Scholarship of Teaching and Learning @UPM

UNIVERSITI PUTRA MALAYSIA

Editors

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PREFACE

by the Editors

In recent years, academics in Universiti Putra Malaysia (UPM) have shown profoundly keen involvement in the Scholarship of Teaching and Learning (SoTL). Their efforts to improve student learning and development through a repertoire of effective instructional approaches have indeed increased and become more visible. It is commendable that our academics strive to create opportunities and engage students in active learning to nurture the development of critical thinking, creativity, communication, collaboration, media literacy and computational skills. The aforesaid student attributes are critical for our graduates to excel in the world of constant change. Given the vibrant development in the teaching-learning landscape within our campus, the Centre for Academic Development (CADe) endeavoured to capture in-class and out-of-class evidences that reflect SoTL's value as a vehicle to advance student learning and at the same time showcase our academics' commitment towards teaching and assessment in the 21st century learning environments. To realise this endeavour, CADe extended invitations to all UPM academics to submit original manuscripts related to the following themes in November 2018:

- Challenges/responses to the SoTL paradigm
- SoTL's role in a specific discipline
- SoTL projects at the course/programme level
- Inter-disciplinary collaborations for advancing SoTL
- Opinions, reflections or commentaries related to SoTL

We received 17 submissions by April 2019 and subjected them to rigorous peer reviews to ensure the highest quality for this book. A total of 13 manuscripts were finally accepted in July 2019 as book chapters. The chapters presented in this book encapsulate the essence of the aforesaid SoTL themes and the topics covered a wide-array of disciplines such as education, engineering, medicine, biotechnology, computer science, information technology and agriculture.

We would like to express our profound gratitude to all authors who put in immense effort to contribute to this book. We are also grateful to the Director of CADe, Professor Dr. Muta Harah Zakaria for her constant encouragement to complete this book in a timely manner. Last but not least, we are indebted to the staff members of CADe who were either directly or indirectly involved in the publication of this book.

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Chapter 1

Unpacking the Scholarship of Teaching and Learning for Academics

Wong Su Luan & Mas Nida Md Khambari

Keywords: scholarly teaching, systematic reflection, unicycle spokes

Introduction

The Scholarship of Teaching and Learning (SoTL) is gaining prominence in Malaysian public universities since the introduction of the differentiated career pathways (DCP) framework by the Ministry of Higher Education in 2016. The DCP framework aims to create "academic ecosystems capable of nurturing excellence and leadership in teaching, research, professional practice and institutional leadership" (Ministry of Higher Education, 2016, p. 12) through four different pathways — Teaching, Research, Professional Practice and Institutional Leadership.

The teaching career pathway was introduced as a way to give due recognition to academics who engage in SoTL. The Ministry of Higher Education (2016) acknowledges that achievements and contributions in SoTL have not been given due weightage for academic promotions in the past. Past studies have also suggested that SoTL work is less valued in promotion excercises, often causing academics to shy away from putting effort in SoTL work (McKinney, 2007; Swart, 2016). Swart (2016) stressed that too often, academics have the misconception that they need to focus solely on research related to their field of expertise to be eligible for promotions. In addition, being involved with SoTL work means one will be slow to yield papers as most education journals have low citation rates (Rowland & Myatt, 2014). Despite these concerns, Malaysian academics have shown great interest to pursue in scholarly teaching.

Indeed, a cursory survey by the Ministry of Higher Education (2016) among 5144 academics from 24 universities revealed 46% of them see themselves as passionate educators. A majority of the academics (42%) chose the teaching career pathway. Within the context of Universiti Putra Malaysia (UPM), 17% of academics chose the teaching track (Ideris, 2019). According to the Ministry of Higher Education (2016), academics opting for the teaching pathway will now have their "teaching and learning activities achievements be weighted higher (50-65%) when they plan for their annual workload and apply for promotions" (p.36).

Given the aforesaid scenario, it is clear that academics must possess the right attributes to excel as passionate educators. They are expected to be creative and innovative in teaching-learning and assessment methods which in turn

impact student learning outcome in a meaningful way. They will also need to engage themselves in scholarly teaching and be courages to share their findings in their quest to seek new pedagogical knowledge. Rightly, the aforementioned expectations form the core of SoTL where academics reflect on their own teaching, apply innovative pedagogies to support student learning and share their scholarly findings with the public (Swart, 2016).

Defining SoTL

SoTL stems from Boyer's (1990) seminal work — *Scholarship Reconsidered: Priorities of the Professoriate* where he concluded that "the work of the professoriate might be thought of as having four separate, yet overlapping, functions. These are: the scholarship of *discovery*; the scholarship of *integration*; the scholarship of *application*; and the scholarship of *teaching*" (p. 16). Although Boyer (1990) did not define SoTL per say, his work influenced many others who then framed SoTL in many ways. Boyer's initial term "scholarship of teaching" was transformed into "scholarship of teaching and learning" when Shulman and Hutching (1999) claim that SoTL

> "requires a kind of 'going meta,' in which faculty frame and systematically investigate questions related to student learning—the conditions under which it occurs, what it looks like, how to deepen it, and so forth—and do so with an eye not only to improving their own classroom but to advancing practice beyond it." (1999, p. 10)

According to Martin, Benjamin, Prosser and Trigwell (1999), SoTL consists of three inter-related components where the teacher engages with the existing knowledge on teaching and learning, does self- reflection on teaching and learning in his/her discipline, and publicly shares his/her ideas about teaching and learning within or even beyond the discipline. A year later, Trigwell, Martin, Benjamin and Prosser (2000) developed a model which describes SoTL based on how it is represented in the literature and the way academic staff understand it. The model posits that SoTL is about being informed and reflecting on one's own teaching, giving focus for the teaching approach used and communicating it to the community (Trigwell et al., 2000). In the same vein, McKinney (2007) defines SoTL as a "systematic study of teaching and/or learning and the public sharing and review of such work through presentations, publications or performances" (p. 10).

There are also various definitions of SoTL by higher institutions of learning. For example SoTL is defined by the University of Edinburgh (2017) as "a process of intentional inquiry into one's own learning, teaching and assessment practices with a view to enhancing those practices and improve the learning of our students" (para.1). The University of Illinois (2019) has defined SoTL as "the systematic reflection and investigation of our classrooms. It is a bridge between the acts of teaching and research, with explicit focus on enhancing student learning. It is asking questions about what works, what doesn't, and

why and then transforming these activities into collecting and analyzing evidence of student learning" (para. 4).

What is clear from the aforementioned literature is that SoTL emphasises on enhancing student learning and teaching practice based on the evidence collected from one's own course (Society for Teaching and Learning in Higher Education, 2019). In this respect, we define SoTL in Universiti Putra Malaysia (UPM) as thinking and reflecting on one's own teaching to augment student learning as well as sharing its effectiveness.

Principles of SoTL

Swart (2016) likened the principles of SoTL to unicycle spokes that when drawn together, they provide understanding to academics about the meaning of SoTL. The use of the unicycle is apt as a metaphor for SoTL as one needs lots of practice over time before being able to ride the unicycle confidently (Swart, 2018). In other words, in order to embark on SoTL successfully, academics not only must be passionate about teaching and learning but have commitment to improve their teaching practice. Swart (2016 & 2018) also stressed that academics will have to learn how to balance the requirements of SoTL with other academic responsibilities. Diagram 1 shows the SoTL unicycle comprising eight spokes by Swart (2016).

First Spoke: Awareness

The first spoke represents awareness. This is the first stage of SoTL where academics become aware of SoTL. In Universiti Putra Malaysia (UPM), the Centre for Academic for Development (CADe) plays a crucial role in promoting awareness towards SoTL. Examples of awareness include hearing about a SoTL programme being organised within or outside campus, the call for grant applications specific to teaching-learning or even poster presentation competitions with a focus on teaching-learning. For example, CADe organises the Fundamentals of Teaching-Learning programme which encompasses a two hour module on SoTL for all new academics. CADe also conducts courses on SoTL through its Continuous Professional Development programmes (CPD) (Figure 1). Information about the courses are usually disseminated informally in digital forms through e-mails, social media platforms such as Whatsapp and Facebook, and while formal methods include circular letters issued by CADe. Creating awareness is fastest and most efficiently done through digital media nowadays given the proliferation of social media apps. Swart (2016) and Samah et al. (2016) stressed that other forms of awareness also entail academics being in the know of the latest literature in SoTL and engaging with experts in the field. In other words, academics who want to advance further in the SoTL field must keep abreast with the latest development through recent publications and engage in intellectual discourse with fellow SoTL practitioners and researchers.

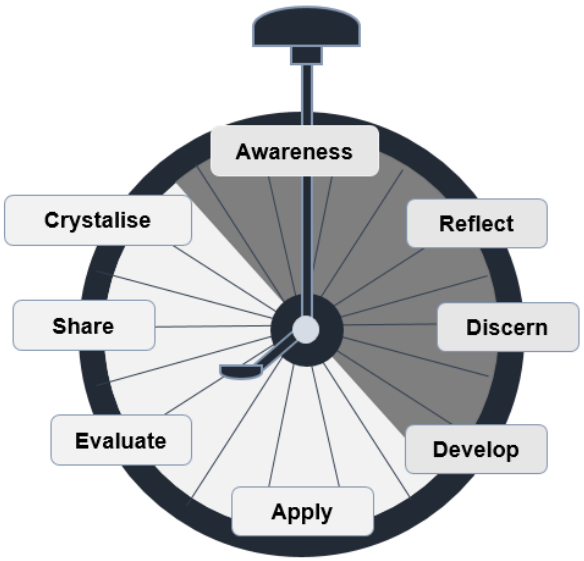

Diagram 1: *Eight Spokes of SoTL Unicycle*

Figure 1: *CPD on SoTL*

Second Spoke: Reflect

The second spoke represents reflection where academics progress into after being aware of SoTL. Reflection that is done in a critical manner is seen as a method to improve teaching practices by questioning assumptions, observing one's practices, acting upon one's observations and evaluating the consequences of one's actions (Center for Teaching-Learning, 2018). It is pertinent for academics to reflect on their teaching strengths and weaknesses; and seek ways to further enhance their strengths and overcome their weaknesses. Clements (2018) stressed that pertinent questions to ask at the reflection stage can be sorted into five categories which are shown in Table 1[1]. Clements (2018) opines that educators who continuously ask themselves the 30 questions will be guided to focus on learning in the learning environment.

