Validation Assessment of a Relationship between Teaching Practice and Professional Engineer Certification: A Pilot Study and Survey Evaluation

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Abstract

Engineering courses are regarded as challenging that require a solid foundation in mathematics, physics, and chemistry as well as critical thinking and problem-solving skills. Inadvertently, these components present challenges to the teaching and learning (T&L) process in the classroom and up to the author's knowledge, there is no study reported in relation with professional engineer certification and UTM-NALI teaching practices. Therefore, this study examined the relationship between engineering educators with professional engineer certification and their teaching methods in particular UTM-NALI. This is a pilot study with small respondents and to validate survey questions for assessment in larger samples. Additional questions regarding the obstacles, recommendations, and example characteristics are also offered. The data on the performance of students and the distinction between certified and uncertified lecturers are discussed. Through their participation in T&L in the classroom, lecturers with and without professional engineer qualifications can be seen experiencing the effects of the NALI model. Even though hybrid classes that were conducted to help pupils catch up with previous Malaysian MCOs (movement control orders) can limit this study, through the test findings, this study can be carried out for larger samples to get congruent conclusions of proposed research.

Keywords: NALI, Professional Engineer Certification, Teaching Practice, Teaching and Learning, Validation Assessment.

Introduction

Engineering courses are notoriously challenging, and students were required to learn the fundamentals of mathematics, physics, and chemistry. To achieve the demanding curriculum requirements that must be met in a short amount of time, the content of engineering courses necessitates those students be adept at higher-level reasoning skills, such as problem-solving. These variables indirectly complicate the teaching and learning (T&L) process in the classroom. Teaching and learning (T&L) for engineering courses demands unique attention and inventive initiatives to prepare graduate engineers for the challenges they will face in the profession. Instructors that can provide coursework and relate it to the job of actual engineers will be able to assist students in better comprehending course material (Ditcher,2001).

However, it is also emphasised that a person's notion of learning will differ and have a substantial impact on their approach to learning, particularly in the classroom. Prior phenomenological study revealed that when learners are asked to describe their understanding of learning, their responses may be categorised into five distinct conceptions of learning (Marton et al., 1993): 1) acquiring new information, 2) memorization and reproduction, 3) acquiring applicable knowledge and abilities, 4) understanding; and 5) interpreting reality in a novel way.

Universiti Teknologi Malaysia's UTM CDex (Center for Advancement in Digital and Flexible Learning) has fostered the New Academia Learning Innovation (NALI) in teaching and learning (T&L). This framework for learning is a more productive, innovative, and creative approach to education (Ujang, 2012). This concept differentiates between two categories:

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Pedagogy/Andragogy learning strategies and Digital Resources. There are eight strategies that fall under the Pedagogy/Andragogy learning strategies which are Outcome-Based Education (OBE), Case Study Teaching, Problem-Based Learning (PBL), Scenario-Based Learning (SBL), Peer Instruction, Service Learning, Job Creation, High-Impact Educational Practices (HIEP), Conceive, Design, and Implement and Operate (CDIO). For the learning digital resources or also regarded as learning material platform, there are six types which are UTM Open Courseware (OCW), UTM MOOC, UTM-MIT BLOSSOMS, Video of Exemplary Professionals, Student-to-Student Edutainment, and UTM e-Learning (Alias and Aris, 2016).

However, up to the author's knowledge, there is no study reported in relation with professional engineer certification and UTM-NALI teaching practices. Therefore, this study was conducted to examine the relationship between engineering educators with professional engineer certification and their teaching methods in particular UTM-NALI. This is a pilot study with small respondents and the study was carried out to validate survey questions for assessment in the next study (larger sample).

Literature review

The world 21st Century

The world in the 21st Century is relying more on technological transformation and digital explosion as the beginning for Industry 4.0 that will focus on a combination of physical, digital, and biological systems. This change will influence our lives, businesses, and industries which in turn alter the need for skills, talents and jobs (Helmi et la., 2019, Canbulat et al., 2020, Chen, 2021, Diocos, 2023). Thus, it is important to improve our education approach for future needs.

The World Economic Forum in 2016 has highlighted the skills needed in the 21st Century as shown in Table 1.

Table 1: Skills needed in 21st Century (Helmi et al., 2019)

Foundational Literacies	• Literacy • Numeracy • Scientific literacy • ICT literacy • Financial literacy • Cultural and civic literacy
Competencies	• Critical thinking/ problem solving • Creativity • Communication • Collaboration • Life-long learning
Character Qualities	• Curiosity • Initiative • Persistence/grit • Adaptability • Leadership • Social and cultural awareness

New Academia Learning Innovation (NALI) model

New Academia Learning Innovation (NALI) was introduced in 2013 (Figure 1). NALI highlights the concept of entrepreneurship in academics which emphases are on productivity, creativity and innovation (Ujang, 2012). There are three main objectives of the NALI initiative which is to align UTM teaching and learning models, activities, materials, environments and systems with the Malaysian National Higher Education Strategic Plan, the needs of employers and the requirements of accreditation bodies. In addition, the initiative is also aimed for UTM academics to emulate best teaching and learning practices from the World's best universities. To suit with UTM's identity, the last objective is targeted in developing UTM's own identity related to teaching and learning models, activities, materials, environments and systems.

