills as well as ethic and integrity skills. The IBL is a dynamic conceptual model where it can be applied to Fashion Design course and Invention course that having similar objective, which is to produce innovative learning outputs based on real world problems to be solved.

Research Methodology

This project adopted mixed method research design that started with collecting qualitative data through classroom observation, interview and documentary evidence. The qualitative data were analyzed applying coding process. The quantitative survey research method was adopted to identify 30 final year students’ experience that enrolled the Food Technology course towards the application of the IBL conceptual model in teaching and learning the course. Descriptive quantitative data were analyzed using the statistics of mean and standard deviation that assisted by computer software of Statistical Package for the Social Sciences (SPSS).

Finding and discussion:

A. Innovation-Based Learning Conceptual Model

![Figure 1: Conceptual Model of Innovation-Based Learning](image)

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**Figure 1: Conceptual Model of Innovation-Based Learning**
First Phase: Preparation

This phase is conducted before the course commences. Two aspects to be prepared are knowledge for technical content of the course, pedagogical aspect of student-centered learning and knowledge about innovation process. This followed by preparing teaching the following materials:

a) Course Outline
b) Guideline of problem crafting and problem solving
c) Assessment rubrics for sensory evaluation of the innovated food product, poster presentation, packaging of the innovated food, and final report of the innovation learning process for the innovated food product development
d) Intellectual property application form
e) List of relevant food industry that may provide information concerning any problems about food like food marketing, food processing, food technology, food nutrition, food ingredient, food shelf life and food demand
f) List of food research institution that may provide professional advice related to the development of food product innovation
g) Templates for application letter for field visit to food industry and food research institution
h) Certificate of participation in innovation exhibition
i) Award for innovation competition

Second Phase: Delivery

The Delivery Phase consists of seven stages of teaching and learning activities as below:

1. Introductory of the Course

The Introduction to the course has three components as below:

a) Introducing content of course outline (course synopsis, course learning outcomes, assessment types, weight of each assessment type, IBL as main method in teaching the course, course weekly schedule, student learning time
b) Dividing students into small groups (2-3 students/group). They will work in group throughout the semester

2. Problem Identification

a) Identifying problem related to food in the market through SWOT analysis from the following informants:
   i) Society-based on their daily life experience consume the food product
   ii) Food industry-based on their experience producing and marketing the food product
b) Searching information related to the problem from various resources to identify solution for the problem
c) Discussing problem and solution for the problem with course lecturer for verification

3. Research Proposal Defense

In this stage, students are required to:

a) Prepare research proposal for innovation process
b) Present the research proposal for defense

3. R & D and Reflection

This stage is where the students conducting series of guided R&D in the laboratory to produce the innovative food product. The R&D activities are based on plan stated in research proposal. Objective, result and reflection of each R&D session are recorded for improvement of the next R&D activity.

5. Intellectual Property Application

In this stage, students are guided to fill online form to apply for Intellectual Property (IP) certificates of the innovated food product (trade secret), labeling (copyright) and packaging (patent) to secure their intellectual property. The application is conducted before the innovated food product and it packaging been exposed to public through the activity of assessment, exhibition, competition and commercialization.

6. Assessment

The assessment involves both types, formative and summative. The summative assessment measures content knowledge of the course through final examination. The formative assessment measures student’s experiential learning process of the following aspects:

a) Skill of the course is measured via weekly hands on laboratory activities,
b) The generic skills are gauged through:
oral presentation to measure communication skills through proposal defense and reporting the innovative food product

written final report of innovation process provides platform to assess students’ effort, innovative as well as creative thinking and problem solving. A complete of final report consist of the following elements:

- Activities been conducted in all stages of the IBL delivery
- R&D plan and progress
- Innovative food product in terms of features, novelty, cost, market size, market competitors, packaging and result of sensory evaluation

Panel of assessors to evaluate the innovated food product are course lecturer, entrepreneurs from relevant food industries, expert from food research institution and winners of innovation competition among lecturers.

7. Product Commercialization

The innovative food product is opened to public for commercialization take place after assessment sessions.

Phase Three: Outputs and Outcomes

Outputs of the IBL are in a form of innovated food product, IP certificates, product commercialization, certificate of participation in innovation exhibition and award for innovation competition. The outcomes of overall learning process adopting the IBL teaching strategy are in-depth understanding of the course technical content and generic skills.

Phase Four: Reflection

In this phase students reflect their one semester experiential learning of the course, give suggestion for CQI of the course and make peer assessment for team working skills.

8. Students’ experience applying Innovation-Based Learning

<table>
<thead>
<tr>
<th>Phases of the Innovation-Based Learning</th>
<th>Application Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>4.35</td>
<td>0.394</td>
</tr>
<tr>
<td>Delivery</td>
<td>4.32</td>
<td>0.360</td>
</tr>
<tr>
<td>Outputs/ outcomes</td>
<td>4.26</td>
<td>0.349</td>
</tr>
<tr>
<td>Reflection</td>
<td>4.20</td>
<td>0.403</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>4.14</td>
<td>0.211</td>
</tr>
</tbody>
</table>

Result of the survey for the application of IBL in teaching and learning Food Technology course is stated in Table 1. The statistics shows overall mean of the IBL application is at high level for each Phase of the IBL process with average min value = 4.25 and standard deviation = 0.343. The result indicates that teaching and learning of Food Technology course has applied all phases of the IBL conceptual model been developed.

Most students are so used to teacher-centered teaching approach whereby everything is given by the lecturers. Therefore, it is not surprise if the students failed to see the connectedness between the technical content knowledge been lectured to the real life application. By employing IBL teaching strategy students are forced to make critical analysis and think out of the box to solve the real problem of the society. Here they learn to apply technical content knowledge of the courses been learned and all the generic skills possess. They are also experiencing learning process based on real life setting during site visit at food industries and food research institution. What they need is guidance in time management as they are undergraduate students with full hands of assignments. Well managed of structured teaching and learning process applying IBL teaching strategy conceptual model able to produce innovative students with in depth understanding of course technical content knowledge and various generic skills. This IBL is a dynamic teaching strategy where it can be applied in teaching other courses like Fashion Design and Invention that having similar interest which are innovation and commercialization.

Other relevant information:

1. Publication: ISI indexed Journal

2. Intellectual Property (IP):
   a) Copyright: 31 (innovative labeling)
   b) Trade Secret: 67 (innovative food products)

3. Competition:
   a) Certificate of Participation-UTM Inatex 2019, Project title: Dukung Anak Cordial
   b) Gold Award-The Best Product, Innovation Competition (2014), UTM Centre for Student Innovation, Project Title: Multipurpose Arabic Paste
   c) Gold Award-The Most Interactive Booth, Innovation Competition (2014), UTM Centre for Student Innovation, Project Title Arabic Paste
   d) Gold Award-Best Dress, Innovation Competition (2014), UTM Centre for Student Innovation

4. Commercialization potential:
   All innovative products (food, packaging and labeling) been developed through the IBL teaching strategy of the Food Technology course and had registered for IP protection having high potential to commercialize after further R&D

5. Networking
   a) Food industries
   b) Food research institution
   c) Community

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