Table 1: *Thirty Questions for Teacher Reflection*

Categories	**Description of Questions**	**Questions**
Modeling Reflection	Asking students	1. Was this activity successful? Why or why not?
		2. If we do this again, what can I do differently to help you learn more?
		3. Did this activity help you learn more than others we've done? Why?
Classroom Culture	Asking about rules and relationships	4. Are the relationships that I have with my students helping or hindering their ability to learn?
		5. Could the problems I have in my classroom be solved by pre-teaching my expectations or developing rules/procedures to deal with these issues?
		6. Was my demeanor and attitude towards my class today effective for student learning?
		7. Am I excited to go to work today?
		8. Are my students excited to come to

[1] We have reorganised Clements' work comprising the 30 reflective questions into Table 1. Source: Clements (2018), p. K

		y class today? (How much does #6 impact #7?) 9. What choices have I given my students lately? 10. Can I explain at least SOMETHING about each of my student's personal lives?
Curriculum and Instruction	Reflecting on assessment and grading practices	11. Does my gradebook accurately reflect student learning? 12. Do my assessments really reflect learning, or merely task completion or memorization skills? 13. Why did I REALLY choose this particular lesson to cover this objective? 14. What evidence do I have my students are learning? 15. What new strategies have I tried lately that might benefit a student I am struggling with? 16. In what ways am I challenging students who are clearly being successful in my classroom? 17. What do I do when students aren't learning in my classroom? 18. Which students benefited from this activity? 19. Which students did not benefit from this activity?
Collaboration	Asking ourselves about our place in a professional learning community	20. In what areas can I still improve professionally? 21. What's stopping me from improving in these areas? 22. In what ways can I support my colleagues in their student's learning? 23. Do my actions as a teacher show my belief that all students can learn at a high level? 24. Do my actions as a teacher show that I take pride in my work? 25. Are the relationships I have with my colleagues conducive to creating a collaborative culture focused on learning?

		26. Are the relationships I have with my student's parents conducive to improving learning?
Mental Health	Helping teachers maintain a healthy outlook	27. What new ideas have I tried in my classroom lately to keep myself energized about teaching? 28. What have I done lately to relieve stress and focus on my own mental health, to ensure I remain an effective teacher? 29. What things am I currently doing that I could realistically make less of a priority in my profession? 30. How much time have I spent with my friends and family in the last two weeks?

Third Spoke: Discern

The third spoke in the unicycle after reflection is discernment. According to Swart (2016), academics need to make informed decisions what gaps, challenges and critical issues that need to be addressed for their teaching-learning. It is important for academics to be able make judgements about the effectiveness of their pedagogical approach based on available sources such as formal student evaluations, external assessors' comments of the programmes evaluated, stakeholder feedbacks and even institutional policies. Samah et al. (2016) stressed that evidence obtained through students' evaluation informed academics' teaching practice. In other words, student evaluation scores become indicators of the academics' classroom performance.

Fourth Spoke: Action

Once academics discern about matters related to their SoTL, they will then need to develop relevant action plans (fourth spoke) to ensure that their teaching approaches reflect the expectations and trends of 21st century learning environment (Swart, 2016). To assist academics to stay relevant as educators in the 21st century, CADe conducts continuous professional development (CPD) courses throughout the year for academics. The CPD courses cover a wide range of topics in the areas of innovative delivery, curriculum development, assessments and others where academics can pick and choose the courses they wish to attend (Figure 1). For example, academics who find themselves less proficient in using digital tools for teaching-learning may make preparations to enrol themselves in courses to hone and enhance their digital skills. On the other hand, digitally literate academics may start planning on how to integrate digital tools in their lessons so that the learning environment becomes fun and engaging. Academics will start working on their lesson plans before the start of the semester to ensure there is positive change in their delivery methods. They will find answers to

questions such as “What tools do I need in my lesson to ensure positive impact on my student learning outcome?”; “When is the best time to use this student centred learning approach in my lesson? or “What is the best assessment methods to measure student learning outcomes”.

Figure 2: *Calendar for Continuous Professional Development*

Fifth Spoke: Apply

Academics are ready to apply what they have in the action plan once they are prepared (fifth spoke). This is where the academics translate what they have planned into action. Within the context of Universiti Putra Malaysia (UPM), the emphasis of the constructive alignment by Biggs (2003) in our curriculum design requires academics to ensure their course learning outcome, assesments and class activities are aligned as shown in Diagram 2. They need to ensure that they apply what they have written in their teaching plan in the learning environment. It can be expected that academics at this stage are applying teaching approaches that they believe can enhance their student learning outcomes. They then use appropriate assessment methods to measure the corresponding outcomes. Academics need to ensure that their learning activities (how will the learners learn) are aligned to the learning outcomes (what we want our students to learn) which in turn are aligned to the assessment approaches (how do we know our learners have learnt). It is vital for academics to capture evidence linked to the outcomes of implementing the action plan (Samah, Yaacob, Raja Hussain, Mohd Yusoff, Ngeow, Othman, Abu Bakar & Lim, 2016). Samah et al. (2016) stressed that evidence such as

gaining feedback through student evaluation, tests/examinations and interviews is a good way to facilitate student learning. With such evidence in hand, it leads academics to the next stage of the unicycle which is evaluation.

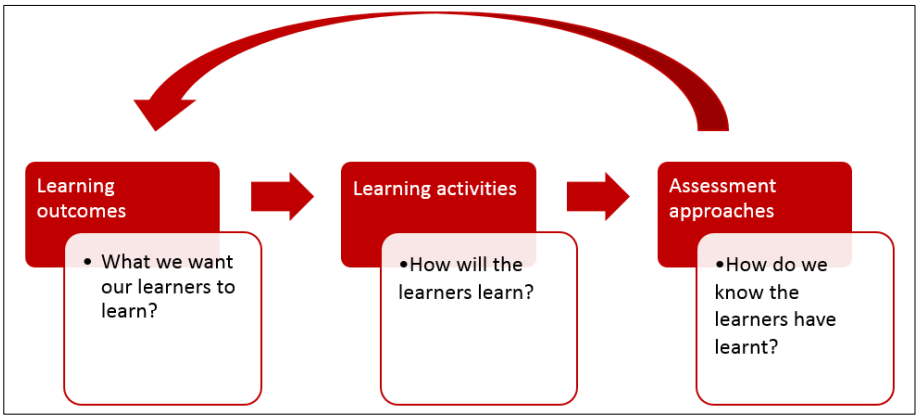

Diagram 2: *Constructive alignment*

Sixth spoke: Evaluate

The evaluation stage (sixth spoke) involves academics ascertaining if the constructive alignment produced the desired outcomes among students. In other words, academics evaluate if student learning outcome is achieved or improved as a result of their actions at the fifth spoke. They need to evaluate the strengths and weaknesses of their own teaching preparation, teaching approaches with the appropriate tools used in the learning environment and student assessments. This stage is where academics decide if they should redesign their course or even their programmes. They then spend time refining new activities, assignments and assessments (Rowland & Myatt, 2014) based on the evidence gathered at the fifth spoke.

Seventh Spoke: Share

Swart (2016) asserts that once academics have gone through the awareness, reflections, discernment, development, application and evaluation stages, they should now share their inquiry with the scholarly communities, make pedagogic research findings public and open to scrutiny (seventh spoke). The sharing sessions include presenting at conferences or participating in poster competitions where one has the opportunities to interact with fellow scholars face to face. To encourage and celebrate diversity in teaching-learning innovation among academics in Universiti Putra Malaysia (UPM), CADe organised the first Putra Innocreative in Teaching and Learning Carnival (PICTL) on 1st to 2nd August 2018. A total of 156 participants from UPM and other institutions took part in the poster competition. Participants and visitors were able to interact with one another face-to-face to share and exchange their

scholarly findings and ideas in relation to teaching-learning. Other means of sharing also include publishing in proceedings, books and journals where one's work may reach an even wider audience of scholars who share the same interests. The sharing sessions are seen as crucial given that academics are able to build research networks, gather feedbacks to improve their teaching practices, gain new ideas and exposure on new teaching activities.

Eight Spoke: Crystalise

The last spoke of the unicycle entails crystalising what SoTL is all about. The constant practice of the aforesaid seven spokes in the SoTL unicycle will result in a clearer understanding of SoTL. Once crsytallisation takes place, academics get better at SoTL. This translates into better teaching practices among the academics and improved student learning. Findings by Narima et al. (2016) suggest that practicing SoTL is vital given that the way academics teach affect student learning. Academics who embrace SoTL are more sensitive towards student learning outcomes. For example, it is likely that academics will seek to improve their existing rubrics to assess student learning outcome in a more holistic manner.

Conclusion

SoTL entails hardwork, persistence and dedication from academics but the rewards are worth every effort put in. SoTL provides the avenue for academics to examine in a more critical and reflective manner about their teaching and at the same time embrace themselves as teachers. On top of that, they learn to celebrate the outcome of their engagement with SoTL. By and large, SoTL is all about empirical examination of one's teaching relating to student outcomes but the ultimate value of SoTL lies in its power to achieve the best educational outcomes for students who will then contribute to the betterment of the society in the near future.

The Centre for Academic Development (CADe) will strive to further inculcate the SoTL culture among academics. The many teaching-learning related training sessions, activities and programmes organised in campus through the years bear testimony to UPM's commitment in laying the right foundation for academics to pursue research that focus on pedagogical refinement within the context of their areas of expertise.

References

Biggs, J. (2003). Aligning teaching for constructing teaching. *The Higher Education Academy.* Retrieved from https://www.heacademy.ac.uk/system/files/resources/id477_aligning_teaching_for_constructing_learning.pdf

Boyer, E. (1990). *Scholarship reconsidered: Priorities of the professoriate.* Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.

Center for Teaching-Learning, 2018. *The Role of Reflection in SoTL FLC*. Retrieved from https://ctl.iupui.edu/Programs/Role-of-Reflection-in-the-SoTL-FLC

Clements, M. (2018). *Teaching like the terminator: 5 steps to overcoming obstacles of learning and becoming the edunator.* Retrieved from http://www.moplc.org/uploads/1/3/4/8/13486647/a7_teaching_like_the_terminator_-_clements.pdf

Felten, P. (2013). Principles of good practice in SoTL. *Teaching & Learning Inquiry: The ISSOTL Journal*, *1*(1), 121-125.

Ideris, A. (2019). *The Vice-Chancellor's Message 2019*. Serdang: UPM Press.

Martin, E., Benjamin, J., Prosser, M., and Trigwell, K. (1999). Scholarship of teaching: A study of the approaches of academic staff. In C. Rust (Ed.), *Improving Student Learning: Improving Student Learning Outcomes* (pp.326-331). Oxford: Oxford Centre for Staff Learning and Development, Oxford Brookes University.

McKinney, K. (2007). Enhancing learning through the scholarship of teaching and learning: The challenges and joys of juggling. San Francisco, CA: Jossey-Bass.

Ministry of Higher Education (2016). *Strengthening academic career pathways and leadership development*. Putrajaya: Kementerian Pendidikan Tinggi Malaysia.

Rowland, S., & Myatt, P. (2014). Getting started in the scholarship of teaching and learning. *Biochemistry and Molecular Biology Education*. *42*(1), 6–14.