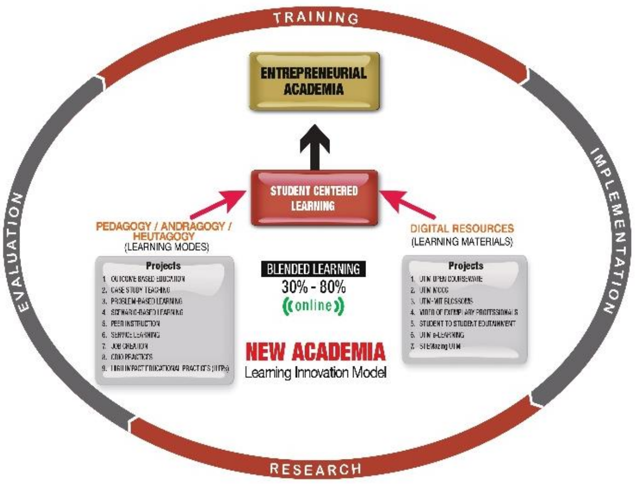

Figure 1. UTM NALI model (UTMCdex, 2023)

i) Outcome-Based Education (OBE)

A technique called outcome-based education (OBE) involves designing the curriculum and including instruction that is focused on the results of the instruction (in this context-lecturers). In a nutshell, it is the abilities that a student must display after receiving training (Chong, 2008). Through a variety of measurement instruments, this can be evaluated and assessed. OBE practitioners must concentrate their techniques on (i) planning, (ii) delivering, and (iii) assessment in order to get the intended results.

In example, OBE can be assessed through three methods namely Program Educational Objectives

(PEO), Program Outcomes (PO) and Course Outcomes (CO). PEO was measured through employer satisfaction survey (yearly), alumni survey (yearly), placement records, and better education records. PO was coming with CO. CO was assessed from Mid - Semester and End Semester Examinations, tutorials, assignments, project work, labs, presentations, employer/alumni feedback, etc, (Japee and Oza, 2021, Syeed et al., 2022).

ii) Case Study Teaching

This approach involves conducting a lengthy, in-depth study of a business or situation that is closely related to reality and has problems and conflicts that need to be resolved. This approach has the benefit of teaching students how to organize their thoughts and conduct conversations based on the facts, which makes their arguments more well-organized, reasonable, and credible.t

Case study is a traditional teaching method by the Harvard Business School (HBS). The class discussion basically starts with pre-class arrival, opening the case, sequences of questioning, listening and responding, to transitions and finally closing the case. To evaluate the students, some of the techniques suggested by Garvin (2009) include identifying students':

- ability to work independently and lead the class discussion as they progress in learning
- engagement with the issues and enthusiasm about the discussion
- skill at applying previous learning in subsequent lessons

iii) Problem-Based Learning (PBL)

A type of active learning known as problem-based learning (PBL) pushes students to "learn to learn," working cooperatively in small groups with the instructors serving as facilitators to find solutions to problems from the real world (Hmelo-Silver and Cindy, 2004, Duch, 1995). PBL's major objective is for students to work cooperatively and creatively to solve a problem (Abed et al., 2023).

PBL is differed than problem solving. In problem solving exercises, students are believed to have the knowledge and skills required to solve the problems. Students will apply the existing knowledge to formulate hypotheses to guide them for more investigation to the problem. But, in PBL, students are encouraged to analyse a problem, or a case presented to them and from there, they make a problem list and formulate possible hypotheses or explanations in order to perform further investigation to get more knowledge about the problem. PBL can help students master a number of useful skills in learners including critical thinking, communication and cooperative or teamwork skills. Students also have the ability to analyse and solve real-world problems and apply classroom learning to address complex problems outside the classroom (Duch et al., 2001).

iv) Scenario Based Learning (SBL)

In order to encourage deep learning and awareness, Scenario Based Learning (SBL) involves participants in actual critical occurrences where they are required to weigh a variety of considerations, make decisions, and reflect on the results and what they have learnt from the events. In essence, SBL is focused on employing scenarios to augment the teaching of knowledge that calls for critical thought on the subject matter that was previously covered in lectures with the students (Thomsen et al., 2010).

Students are the focus of SBL approach; they required to partake in the construction of their knowledge; participate actively in the learning process, which almost similar situations (contextual), practice to make appropriate decisions and reflect on what was learnt related to their professional practice (Errington, 2011, Zitouniatis et al., 2022).

v) Peer Instruction

Peer Instruction (PI) is an active learning strategy in which students engage in conversation with peers and the instructor. Additionally, PI draws on the ideas of cooperative learning as students collaborate with one another to learn, promoting participation-based active learning. By explaining course concepts in their own terms, students are able to use metacognitive techniques to improve their learning (Rivadeneira and Inga, 2023).

Students are asked to individually prepare a 15-minute lesson to teach a small group of their peers and has the right to choose their topic. These lessons are not solely for student presentations. Students can apply the creative process to an educational context, develop a lesson plan which including pertinent content in an engaging activity, and a mechanism for summative assessment (e.g., discussion, individual or group quiz, quality of activity outcome). Before completing this assignment, students are given a template to create a lesson plan and a brief (5-10 minute) description of the assignment during a class period (Jahnke and Lindgren, 2021).

vi) Service Learning

Service learning (SL) is a teaching and learning approach that promotes civic duty and integrates classroom knowledge into meaningful community service (Felten and Clayton, 2011). In order to enhance learning, promote civic responsibility, and strengthen the communities in which learners live and work, SL incorporates community service initiatives with academic courses. Fieldwork, applied service-learning research, and other academic activities are some of the methods used by SL to include students in project-based service endeavours with neighbourhood partners. Studies must attest to its capacity to considerably enhance student learning (Warren, 2012, Mamat et al., 2019).

After completing the task with community, students are evaluated based on the impact, successes, and challenges of the programme. This will help the SL experience in mutually beneficial exchange of knowledge and resources (Alias and Aris, 2016).

vii) Job Creation

A teaching and learning strategy called Job Creation (JC) emphasises active and project-based learning. JC places a strong emphasis on the knowledge acquired via working on a real-world tender project that was acquired through the bidding process or project proposals. It gives students the chance to create employment prospects while putting entrepreneurial principles into practise. Additionally, it exposes students to the actual world of project management and implementation, which will provide them the skills and experiences they need to be ready to take on real challenges in the workplace.

For example, in UTM, a total of 24 projects were offered to the student companies for bidding. after project approval by the company, students can register for Job Creation courses at the Centre for Co-Curriculum and Service Learning (CCSL). To implement the course, students will have to fulfil the program requirement which including attending talks, registering the company, preparing tender documents, evaluating papers and presenting to bid for projects. Students also will fill out written quotation and provide the necessary paperwork to be submitted before the closing date. Students will then be invited to present their paper quotes for evaluation purposes (Alias and Aris, 2016).

viii) High-Impact Educational Practices (HIEPs)

Research has demonstrated several educational strategies known as High Impact Educational Practices (HIEPs) to have a significant impact on student progress. HIEPs can contain a variety of learning tactics, including problem-based learning, service learning, project-based learning, capstone courses, field experiences, and other active learning strategies, according to the national survey on student engagement (National Survey of Student Engagement, 2007, Arikan et al., 2022).

The elements in HIEPs includes First Year Seminar/ Experience (FYS), Capstone Project (CAP), Internship (IN), Empirical Research (ER), Collaborative Assignment and Project (CAS), Diversity/ Global Learning (DGL), Service/ Community Based Learning (SBL), Interdisciplinary Approach to Assessment (ID) as well as Intensive Academic Writing (IAW). However, the implementation process is not a fixed procedure for HIEPs (Alias and Aris, 2016).

ix) Conceive, Design, Implement and Operate (CDIO)

Conceive, Design, Implement, and Operate (CDIO) is a project-based instructional method that makes use of instructional events where learning takes place through the development of a system, process, or product (Edström and Kolmos, 2014, Souppez and Awotwe, 2023). The different steps involved in developing a product, method, or system are represented by the CDIO approach.

To implement CDIO, mastering the principle CDIO is a must, followed by the focus of the intended learning outcomes of the engineering program. From here, the context, program goals, and specific objectives for learning can be established. Then, the curriculum, use of design-implement experiences and workspaces, approaches to teaching and learning, and assessment and evaluation practices can be evaluated (Alias and Aris, 2016).

x) UTM Open Courseware (OCW)

OpenCourseWare (OCW) is a term used to describe a free and open digital publication of excellent university-level educational materials that are arranged as courses and contain content, course design resources, and assessment tools. OCW is freely available and openly licenced on the Internet at all times and from any location (Vladoiu, 2011).

Often, the instructors are reluctant to join this as they have to share their notes, worrying the copyright issue. However, as the committee were selected by vice chancellor, they are allowed to make a decision to use the same software used in the university's e-learning system as a platform for the OpenCourseWare website. The reason is that they are trying to avoid technical difficulties among instructors who will be involved in developing the learning materials. In OCW, there are Course Selection, Intellectual Property Issues, Formatting of figures and multimedia materials, Content Design, Review by evaluators, Correction by Author, Final Editing, and Publication (Alias and Aris, 2016).

xi) UTM MOOC

Massive Open Online Courses, sometimes known as MOOCs, are free web-based distance learning courses intended for the participation of sizable numbers of students who are geographically distributed. The open educational resources (OER) movement gave rise to the term MOOC, which was first used to describe online courses in 2008. The UTM MOOC is created using five fundamental phases, including copyright, course setup, course design, course development, and course implementation. Each stage has been carefully created to meet the requirements of the course structure and to offer flexibility in developing active and interactive user engagement and learning methodologies.