Samah, N. A., Yaacob, A., Hussain, R. M. R., Yusoff, N. M., Meng, N. Y., Othman, R., ... Hin, L. C. (2016). Exploring the perception of scholarship of teaching and learning (SOTL) among the academics of Malaysian higher education institutions: Post training experiences. *Man in India*, *96*(1), 433-446.

Society for Teaching and Learning in Higher Education (2019). *What is SoTL*. Retrieved from https://www.stlhe.ca/sotl/what-is-sotl/

Swart, A.J. (2018). Quantifying the impact of a new SoTL programme in Engineering Education at a university in South Africa. IEEE Global Engineering Education Conference (EDUCON), 32-37.

Swart, A.J., Luwes, N., Olwagen, L., Greyling, C. & Korff. C. (2016): Scholarship of teaching and learning: 'what the hell' are we getting ourselves into? *European Journal of Engineering Education*. DOI: 10.1080/03043797.2016.1214689

Shulman, L.S., & Hutchings, P. (1999). The Scholarship of teaching: new elaborations, new developments. *Change, (31)*5, 10-15.

Trigwell, K., Martin, E., Benjamin, J. & Prosser, M. (2000). Scholarship of teaching: A model. *Higher Education Research and Development*, *19*(2), 155-168.

University of Edinburgh (2017). What is Scholarship of Teaching & Learning (SoTL)? Retrieved from

https://www.ed.ac.uk/institute-academic-development/learning-teaching/staff/sotl/what-is-sotl

University of Illinois (2019). *Scholarship of teaching and learning.* Retrieved from https://citl.illinois.edu/citl-101/teaching-learning/scholarship-of-teaching-and-learning

Chapter 2

Teaching for Understanding: The Two-Stage Teaching Strategy for Engineering Courses

Suraya Abdul Rashid

Keywords: teaching for understanding, collaborative learning, engineering education

Introduction

Engineering education is the activity of teaching knowledge and principles to the professional practice of engineering. Engineering graduates must be trouble-shooters, problem-solvers and more importantly team-players. The notion of collaborative work is anchored in engineering practice because by and large, engineers do not work in isolation (Gol & Nafalski, 2007). The engineering fraternity works in a team that invariably involves technicians, technologists and engineers. It is inconceivable to think that great engineering projects of high complexity, can be conceived and created by an engineer in solitude.

Consequently, collaborative learning is most suited for preparing engineering students for the challenges that lie ahead (Stump, Hilpert, Husman, Chung & Kim, 2011). Collaborative learning is generally understood to refer to small group learning where the group members actively support the learning processes of one another. It is a learning approach, based on educational theories of Constructivism (Briede, 2013), which favours deep learning within a small team environment. Collaborative learning has been hailed as giving students an opportunity to engage in discussion, take responsibility for their own learning, and thus become critical thinkers (Gokhale, 1995).

However, many engineering courses contain learning challenges which hamper understanding. Thermodynamics for example, a historically difficult subject for engineering students, contain various Threshold Concepts (Meyer & Land, 2003; Male & Bennet, 2015) which include, among others, irreversibility of work, entropy, and the First and Second Laws of Thermodynamics. Many engineering courses also require students to master equipment design skills and Higher Order Thinking skills (HOTS).

Various methods have been suggested to enhance the teaching and learning of Threshold Concepts which include blended learning approach, active learning techniques, computer-based instruction, and virtual lab (Mulop et al., 2012). All of these approaches within the context of their respective studies, have shown to be positive and encouraging for students. Similarly, several strategies based on inquiry-based learning (Madhuri et al., 2012), active learning environment (Divya et al., 2016), and flipped classroom (Priyaadharshini & Sundaram, 2018)

have been suggested to encourage the attainment of HOTS in engineering education.

However, despite the availability of various learning strategies, approaches to learning research discovered that generally, students either take a 'surface' or a 'deep' approach to learning (Case & Marshall, 2004). Deep understanding involves what Bloom (1956) calls higher-order cognitive processing, i.e. it requires learners to not only be able to apply what they have learnt, but to also be able to analyze, evaluate and create new products, in terms of Knowledge, Skills and Attitudes (KSAs) of their own. A *Teaching for Understanding* (Kipper & Ruutmann, 2013) approach has been adopted to help students overcome these learning challenges. Teaching for Understanding is a framework developed by the Harvard Graduate School of Education (Blythe & Perkins, 1998). This framework is a guide that can help keep the focus of educational practice on understanding, while allowing teachers flexibility to design units that fit their priorities and teaching style. One of the earlier Teaching for Understanding framework developed by Blythe and associates is based on (1) An Overarching Generative Topic, which encompasses the other three elements: (2) Understanding Goals, (3) Performance of Understanding, and (4) On-going Assessment. This framework has been studied and used to discuss several strategies that can be used to teach for understanding (Kivunja, 2015).

This chapter aims to introduce an effective approach on the premise of Teaching for Understanding, which has helped to overcome learning challenges posed by various engineering courses. This approach is referred to as the *Two-Stage Teaching Strategy* to overcome learning challenges which are complex in nature. This approach can be used successfully for the constructive alignment (Cropley & Sitnikova, 2005; Nightingale, Carew & Fung, 2007; Cain, Grundy & Woodward, 2017) of any course provided that the learning challenges are identified. For the purpose of this chapter, the flexibility of the approach will be demonstrated through two chemical engineering courses— Thermodynamics (EMM 3213) and Particle Technology (ECH 4402). These courses were chosen because they have different characteristics and their learning challenges are different. Table 1 shows the course structure and learning challenges associated with the respective courses. Advantages of this approach is that it provides good structure for educators to focus on Teaching for Understanding. The choice of learning strategies is also flexible, allowing the educator to choose appropriate strategies they prefer or that suit their circumstances.

Table 1: *Course structure and learning challenges*

Course	Program	Structure	Learning Challenges
Thermodynamics **EMM 3212**	Bachelor of Chemical Engineering	(3+0) Core chemical engineering course and a prerequisite course to Chemical Engineering Thermodynamics (ECH 3108)	Contains abstract **Threshold Concepts** such as: Open and Closed Systems, Irreversibility of Work, Entropy and the First and Second Laws of Thermodynamics
Particle Technology **ECH 4402**	Bachelor of Chemical Engineering	(3+0) Elective Course for Materials Science and Engineering Option	Covers characteristics of solid particles and equipment design. Does not contain abstract concepts but requires **equipment design skills and Higher Order Thinking Skills**.

The Two-Stage Teaching Strategy

The Two-Stage Teaching Strategy is illustrated in Figure 1. The first stage or Stage I is a generic teaching stage, where new concepts or topics are introduced to students through a collaborative learning approach. Collaborative learning is useful to introduce new concepts to students whereby surface understanding can be achieved. This stage may be sufficient for easy to understand concepts or topics. Blended Learning (Garrison & Vaughan, 2008) may also be implemented if the instructor wishes to do so. Blended learning is a current trend in engineering education (Jones & Chew, 2015) whereby this style of teaching and learning require students to make use of online resources for learning such as online games, simulations or Youtube videos. It is well known that the attention span for learning is short, so it is important to break up the sessions through the use of various traditional and E-learning platforms to ensure that students are engaged and their mental energy is maintained throughout the learning process.

Meanwhile, the second stage or Stage II, is the Teaching for Understanding stage which is crucial to ensure the attainment of deeper understanding of more complex concepts or topics to overcome specific learning challenges. The learning strategies utilised would also depend on the complexity of the concept or topic. Different learning strategies are more suited to overcome certain learning challenges. Examples of learning strategies used to teach Thermodynamics and Particle Technology will be described in the following section. It should be noted that the flexibility of this approach allows educators to design the (i) type and number of learning strategies required for each stage as well as the (ii) duration of each stage (in chemical engineering jargon, the retention time in each process can be controlled). Some courses require equal amounts of time in both stages, whilst other courses may require a shorter time in the Stage I and a longer time in Stage II or vice versa.

Overcoming Learning Challenges using the Two-Stage Teaching Strategy

The Two-Stage Teaching Strategy is particularly designed to overcome learning challenges and is flexible enough to be used for various courses. Although Stage I is a generic approach suitable for all courses, the length of time spent at this stage can be controlled; it can be reduced or increased. Meanwhile, Stage II is carefully tailored to overcome different learning challenges in different courses. The flexibility comes from the flexibility of the length of time spent at each stage as well as flexibility in choosing appropriate learning strategies for different courses. This will be demonstrated in the two examples given below.

(1) Overcoming Threshold Concepts in Thermodynamics

Thermodynamics has traditionally always been a difficult course for engineering students. This is because this subject contains many Threshold Concepts which are abstract and difficult to grasp. Students taking a Chemical Engineering Bachelor degree have to encounter two Thermodynamics course; Thermodynamics (EMM 3212) and Chemical Engineering Thermodynamics (ECH 3108). These are core chemical engineering courses and very difficult to master. Figure 2 illustrates the Two-Stage Teaching Strategy typically designed for Thermodynamics. In this approach, Stage I follows the generic method of collaborative learning to achieve surface understanding of Precursor Concepts (Peter et al., 2014). During the subsequent classroom session, a recap of prior knowledge is given followed by a well-designed Stage II. At this stage, different learning strategies are used for a Teaching for Understanding approach in order to achieve deeper understanding. Two learning strategies which have been found to be effective are Inductive style (Prince & Felder, 2006, Hesketh et al., 2003) and Reciprocal style (Schunn & Silk, 2011, Rosenshine & Meister, 1994) learning. Inductive Learning is used to understand concepts like entropy, the second law of thermodynamics and the Carnot Cycle. Reciprocal Learning is used to solve calculations related to for example work generated, power consumed, specific heat capacities, enthalpy, and entropy. Note that from the author's experience, the length of time required in both stages are fairly equal.

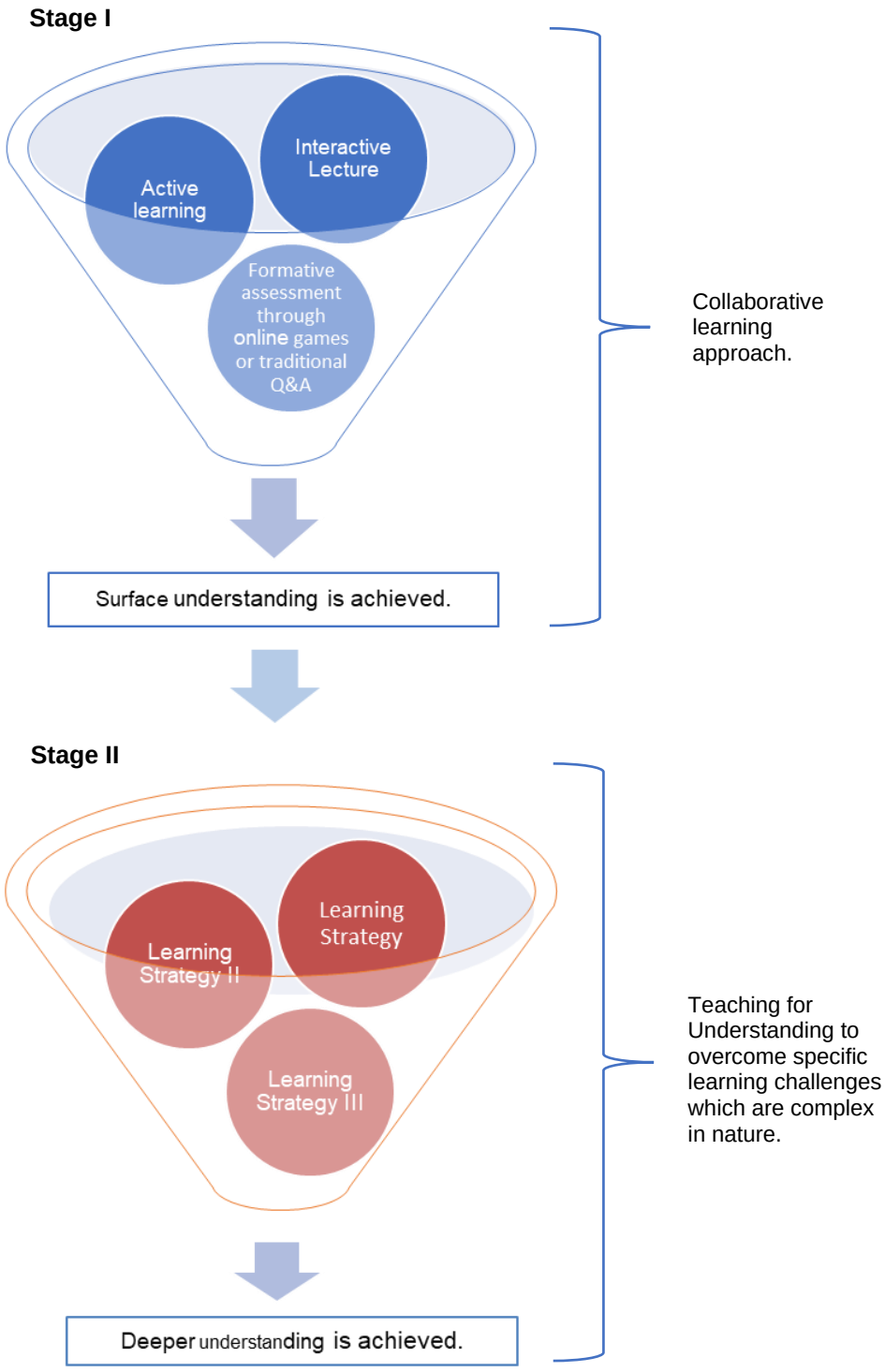

Figure 1: *The Two-Stage Teaching Strategy to overcome specific learning challenges which are complex in nature*

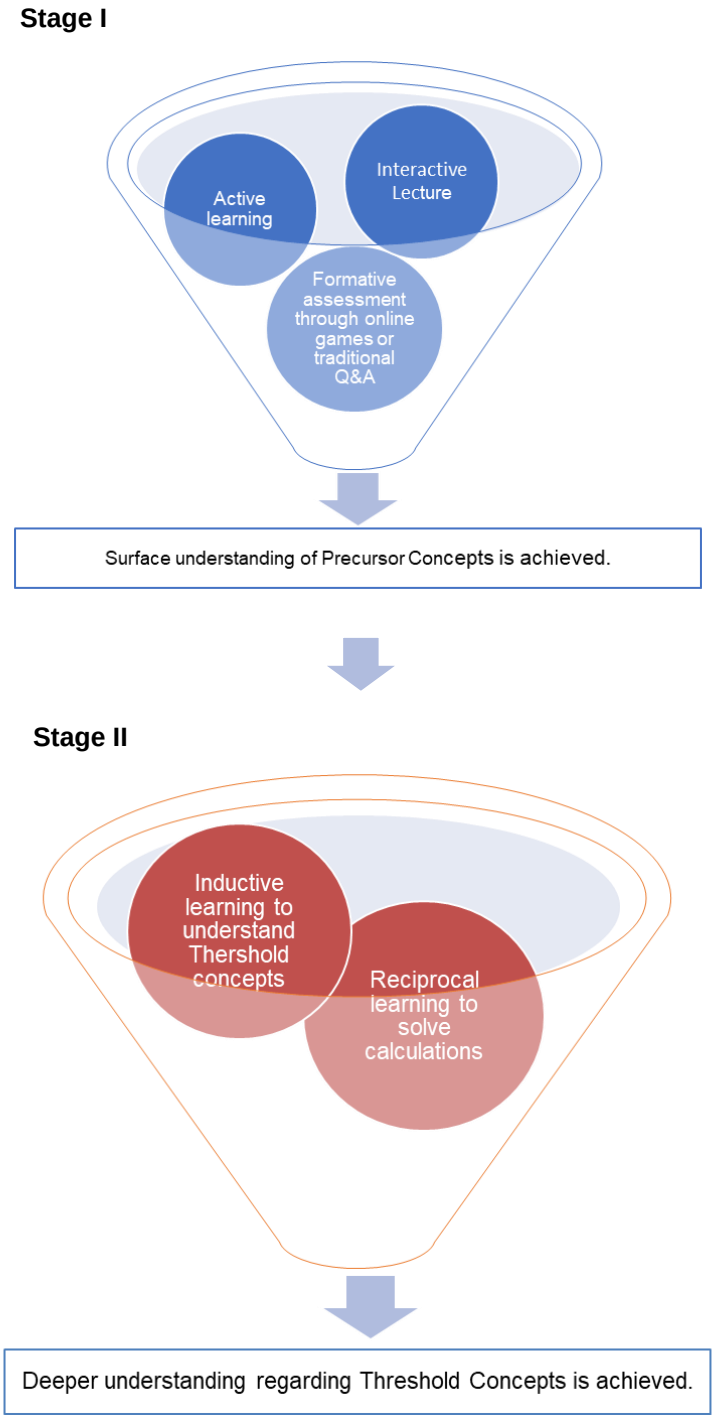

Figure 2: *The Two-Stage Teaching Strategy designed for overcoming Threshold Concepts in Thermodynamics*

(2) Attaining Equipment Design Skills and Higher Order Thinking Skills in Particle Technology

At the end of the Particle Technology (ECH 4402) course, students should be able to, among others, (i) design particle processing equipment as well as (ii) select suitable equipment for particle processing. For this course, The Two-Stage Teaching Strategy is designed slightly differently. Here the duration of Stage I is decreased and the duration of Stage II is increased. This is because unlike Thermodynamics which require understanding of Precursor Concepts prior to understanding Threshold Concepts, most of the understanding for Particle Technology will be attained through Stage II learning strategies which are explained below. The difference in scale for these stages is illustrated in Figure 3. Typical collaborative learning strategies such as interactive lecture and active learning as described previously are used for Stage I.

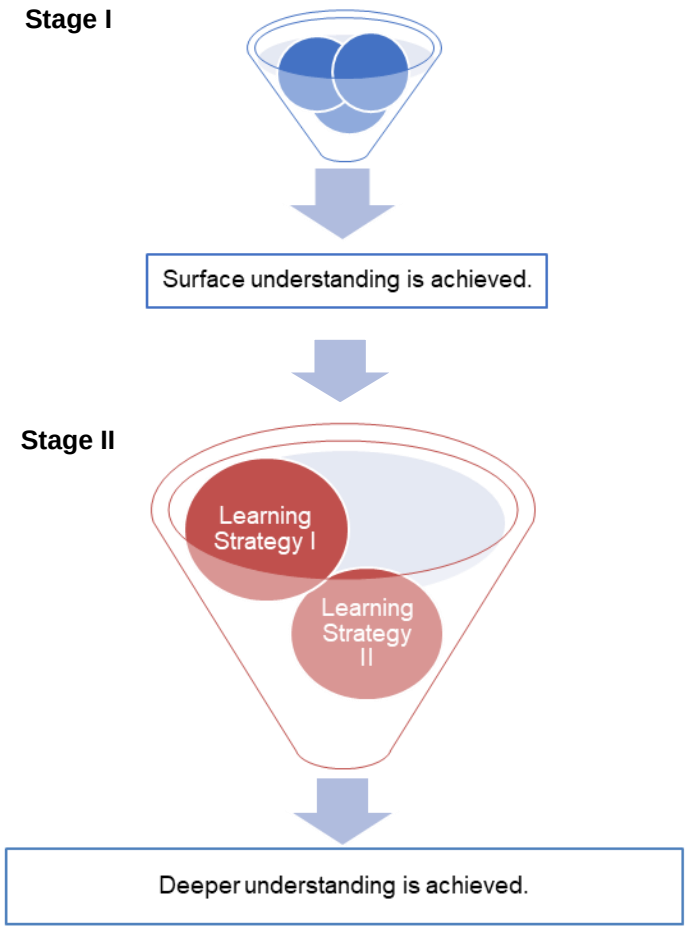

Figure 3: *The Two-Stage Teaching Strategy designed for attaining equipment design skills and higher order thinking skills in Particle Technology. The difference in scale illustrates the shorter duration for Stage I and the longer duration for Stage II*

Different learning strategies are used in Stage II depending on the intended outcome. Reciprocal learning is found to be useful to tackle equipment design calculations whilst Inductive learning is useful to attain HOTS such as selection of appropriate equipment and proposing process optimization for particle processing. Meanwhile, a learning strategy that is particularly useful to achieve both outcomes is immersive learning (Norton et al., 2008). Example of immersive learning to attain equipment design skills is the use of online simulators (e.g. Cyclone Design Simulator https://aerosol.ees.ufl.edu/cyclone/section01.html), whilst an example to attain HOTS is to experience first-hand an example of a pilot scale operation. Figure 4 (a) and (b) illustrates Stage II designed to meet the two different outcomes.