As for UTM MOOCs, the course consists of multiple choices, true or false, text input and also online activities. The online activities are activities where the students were asked to solve a set of questions and the time taken for the students to finish the questions will be recorded (Alias and Aris, 2016).

xii) UTM-MIT BLOSSOMS

A video-based learning tool called BLOSSOMS is a supplement to the current curricula. Due to the teaching duet pedagogy method, which divides the video lesson into segments with learning activities in between and is led by subject-matter specialists, it differs from typical video-based learning. The major goal is to improve understanding of abstract topics, particularly in the areas of science, mathematics, and engineering. Launched on 8th January 2013, the BLOSSOMS project is a blended learning system for studying Science, Technology, Engineering, and Mathematics (STEM) courses in partnership with Massachusetts Institute of Technology (MIT), USA.

In order to produce BLOSSOMS video, UTM-MIT has highlighted 10 processes in the production which are; the development of concept, architecture and pseudo script documents; a series of evaluation from UTM and MIT content experts; thorough discussion with CTL video production team before video shooting; shooting and editing video; and approval from MIT for each level (Alias and Aris, 2016).

Meanwhile for teaching and learning, BLOSSOMS video may contain several segments and several learning activities. In T & L, BLOSSOMS lesson adopts a blended learning approach, where students were asked to watch a video (normally four minutes maximum) in the class. Then, the class will do class activities based on video and assisted by lecturers. The video will be watched again for next topic and it is repeated with different video until learning objectives were achieved. Normally, it took up to 50 minutes to finish the class (Alias and Aris, 2016).

xiii) Video of Exemplary Professionals

A collection of videos called Video of Exemplary Professionals (VoEP) shows the expertise and abilities of professionals from all around the world in a variety of professions. VoEP enables viewers to investigate the contributions made by authorities in a particular subject to creativity and cultural education. Experts' presentations may have an effect on students' learning as well as the lives of their families and communities.

To implement this method, lecturer will choose respective video for certain topic, and choose for teaching methods that suit the topic. To assess the students, lecturers will observe on high performance thinking minds among students based on the selected video, the best practice in selecting video, critical thinking and mutual communication between lecturers and students (Alias and Aris, 2016).

xiv) Student-to-Student Edutainment

Since 2013, UTM has made the decision to include edutainment as one of the initiatives in the New Academia Learning Innovation Model. This project demonstrates how to make a class enjoyable and exciting by fusing educational and entertaining aspects. Students' reception can be improved in this way, and learning is made more efficient. The goal of educational entertainment is to motivate pupils to discover new things through interaction, experimentation, and repetition. The majority of the time, students experience the excitement without realising they are also learning.

To achieve this method, students will get involve in competition. Normally, the competition will be held in second semester for every academic session. The purpose is to see student’s critical thinking and performance (Alias and Aris, 2016).

xv) UTM e-Learning

The Moodle open source LMS is used by UTM for e-Learning delivery. Students and educators can access this online learning platform using their regular, school-based login credentials (Oye et al., 2012). Along with assessment resources like assignments and quizzes, students have access to course materials, lecture notes, and communication tools.

e-Learning in UTM focuses on the achievement of 30 % of information (A), resources (B), activities (C), assessment (D), as well as active index (E). To assess, the individual learner variables were focused (physical/demographic characteristics, learning history, affective attributes including learner attitude and learner motivation, familiarity with the technology) as well as environmental variables include (physical LE, subject LE, institutional environment). Other than that, contextual attributes, technology variables and pedagogic variables (accreditation and certification, methodologies, learner support systems, assessment and examination) also considered (Alias and Aris, 2016).

Methodology

Survey research was used in this study involving two groups of samples (**Figure 2**).