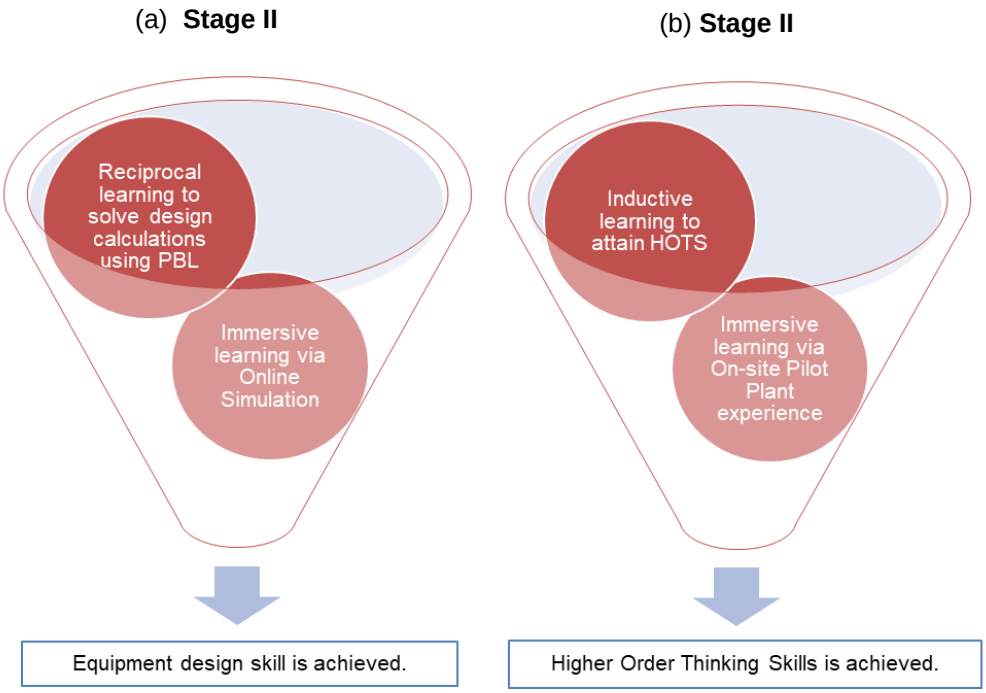

Figure 4: *Stage II designed to attain (a) equipment design skills, and (b) Higher Order Thinking skills in Particle Technology*

Development of the Two-Stage Teaching Strategy Through Continuous Improvement and Authentic Reflection

The Two-Stage Teaching Strategy was developed over several cycles of implementing various teaching and learning strategies and observing student performance. The motivation behind developing the approach was not only to improve the quality of students' learning experience, but also to demonstrate that Teaching for Understanding was key in helping students overcome learning

challenges for different engineering courses. The improvement in teaching and learning of two courses through continuous improvement and authentic reflection is demonstrated.

(1) Improving Teaching and Learning of Thermodynamics

The author was assigned a Chemical Engineering Thermodynamics Course (ECH 3018) in Semester 1 2016/2017. Figure 5 shows individual student performance for the summative assessments of similar topics in Test 1 (carried out at Week 5 of 14), as well as the Final Exam (at the end of the semester) for this particular cohort. For this cohort, only conventional collaborative learning (interactive lectures and active learning) was implemented. It can be seen that generally students were able to obtain good marks for Test 1. However, their performance in answering similar topics in the Final Exam generally dropped across the board. This indicated that although initially surface understanding of Precursor Concepts was achieved, deeper understanding of Threshold Concepts was probably not achieved. Three students who obtained A grade for this course are indicated in the Figure 5. Two out of the three students showed improvement in the Final Exam marks compared to Test 1. The results suggest that only 4 out of 32 students (indicated by *) i.e. 13% were able to attain deep learning.

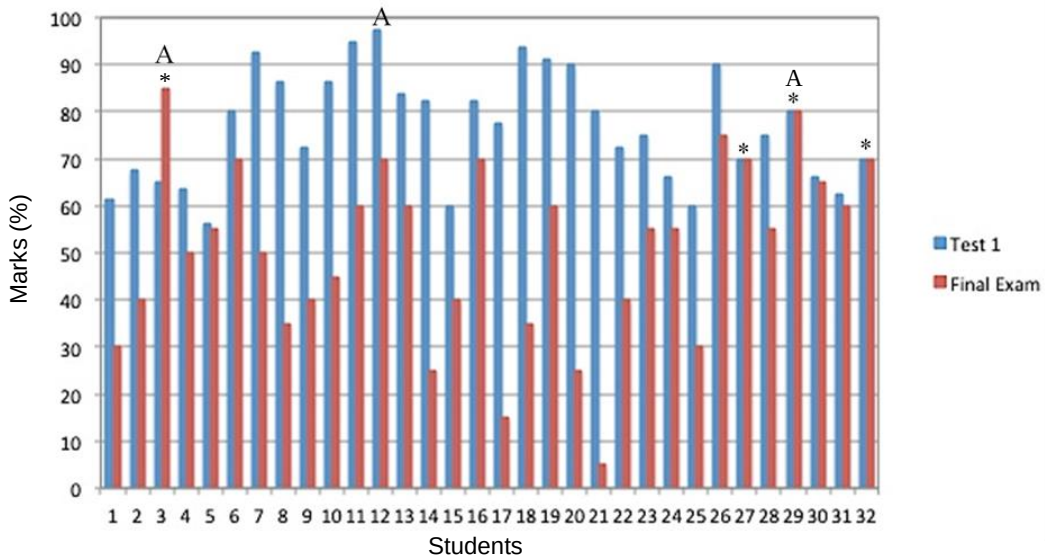

***Figure 5**: Individual student performance for Test 1 and Final exam in Thermodynamics using a conventional collaborative learning approach*

Recognizing the specific learning challenges of this course, it was clear that there was a need to overcome Threshold Concepts in Thermodynamics. Thus teaching strategies were adjusted to focus on deeper understanding and the Two-Stage Teaching Strategy was implemented.

(2) Improving Teaching and Learning of Particle Technology

The Particle Technology course ECH 4402 was conducted by the author for the first time in Semester 1 2013/2014. The implementation of the course was based on interactive lectures, active learning, Problem Based Learning (PBL) and immersive learning through on-site pilot plant visit. It was unknown at the time as to how the students would take up the assignment on cyclone design which was the PBL element since it was the first time for the author to set the assessments.

Figure 6 shows the Tests and Final Exam grades of the students for that particular cohort. It can be seen that 14 out of 51 students were able to obtain an A grade for this course. Despite this, it is noticeable that the performance of 43 out of 51 students (84% of the cohort) was lower for the final exams compared to the tests. This indicated that HOTS had not been achieved by majority of the students.

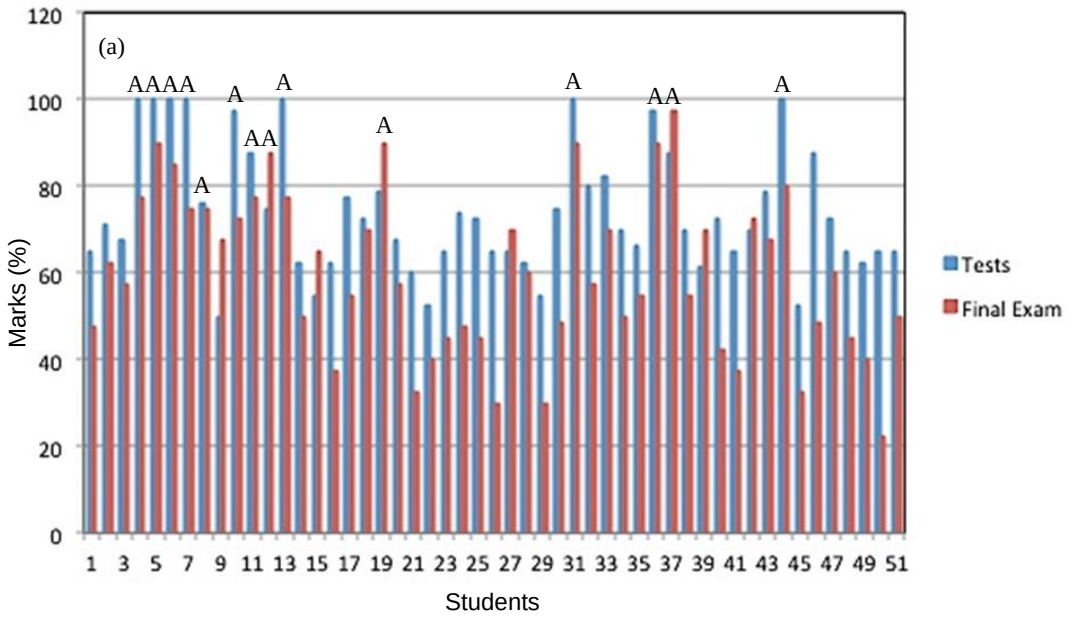

Figure 6: *Individual student performance for Tests and Final Exam in Particle Technology using a conventional active-learning approach*

Upon reflection of the teaching and learning approach as well as analysis of the student performance, it was deduced that:

(i) The relatively high number of students who obtained an A grade was probably assisted by the relatively high marks of 20% allocated to the continuous assignment which was based on cyclone design.
(ii) The formative assessment for HOTS element during the immersive learning approach of on-site pilot plant visit, was insufficient for students to attain this skill. Therefore they could not answer this aspect which was part of the summative assessment in the final exam.
(iii) Considering it was the first time the course was conducted, the constructive alignment of the course was still somewhat lacking.

The following year that the author conducted the course, the following changes were made:

(i) The Two-Stage Teaching Strategy was implemented with specific learning strategies for Stage II to overcome learning challenges in Particle Technology which covered both design skills and HOTS.
(ii) Allocated marks for the cyclone design PBL was reduced from 20% to 10% since students appeared to be able to carry out the task quite well.
(iii) A more authentic assessment to address HOTS was developed and 10% was allocated to the overall course marks as part of an assignment, as well as the final exam.

Impact of the Two-Stage Teaching Strategy on Teaching for Understanding

In this section, the impact of utilising the Two-Stage Teaching Strategy to overcome learning challenges and promote Teaching for Understanding is demonstrated.

(1) Qualitative Evidence of attaining deeper understanding in Thermodynamics

Figure 7 shows individual student performance for the summative assessments on Threshold Concepts in Test 1, as well as the Final Exam for a particular cohort taking Thermodynamics EMM 3213 in Semester 1 2017/2018. For this particular cohort, the Two-Stage Teaching Strategy was implemented. It is interesting to observe that more than half of the students (16 out of 30 students, denoted by * in Figure 3.7) were able to maintain or even improve their performance in the Final Exam compared to Test 1. Five students who obtained A grade for this course are indicated in the figure. Three out of these five students showed improvement in the Final Exam marks compared to Test 1, with the most impressive improvement of 208% shown by student number 22. These findings

suggest that the students had achieved deeper understanding of threshold concepts through the innovative teaching and learning strategy.

Students' attainment of deeper understanding before and after the implementation of the Two-Stage Teaching Strategy is shown in Figure 8. Students' attainment of deeper understanding for Thermodynamics had increased from 13% to 53%, Although the comparison is made between two different cohorts, the results provide some evidence to indicate improvement in the quality of teaching and learning through focusing on Teaching for Understanding.

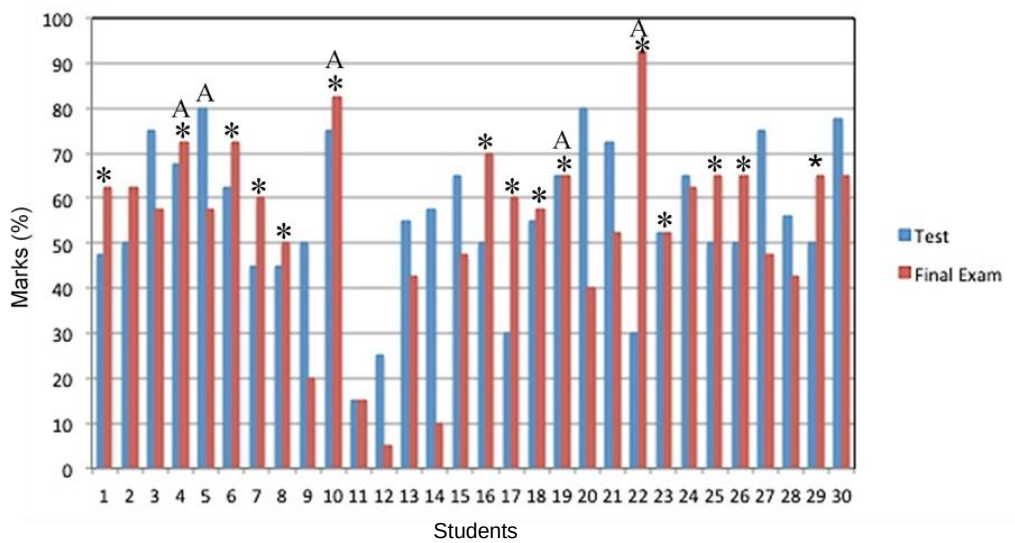

Figure 7: *Individual student performance for Tests and Final Exam in Thermodynamics using the Two-Stage Teaching Strategy*

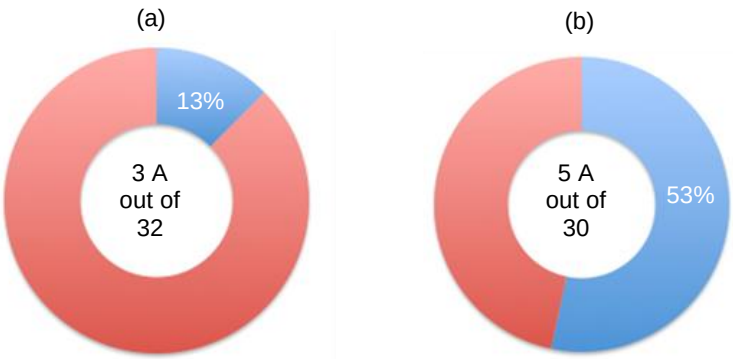

Figure 8: *Students' attainment of deeper understanding for Thermodynamics (a) before and (a) after the implementation of the Two-Stage Teaching Strategy. Note that students in (a) and (b) are from different cohorts*

(2) Qualitative Evidence of attaining deeper understanding in Particle Technology

Figure 9 shows individual student performance for the summative assessments in Tests as well as the Final Exam for a particular cohort taking Particle Technology ECH 4402 in Semester 1 2014/2015. For this particular cohort, the Two-Stage Teaching Strategy was implemented. It can be seen that 38 out of 57 students (67% of the cohort) were able to perform better in the final exams compared to the tests, with seven students obtaining an A grade. The results suggest that students had attained deeper understanding in Particle Technology.

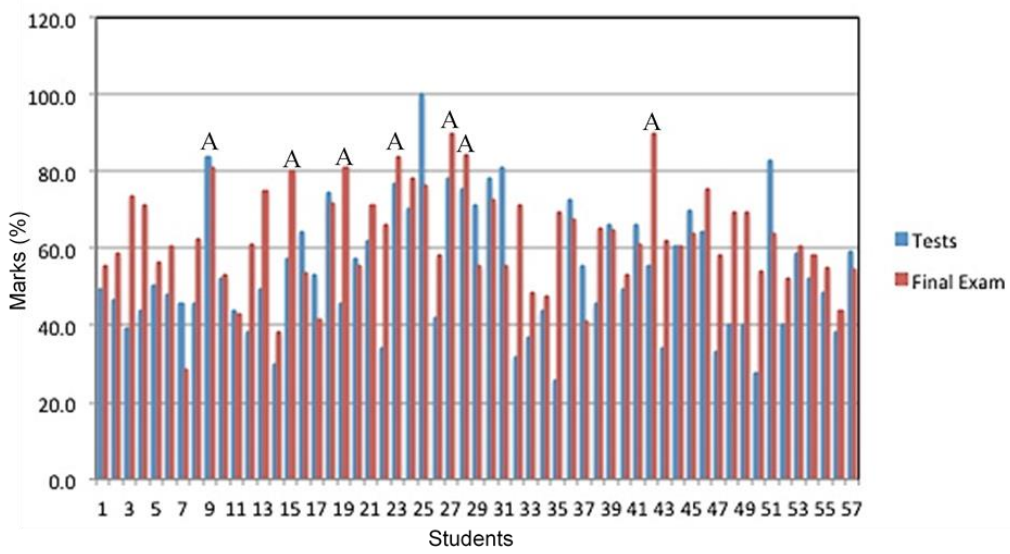

Figure 9: *Individual student performance for Tests and Final Exam in Particle Technology using the Two-Tier Teaching Model*

Students' attainment of deeper understanding before and after the implementation of the Two-Stage Teaching Strategy is summarised in Figure 10. Students' attainment of deeper understanding for Particle Technology had increased from 16% to 67%. Although the comparison is made between two different cohorts, the results provide some qualitative evidence to indicate improvement in the quality of teaching and learning through Teaching for Understanding.

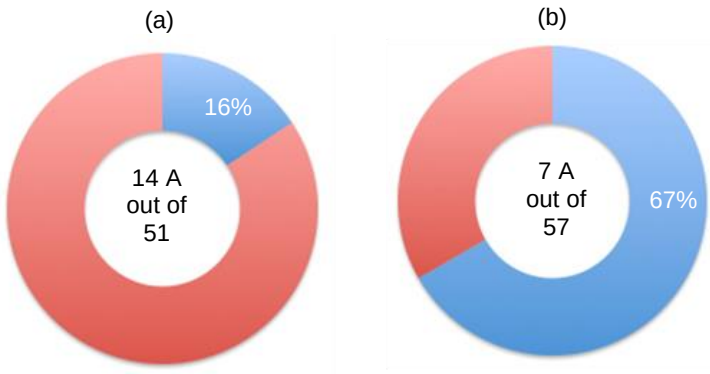

Figure 10: *Students' attainment of deeper understanding for Particle Technology (a) before and (a) after the implementation of the Two-Stage Teaching Strategy. Note that students in (a) and (b)*

Conclusion

It can be concluded that despite the plethora of strategies available for implementation of teaching and learning, it is important to realise that different engineering courses may have different learning challenges to be addressed. Based on the premise of the Teaching for Understanding framework, the Two-Stage Teaching Strategy has been proposed and described in the context of a Thermodynamics and Particle Technology course. Stage 1 is a generic teaching stage, where new concepts or topics are introduced to students through a collaborative learning approach. Stage II is the Teaching for Understanding stage crucial to ensure the attainment of deeper understanding of more complex concepts or topics, to overcome specific learning challenges. The implementation of the approach for overcoming threshold concepts in Thermodynamics, as well as attainment of equipment design skills and HOTS in Particle Technology were demonstrated. Examples of different learning strategies were provided based on the different needs of these two different courses. The positive impact of utilising the Two-Stage Teaching Strategy for both of these courses were presented. This proposed approach is useful for educators, especially for engineering courses, because it provides good structure yet the choice of learning strategies are flexible, allowing the educator to choose appropriate strategies to address specific learning challenges. Finally it is important to stress that careful consideration of course content and development of authentic assessment is crucial in order to ensure effective constructive alignment for any particular course.

References

Blythe, T., & Perkins, D. (1998). Understanding understanding. In T. Blythe (Ed.), *The teaching for understanding guide* (pp. 9-16). San Francisco: Jossey-Bass.

Bloom, B. H. (1956). Taxonomy of educational objectives, *Handbook 1: Cognitive domain*, New York: David Mackay Co.

Briede, B. (2013). *A constructivist approach in engineering education, engineering for rural development*, 584-589.

Cain, A., Grundy, J., Woodward, C. J. (2017). Focusing on learning through constructive alignment with task-oriented portfolio assessment. *European Journal of Engineering Education*, 1-16.

Case, J., & Marshall, D. (2004). Between deep and surface: procedural approached to learning in engineering education contexts. *Studies in Higher Education*, *29*(5), 605-615.

Cropley, D. H., & Sitnikova, E. (2005). *Teaching and Learning in Engineering Education: Constructive Alignment*. Proceedings of the 2005 ASEE/AaeE 4th Global Colloquium on Engineering Education, Paper 164.

Divya, A., Abirami, A. M., Nisha Angeline, C. V., & Lavanya, R. (2016). IEEE 4th International Conference on MOOCs, *Innovation and Technology in Education*, 47-53

Garrison, D., & Vaughan, N. D. (2008). *Blended learning in higher education: Framework, principles and guidelines*. San Francisco: Jossey-Bass.

Gokhale, A. A. (1995). Collaborative learning enhances critical thinking. *Journal of Technology Education*, 7(1), 22-30.

Gol, O., & Nafalski, A. (2007). Collaborative Learning in Engineering Education, *Global Journal of Engineering Education*, 11, 2, 173.

Hesketh, R. P., Farrel, S., & Slater C. S., (2003). An inductive approach to teaching courses in engineering. *American Society for Engineering Education*, 8.197.1-8.197.19

Jones L.J.N., Chew E. (2015) Blended Learning in Engineering Education: Curriculum Redesign and Development. In Tang S., Logonnathan L. (eds.) *Taylor's 7th Teaching and Learning Conference 2014 Proceedings*. Springer, Singapore

Kipper, H., & Ruutmann, T. (2013). Teaching for Understanding in Engineering Education, *iJEP*, *3*(1), 55.

Kivunja, C. (2015). Teaching For Understanding: Spotlighting the Blythe and Associates Pedagogical Model. *Cultural and Pedagogical Inquiry*, *7*(1), 84-99.

Madhuri, G. V., Kantamreddi, V.S.S.N., and Prakash Goteti, L. N. S. (2012). Promoting higher order thinking skills using inquiry-based learning. *European Journal of Engineering Education*, *37*(2), 117-123.

Male, S. A., & Bennet, D. (2015). Threshold concepts in undergraduate engineering: Exploring engineering roles and value of learning. *Australasian Journal of Engineering Education*, *20*(1), 59-69.

Meyer, J. H. F., & R. Land, R. (2003). *Threshold Concepts and Troublesome Knowledge: Linkages to Ways of Thinking and Practicing Within the*

Disciplines. Enhancing Teaching-Learning Environments in Undergraduate Courses Project, Occasional Report 4, 1-12.

Mulop, N., Mohd. Yusof, K., & Tasir, Z. (2012). A Review on Enhancing the Teaching and Learning ofThermodynamics, *Procedia – Social and Behavioural Sciences*, *56*, 703-712.