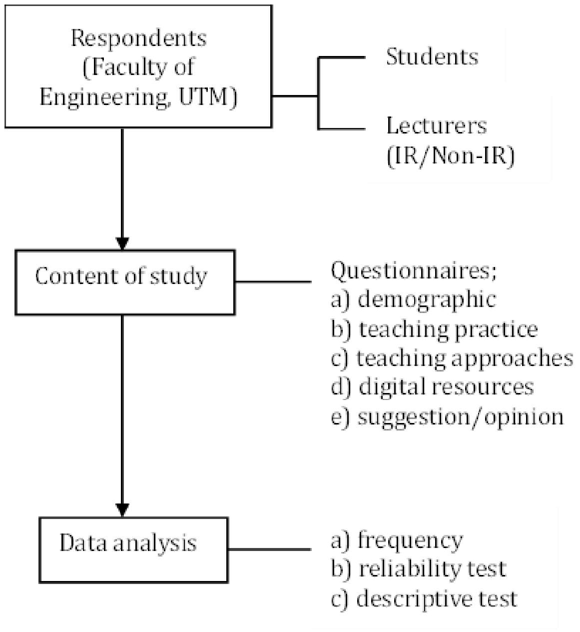

Figure 2. Design of experiment

The first group was students and the second group was lecturers. In specific, nine lecturers with and without professional engineer certification and 168 students from the Faculty of Engineering UTM were selected randomly. List of samples was acquired from the UTM database which contain a list of lecturers and students from the Faculty of Engineering. The research instrument used in this study was adapted from Hamdan et al. (2014). There are few changes have been made from the original instrument to suit with the objectives of the current study. However, the rating scales were retained as the original version using Likert-type scales with a range of 1 to 5 to denote different levels of agreement. The original instrument was meant for assessing UTM lecturers teaching practice. Since this study involved students, some items were adapted to ensure data could be collected from students as participants of this study. Thus, there were two sets of questionnaires were used in this study. There are 46 items including demographic items for the lecturers and there are 38 questions including demographic items for students. In addition, there are two sets of questionnaires in Malay and English prepared in this study. The questionnaire scales of measurement depict the teaching practices among engineering lecturers in the Universiti Teknologi Malaysia (UTM), Malaysia.

Quantitative Data Analysis

A questionnaire was distributed to lecturers and students from the Faculty of Engineering in Universiti Teknologi Malaysia, UTM, Johor Bahru. About nine respondents among lecturers with and without IR participated in this survey and a total of 168 respondents among engineering students answered the distributed questions. Basically, in this study, the questionnaire is consisting of five sections in which part A is for demographic info, part B and C are for teaching approaches, part D is for different types of digital used during teaching and learning and lastly, part E is for respondent's opinion and suggestion. Since the study conveyed of two different types of questions, we performed data analysis for different categories; one for lecturers and another one for the students. The discussion in this study also explained two different kind categories.

Data was analysed with descriptive and inferential statistics by using SPSS software version 16.0. For the first part, descriptive statistics was used to determine sample characteristics for both lecturers and students. Cronbach's alpha was carried out to determine the reliability of the respective constructs and a descriptive test was performed to examine the concept of questions delivered in the survey.

Results analysis

Demographic Analysis

i) Lecturers

There are 13 questions that were demonstrated in part A; demographic info which reflected the respondent's background. Generally, the question is included gender, age, position, school, highest academic qualification, Differentiated Career Pathways (DCP), total years' service in UTM, total teaching experience (including outside UTM), year courses taught, total industrial experience, how do the staff gain the industrial experience, staff professional qualification and years registered with professional qualification. The data analysis obtained from the study is tabulated in Figure 3.

From the figure, female respondents are more than male respondents. Female frequency is 6 (67%) while male frequency is 3 (33%) (question a). For age, most respondents are from 31 to 50 years old (89%), except one more than 51 years old (11%) (question b). All respondents who answered the questionnaire are senior lecturers (56%) and the other balance is from associate professors (44%) (question c). As of the school, most respondents are coming from School of Civil Engineering (89%) and other 11% are coming from School of Electrical Engineering (question d). All the respondents have highest degree academic qualification (100% doctor of philosophy), while their DCP are mostly from research (67%), followed by teaching (22%), and lastly leadership (11%) (question e). They are also mostly taught 2nd year students (78%), followed by 4th year students. This can be seen from Figure 3 (question f). As for industrial experience, most respondents have a great experience. This can be seen that most respondents answered 13 to 120 months industrial experience (67%) (question g). How do they have such great industrial experience? This is from their experience involving consultancy work while working in the UTM (88.9%), and also have working experience with industry before joining UTM (66.7%) (question h). All the respondents also registered with BEM. This can be seen from their chosen answers which 77.8% and 44.4%, respectively (question i). As for their total years registered with professional qualification is mostly 4 to 6 years (67%), followed by a new registration which nominated 22%. This is probably because the registration is yet announced or the registration is within a month (question j).