Nightingale, S., Carew, A. L., & Fung, J. (2007). Application of Constructive Alignment Principles in Engineering Education: Have we really changed? *Annual Conference of Australasian Association for Engineering Education*, 1-9.

Norton, C., Cameron, I., Crosthwaite, C., et al. (2008). Development and deployment of an immersive learning environment for enhancing process systems engineering concepts. *Education for Chemical Engineers*, *3*, 75-83.

Peter, M., Harlow, A. (2014). *Threshold Concepts: Impacts on Teaching and Learning at Tertiary Level.* Teaching and Learning Research Initiative.

Prince, M. J., Felder, R. M., (2006). Inductive Teaching and Learning Methods:

Definitions, Comparisons, and Research Bases. *Journal of Engineering Education*, 123-138.

Priyaadharshini, M., & Sundaram, B. V. (2018). Evaluation of higher-order thinking skills using learning style in an undergraduate engineering in flipped classroom. *Computer Applied Engineering Education*, 1-18.

Rosenshine, B., & Meister, C., (1994). Reciprocal Teaching: A Review of the Research. *Review of Educational Research*, *64*(4), 479-53.

Schunn, C. D., & Silk, E. M. (2011). Learning theories for engineering and technology education. *Fostering Human Development through Engineering and Technology Education*, 3–18.

Stump, G. S., Hilpert, J. C, Husman, J., Chung, W., Kim, W. (2011). Collaborative Learning in Engineering Students: Gender and Achievement. *Journal of Engineering Education*, *100*(3), 457-497.

Chapter 3

Nurturing Soft Skills through Project Oriented Problem Based Learning (PoPBL): Corporate Organisation Engagement

Rahimah Jamaluddin

Keywords: project oriented problem based learning, community engagement, clothing management, home economics education

Introduction

Creating and producing excellent human capital equipped with a variety of skills including cognitive, psychomotor and soft skills are crucial towards achieving the developed country status by 2020. To address the issues of unemployment among graduates due to the absence of soft skills and employability skills, these three aspects need to be addressed to enhance students' capabilities as they move into the work environment.

Soft skills involve dealing with others (interpersonal skills) and organising oneself (intrapersonal skills), enabling individuals to reach their maximum performance (Pazhani & Shanmuga, 2012). Soft skills can be nurtured through active involvement of learners in the learning environment. Problem Based Learning (PBL) and Project Oriented Problem Based Learning (PoPBL) are identified as effective approaches to promoting students' soft skills (Sumarti, & Sudarmin, 2015; Fatmawati & Hafizoah, 2017; Noraini & Shahliza, 2013). PoPBL is a teaching learning method that promotes deeper learning by doing, and exposes students to experiential learning through three inter-related components: i) problems, ii) projects and iii) team work (Du, & Jensen, 2010).

To become a teacher, an individual needs to master a variety of soft skills as well as be prepared with the pedagogical and subject knowledge required for teaching. In line with the development of 21st century learning, which focuses on creating an atmosphere that is "more dynamic, interesting and conducive to instil learning" (Ministry of Education Malaysia, 2017), a suitable teaching and learning strategy that actively involves students in their learning, needs to be utilised. Implementation of project oriented problem based learning by engaging communities as part of the learning process is seen to be very significant (Rahimah, Mass Hareeza, Suhaida & Arasinah, 2019).

Project Oriented Problem Based Learning (PoPBL)

Project Oriented Problem Based Learning (PoPBL) refers to a teaching method that enable students to acquire and apply knowledge, skills and experience in real- life situations. PoPBL shares similar elements with problem-based learning, in which learning content is intentionally combined with particular skills and values as part of a planned and scaffold process to solve a life-relevant problem (Du Toit, Havenga, & Van der Walt, 2016; Habók & Nagy, 2016). Meaningful learning will occur when the subject of learning is relevant to an individual student's interests, and self-initiated learning will be more lasting and comprehensive to the students. Three key features of PoPBL are student-centered, self-directed and collaborative learning that focus on real world issues and may involve stakeholder engagement (Brundiers & Wiek, 2011).

In PoPBL, students fulfil an active and participatory role in their own learning process, and the lecturer facilitates and guides this learning process, rather than being the giver of knowledge (Bell, 2010). Utilizing PoBL as the main teaching/learning strategy holds several advantages for students, including real-life problem solving (Bell, 2010; Swafford & Dainty, 2010), students learn to value the opinions of others through collaborative work (Mitchell, Foulger, Wetzel, & Rathkey, 2009), and students develop important 21st century skills, such as communication skills, planning skills, higher-order thinking, critical thinking and lifelong learning (Bell, 2010; Buck Institute for Education, 2012; Roessingh & Chambers, 2011). Research done by Noraini & Shahliza (2013) reported that implementation of PoPBL successfully improved their student soft skills such as communication between teammates (Pazhani, & Shanmuga, 2012; Sumarti, & Sudarmin, 2015) and planning, as well as their students' technical skills in analysing real world problems, designing the structured solutions and developing products. In accordance with the study, Colakoglu and Sally (2013) indicated that PoPBL can increase students' motivation and mastery of the subject matter, and enhance the critical thinking skills that will enable students to think outside the box.

One Team One Spirit Runway Project and Corporate Organisation Engagement

One Team One Spirit runway project is designed specifically for final year students who enrolled in the Clothing Management III (STE4201) course in the 1st semester 2018/2019. Based on the course outline, students are required to sew corporate wear as one of the practical projects. The learning outcome of the course emphasis on cognitive (C), psychomotor (P), affective (A) and entrepreneurial skills (KK) are listed:

At the end of the course, student can:

1) evaluate an appropriate fashion for particular groups (C5)
2) design and sew fashion clothing (P6)

3) demonstrate the attitude and interest of professional work ethic in making clothes (A5)
4) identify business opportunities in the field of clothing (KK)

To achieve the learning outcome, this project was designed uniquely by considering the need to allow the students to experience the process of designing and producing corporate wear through PoPBL. Nine organisations in UPM were invited to contribute to the success of this project as clients to the students'. Organisations in UPM were chosen by the lecturer because it is easier and convenient for the students to meet their clients. Furthermore, this selection was made due to time constraint and students' transportation cost. These organisations consisted of Centre for Academic Development (CADe), Wazan, Family, Adolescent and Child Research Centre of Excellence (FACE), Entrepreneurial Development and Graduate Marketability (CEM), KUPUTRA Kindergarten, UPM Women's Association (PERMATA), Putra Future Classroom (PFC), Co-curriculum and Student Development Centre and UPM Association of Administrative Officers (PPUPM).

This project involved a total of 38 students, comprising nine groups. Members of each group had to design a different corporate wear for the organisation. Each group had to discuss with the organisation representative in terms of theme, colour, material of fabric as well as the style of the corporate wear. This project took five weeks to complete. At the end of the project, a fashion show was held on 22nd Dec 2018 at the Chancellor College Hall. Apart from corporate organisations, this PoPBL project also involved fashion industry experts to evaluate the students' work. Among the experts were Operations Manager from Syarikat Jasa A.S Sdn Bhd, General Manager of Saling Erti Sdn Bhd and a fashion lecturer from Sepang Vocational College.

The aims of this PoPBL project are to enable students to master their practical skills in designing and sewing corporate wear as well as to develop soft skills. At the same time, this initiative was taken in order to provide students the opportunity to gain knowledge in marketing products, nurture entrepreneurial values, and obtain funding to purchase project materials such as fabrics and accessories. Another consideration made in this project was engaging the corporate organisations as clients to the students so that they can experience working and dealing with clients in a real-life situation. Therefore, the purpose of this PoPBL project is to explore students' learning experiences in carrying out the PoPBL runway project and to identify the soft skills that contributed to them most.

Planning and Structuring Project Oriented Problem Based Learning with Corporate Organisation Engagement

The preferred framework for the planning and scaffolding of PoPBL in this project is shown in Figure 1. To ensure that all PoBL requirements are met, and to get the most benefit from PoPBL as a teaching and learning strategy, a comprehensive plan needs to be made. The implementation of this project

takes into account all the elements of soft skills that have been identified as necessary attributes that IPT graduates need to master. Soft skill elements that are embedded in this project are communication skills, critical thinking and problem solving skills, teamwork skills, entrepreneurial skills, moral and professional ethics and leadership skills. Description of these soft skills are as shown in Table 1.

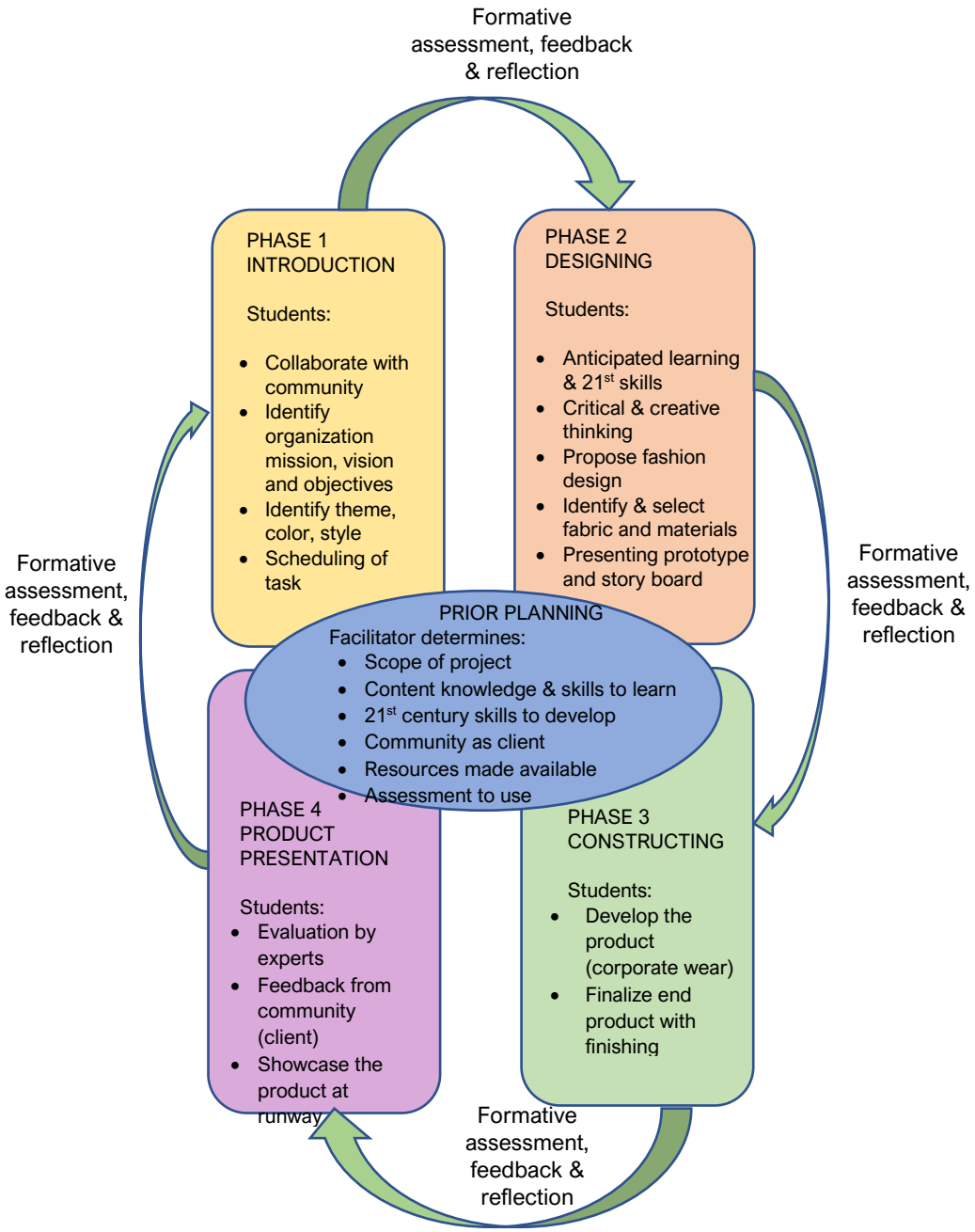

Figure 1: *The preferred scaffolding/framework of runway PoPBL project with community engagement*