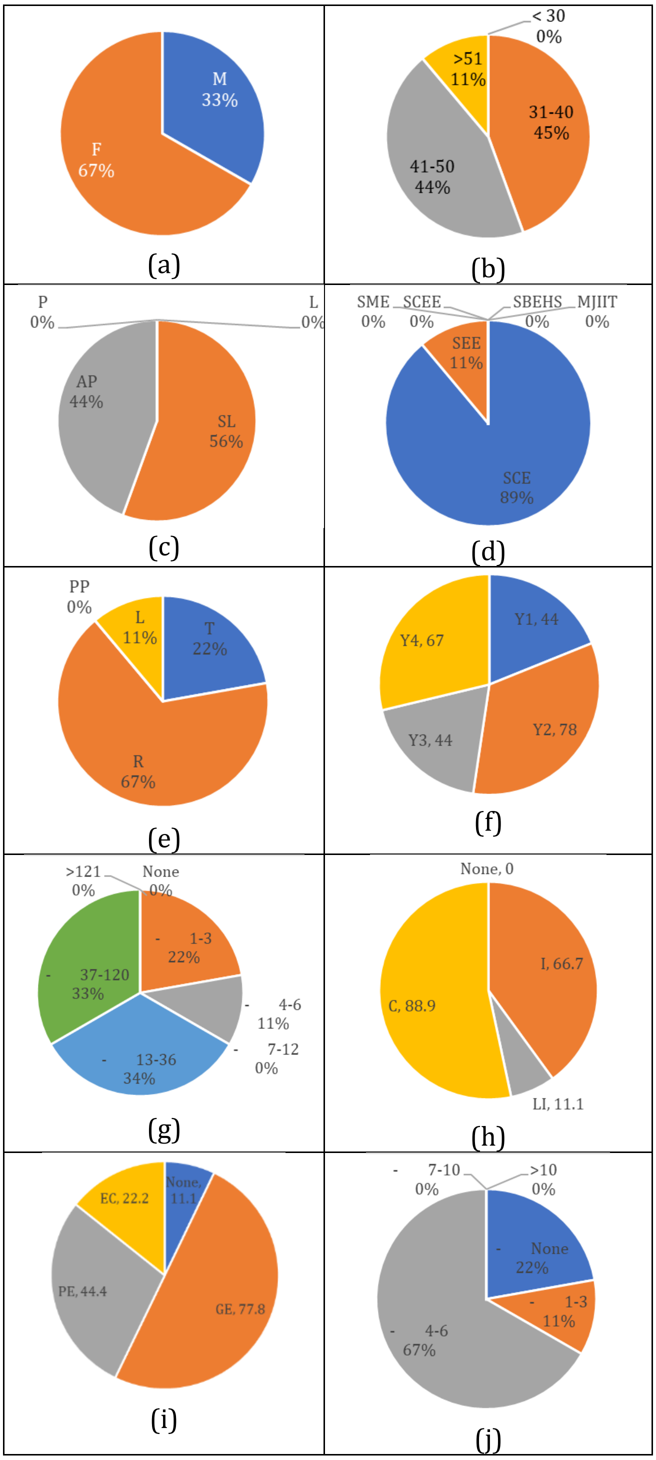

Figure 3. Demographic data for lecturers in UTM

(a) Gender; (b) Age (y.o); (c) Position; (d) School; (e) Differentiated Career Pathways (DCP); (f) Year courses taught; (g) Total industrial experience (mo); (h) How do the staff gain the industrial experience; (i) Staff professional qualification; (j) Years registered with professional qualification (y)

Legends: M- Male; F- Female; L- Lecturer; SL- Senior Lecturer; AP- Associate professor; P- Professor; SCE- School of Civil Engineering; SEE- School of Electrical Engineering; SME- -School of Mechanical Engineering; SCEE- School of Chemical and Energy Engineering; SBEHS- School of Biomedical Engineering and Health Sciences; MJIIT- Malaysia-Japan International Institute of Technology; T- Teaching; R- Research; PP- Professional Practice; L- Leadership; Y1- Year 1; Y2- Year 2; Y3- Year 3; Y4- Year 4; I- Previously worked with industry before joining UTM; LI- Undergone Latihan Ikhtisas; C- Involve with consultancy work while serving in UTM; GE- Graduate Engineer registered with BEM; PE- Professional Engineer registered with BEM; EC- Professional engineer registered with Engineering Council, UK

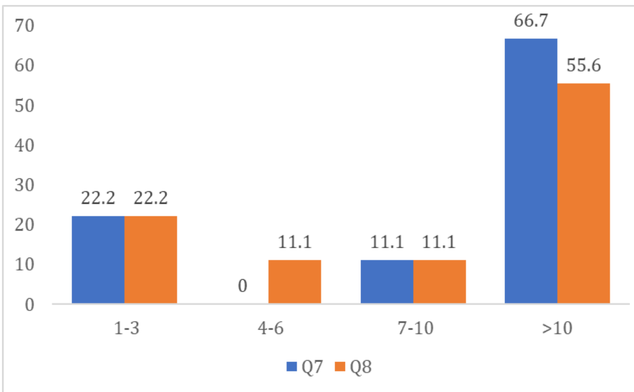

Figure 4. Total service and total teaching experience

(Q7) Total years' service in UTM (y); (Q8) Total teaching experience (including outside UTM) (y)

From Figure 4, most respondents have more than 10 years of service in UTM (66.7%) with the total of teaching more than 10 years (55.6%).

ii) Students

There are five questions were demonstrated in part A for students to answer; demographic info which reflected the respondent's background. The question is about gender, nationality, learning code, year of study, as well as school. The data analysis obtained from the study is tabulated in Figure 5.

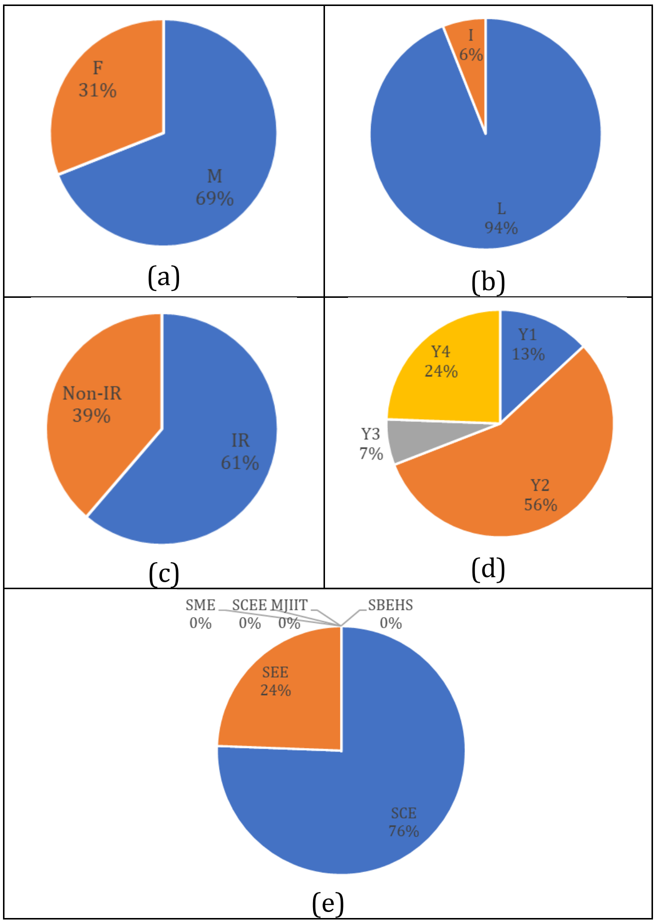

Figure 5. Students' demographic data

(a) Gender; (b) Nationality; (c) Learning code; (d) Year of study; (e) School

Legends: M- Male; F- Female; L- Local; I- International; IR- Professional engineer certification; Non- IR- Without professional engineer certification; Y1- Year 1; Y2- Year 2; Y3- Year 3; Y4- Year 4; SCE- School of Civil Engineering; SEE- School of Electrical Engineering; SME- -School of Mechanical Engineering; SCEE- School of Chemical and Energy Engineering; SBEHS- School of Biomedical Engineering and Health Sciences; MJIIT- Malaysia-Japan International Institute of Technology

Male respondents are nominated for the survey (69%) rather than female respondents (31%) (Figure 5) (question a). For nationality, most students are from local (94%) and only 6% are from international students (question b). Learning code is to represent whose lecturers are teaching them. So, from the figure, the students mostly learned from lecturers with IR certification (61%) and the other 39% were taught by experienced non-IR registered lecturers (question c). The students were also nominated by 2nd year students (56%), followed by 4th year students (question d). All of them are mostly from the School of Civil Engineering (76%) and only 24% are from the School of Electrical Engineering, respectively (question e).

Reliability Test

SPSS software is used to conduct the reliability test among the nine respondents from lecturers and 168 respondents from students in the survey. The results of Cronbach's Alpha for both categories are shown in Table 2.

Table 2. Cronbach's Alpha data

Categories	Parts	Cronbach's Alpha
Lecturers	B- teaching practice	0.924
	C- tendency of teaching	0.869
	D- teaching aids	0.465
Students	B- lecturer's teaching practice	0.816
	C- lecturer's tendency of teaching	0.939
	D- lecturer's teaching aids	0.773

From the table, the result of Cronbach's alpha of each category was above 0.7 which indicates that the survey questionnaire was valid and reliable except part D for lecturers with 0.465 Cronbach's alpha value. Even though the value is lower than 0.7, according to the study by Taber (2018) and Nawi et al., (2020), the value of 0.4 to 0.9 is considered acceptable and sufficient. This can be confirmed by the study of Griethuijsen et al. (2014) who obtained the result of 0.446 for their study and described that the Cronbach's alpha will increase as the number of items is increased. It is also plausible to say that the small number of respondents from lecturers might as well have influenced the results obtained in part D. This can be seen from part D for students where the number of respondents is slightly highest compared to lecturers. However, Bonett and Wright (2014) stated that there is no universal minimally acceptable reliability value that has been discussed relating to the samples. Meanwhile, the results with zero variance are removed from the analysis; for lecturer in part B, question 3 and 8, respectively.

Descriptive test

Descriptive analysis was carried out to both survey questionnaires; lecturers and students. The questions asked are the Likert-type scale. The mean score to part B is ranging from 3.22 to 5.00 which indicates that the respondents strongly agreed that they have significant teaching practice in their work. In this part, the item with the highest mean score is "I do not allow students to ask questions in class while I'm teaching" and "I do not encourage my students to give ideas or comments about what is being taught in class" (mean=5.00). These questions are reversed scored items. Which means that the score '5' means the lecturers strongly disagree by the method that they are not allowed to ask the students questions or comment on their teaching methods. On the other hand, the item with the lowest mean score is "I believe my students can do well by using only the materials given by me in class" (mean=3.22). This means that in order to be excellent in the study, the students must also look for other alternative resources to seek the knowledge instead of hoping for 'spoon-feed' by their respective lecturers. It will help the students with creative minds and diverse their knowledge with multiple references other than the materials used in the class. The other item with mean 3.78 to 4.44 agreed that they also used other practice in their teaching.

Meanwhile, for part C, the highest mean score is "I prefer to use the following inquiry-discovery methods because it emphasises experiential learning, i) Problem-based learning, ii) Case-based learning, iii) Project-based learning" (mean = 4.44). This means that most lecturers are using this practice in their teaching where they diversified their teaching methods instead of selecting one way of teaching in the class. The lowest score is "I prefer to give students service-learning based assignment" and "I prefer to use virtual reality in class" (mean = 3.44). Both questions mean the subject teaching may be not involving the community, thus, there is no service-based learning and no virtual reality means the lecturers are not using virtual situations in the class. This is because in order to obtain a real situation especially for the industry, there are a lot of procedures that must be considered for both parties; university (to be specific the school) and industry before having a visit or at least recording the video. Most of the time, there is a confidential part in the industry that must not be exposed directly to the public or the materials for recording are not suitable in that sector for example clean room for food processing or cosmetic industry. Thus, the virtual reality may be by referring to the video from YouTube or company website.

On the other hand, in part D, which is teaching aids, the lecturers mostly relied on UTM e-Learning (mean = 4.00) for their teaching and only a few are using OpenCourseWare (OCW) offered by UTM (mean = 2.78). This is probably due to not all subjects are available and covered by experts in the website that the lecturers can refer to.

As for students, in part B, the highest mean score is "My lecturers assign tasks based on the project which are relevant to topics learned in class" (mean = 4.51). On the other hand, the lowest mean score is "My lecturers believe that students can do well by using only the materials given to them in class" (3mean = 3.68). This means that most of their lecturers are given the task that is relevant to the class and not only expect that the students must use their materials to learn the respective topic in the class.

In part C, the highest mean score is represented by "I prefer my lecturers to use demonstration because it gives students example steps of conducting an activity or task" (mean = 4.55). The students prefer their lecturers to demonstrate any tasks given to them for better understanding of the topic taught in the class. The lowest score is referred to as "I prefer my lecturers to use cooperative methods because it allows students to work together including assessing their own group performance' (mean = 4.28). This shows that the students mostly prefer their lecturers to assess the group performance rather than students evaluating their own friends. Maybe for them, there will be no bias if their lecturers evaluated their performance instead of the students, so that the results obtained may be more accurate for them to polish their skills in certain subjects.

In part D, the highest mean score obtained from the study is "I prefer to use videos that my lecturers develop" (mean = 4.25), whereby the lowest mean score is "I tend to use OpenCourseWare (OCW) which is developed by UTM experts" (mean = 3.16). The students are most likely their lecturer who prepared the video rather than relied on OCW website for their studies.

Discussion

In this study, we have successfully retrieved engineering lecturers' profiles from school administration. The detailed profile background for lecturers as well as students was shown in the demographic data analysis section. A total of nine respondents from lecturers with and without IR answered the survey and approximately 168 respondents from students also participated in this study.

This objective was tested in the section reliability test and descriptive analysis. Cronbach's alpha test showed that the items tested were reliable and accepted (the alpha value is more than 0.4 and 0.7). The feedback from lecturers with and without IR showed that they consistently agreed with each other about the teaching approaches and materials used in their teaching in the class. The highest mean score is also more than 0.3 which means that they significantly practice the teaching technique in their work.

Students' perceptions on teaching and learning practice by their lecturers were demonstrated in section reliability tests and descriptive analysis. Reliability test showed that the items tested were reliable and consistent. This can be seen from Cronbach' alpha value that is more than 0.7 for all parts. Their lecturers also practice good approaches teaching when facing the students during learning (the mean score is higher than 0.3).

Conclusion

This pilot study has revealed that the suggested research is highly significant and has the potential to significantly enhance teaching and learning (T & L) for both engineering lecturers and class participants. From this point on, the number of people who took part in this poll reflects our first goal. Because this poll was conducted in the early stages of the epidemic, when it was still active, and since hybrid classes were used to help pupils catch up with previous Malaysian MCOs (movement control orders), it was carefully conducted. It is challenging to access and appropriately assess the educational process because the offered subject requires the students to practically learn in a variety of methods. Even if the reliability test and descriptive analysis for the nine lecturers in the sample are valid and reliable, more samples must be used in the real study to see whether the sample size has a substantial impact on our survey evaluation results. The survey question reveals that the instructors at the Faculty of Engineering use the NALI technique in class, which is encouraging because it will allow us to assess their methods through a broader study (qualitative and quantitative analysis for larger sample).

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