Table 1: *Description of soft skills embed in runway PoPBL Project*

Soft skills	Description of activities
Communication	Students carry out activities such as group discussions, collaboration and discussions with clients, individual pitching, fashion design proposal presentation and Q&A with the judges (panel of experts in fashion industry).
Critical thinking and problem solving	Students are required to think critically during brainstorming sessions to generate new ideas on styling, design, colour, pattern, and fabric selection. Problem solving occurs during presentation of the fashion design proposal in order to fulfill the needs and requirement of the client.
Teamwork	Throughout the PoPBL, most activities require students to work in teams. For example, before the proposal presentation session students need to provide story boards, technical drawings, and have discussions with group members about color selection, fabrics, styling and design.
Entrepreneurship	The uniqueness of this PoPBL involving the community as client successfully stimulated the interest and aspirations of students to venture into entrepreneurship. Collaboration between students and the community has produced attractive fashion designs and opened the students' minds to entrepreneurship as a career option.
Professional ethics and moral values	Students should practice professional ethics and morals throughout PoPBL implementation as preparation and training for the real work environment.
Leadership	Team work is one of the main criteria of student assessment. Each member of the group has their respective roles and responsibilities. This can nurture leadership skills among students as they work to solve the problems or conflicts that arise during the task.

Project Evaluation

In this PoPBL project, proper planning has been made to ensure the evaluation is parallel with course learning outcomes. Score from this PoPBL project will contribute 30% to the STE4201 course work. Details of STE4201 course assessment is shown in Table 2. In this particular project, evaluation covers various aspects, not just relying on the fashion product itself but includes an evaluation of the process throughout the duration of the project. The evaluation used in this PoPBL project is shown in Table 3.

Table 2: *Description of STE4201 course assessment*

	Marks	Percentage
Final examination	60	30%
Total	60	30%
Course work		
Test 1	30	10%
Corporate wear	100	30%
Vest	35	10%
Kebaya	35	10%
Final sewing test	30	10%
Total	**230**	**70%**

Table 3: *Description of PoPBL runway project evaluation*

Evaluation criteria	Marks
Fashion design proposal (story board & technical drawing)	20
Team work	20
Product evaluation (Individual pitching)	20
Product evaluation (group presentation)	20
Fashion show	20
Total	**100/30%**

Several measurements were used to evaluate students' work in PoPBL runway project such as matrix rubrics, critiques and feedback forms. Matrix rubrics are used in this project to measure student's proposal and their end product of corporate wear. Critiques from judges and lecturers were given to improve students' work. Students had to defend their designs and in certain cases make adjustments to their corporate wear. Feedback forms were distributed to the

students by using google form at the end of the project to get students' reflection on their learning experiences.

Methodology

Descriptive qualitative survey was used to explore student's learning experience in carrying out this PoPBL runway project. This project involved 38 students who were enrolled in STE4201 Clothing Management III, in the 1st semester 2018/2019. Interviews were conducted after students completed their presentation with the judges and google forms were distributed to students at week fifteen. Open-ended questions were asked in order to get student's learning experience in four main activities namely designing organisation corporate wear, dealing with the organisation representative, evaluation by the experts and organising corporate wear runway. Besides that, students are required to list down soft skills that they gained from this project. Data collected were then analysed using Atlas.ti software.

Findings

Student Reflection on Learning Experience

Most of the students gave a positive review on their learning experience and they were very happy to have the opportunity to experience learning through PoPBL with corporate organisation collaboration. Most of them agreed that this PoPBL project gave them a meaningful learning experience because they had to deal with clients and merchants in real-life situation. It was a memorable experience as stated by the students:

> *"learn how to deal with the organisation in terms of formal procedure working with them, get funding from them and proposing our ideas on corporate wear design"* (R12)
>
> *"an unforgettable experience convincing clients with our group designs that are customised by their organisation"* (R1)
>
> *"trying to get sponsorship from the organisation and we get it RM200"* (R10)
>
> *"learn how to bargain with merchants for getting exclusive fabric with cheaper prices which we can afford to buy"* (R5)

Apart from dealing with clients and merchants, expert evaluation also gave students a meaningful lesson. The critiques and comments given by the fashion experts not only enhanced students' soft skills in communication and presentation but also provided important feedback from the perspective of

industry. This activity increased students' knowledge about commercialisation aspects, quality of sewing, creativity and others.

> *"We didn't expect the assessor will notice that our stitches didn't fit the standard size. This experience taught us to work professionally"* (R5)

> *"can enhance my knowledge on fashion, the critique given by assessor enhance my motivation"* (R16)

> *"The assessments given to me and my friends helped us to improve the quality of our stitches"* (R33)

> *"Positive comments can inspire me to be more successful in this industry. Learn from mistakes"* (R24)

> *"getting new knowledge examples… should consider the aspects of mass production. So the design should be simple but elegant"* (R21)

Majority of the students enjoyed doing this PoPBL project. Students said that:

> *"I feel happy doing this activity as I had the opportunity to get to know the organizations at UPM, work with them, conduct research on corporate wear"* (R8)

> *"Fun, new experience and excited" (R10)*

> *"So much fun ... it can help me be more creative, I can also upgrade my skills in designing corporate wear"* (R3)

> *"It's fun to show off your own designs to the public"* (R5)

Soft Skills

This PoPBL project successfully instilled various soft skills to the students. The main soft skills that students learned was critical thinking and problem solving. According to the students, they had difficulties in proposing corporate wear design. Since they had to propose a different design for each member and different design for the other groups. So they had to think creatively in order to solve the problem. They needed to do extra homework by searching information about corporate wear, the style, the principle and concept of it. After doing all that, then only they could propose a few acceptable designs as requested by the organisation.

> *"I have to come up with different ideas with my other friends in producing impressive design"* (R20)

"learn to solve problems when the design and color of our team is initially not approved by the organisation. As a result, our team produces over 10 different designs and colors to present to the organisation's representatives" (R17)

"The challenge is to choose the right fabric, pattern and color for the selected organisation" (R5)

"I need to convince the clients with our group design by stating the advantages of the design" (R11)

"Learn how to produce different design from other team members by doing research on various such as internet, magazines, book etc" (R16)

Other than that, in the process of fabric cutting and sewing, some of the students made mistakes. They needed to think critically in order to overcome the problem and this was very challenging for them.

"I've made a mistake during the production, I mistakenly cut the fabric so the fabric was not enough and I had to change with other design" (R8)

"After I cut off the piece by accident, I learned how to cover the parts so that the clothes I made didn't look defective" (R17)

The second important soft skills that the students learned through this PoPBL project is communication. Two-way communication is needed especially when dealing with the clients and merchants. This project successfully taught them on how to communicate confidently and effectively.

"Improves my communication skills and enhances my self-confidence" (R1)

"Help me be more professional when we talk to the organizations representative" (R5)

"learn how to communicate with organizations and within team members effectively" (R4)

"Gives me confidence to speak more carefully and thoroughly" (R21)

"I was able to gain new experiences and improve my communication to become more prudently" (R15)

In doing this PoPBL project, students learned how to work in group, respect and help each other, cooperate and share ideas. These team work skills need

to exist in students' souls to ensure that the tasks given to them can be executed properly. This statement is clearly stated by the students as follows:

> *"This project enhanced my teamwork and share ideas"* (R10)

> *"we help each other in designing corporate wear, and brainstorm ideas to get suitable color, fabric and patterns"* (R15)

> *"should cooperate and be tolerant with group members and most importantly always be receptive to others opinion"* (R1)

> *"help each other and remind them to finish their work on time"* (R19)

Leadership is a skill that needs to be polished through experience. In this PoPBL project, each member of the group has their own role. For example, as group leader, treasurer, design coordinator and spokesperson to the group. By implementing this project, this leadership skill can be inculcated in them. They even have the responsibility to ensure their team can produce well designed corporate wear for their representative organisation.

> *"a great responsibility for me where I should be wise in making fair and acceptable decisions"* (R3)

> *"as a leader, I learn how to get team members work with each other. This is important because if there is no team work, then the process of completing the task becomes unpleasant and stressful"* (R12)

> *"learn to respect the value of patience, precision to complete this project"* (R14)

> *"teach me on how to become a good leader, listen to their problem and make a right decision"* (R7)

The most important skill that is expected to be acquired in this PoPBL project is entrepreneurship as stated in the learning outcomes. Entrepreneurship is a skill that needs to be learned through practical training. In line with Model of Entrepreneurship Learning by Gibb (2011), exposure to the entrepreneurial environment as pedagogy of teaching and learning can encourage students' interest and intention to venture into entrepreneurship. This can be proven by the student's statement as follows:

> *"I wish open my own boutique. I have also learned how to make a profit and loss in production of clothing"* (R1)

> *"This project opened my mind and expose me to the entrepreneurial world" (*R35)

"learn how to manage a product and gave me the opportunity to get involved in business" (R30)

Discussion and Conclusion

One Team One Spirit Runway Project has successfully achieved the course learning outcomes especially in designing and sewing fashion clothing for a particular group of people and identified business opportunities in the field of clothing (KK). This is evidenced by 38 corporate wear successfully showcased during the fashion show held at Chancellor College Hall, UPM. This indicates that community involvement in the context of teaching and learning can improve students' skills in designing fashion as well as nurture students' entrepreneurship interest, intention and competencies (Rahimah, Mass Hareeza, Suhaida & Arasinah, 2019). The implementation of this PoPBL runway project has successfully given them a meaningful learning experience.

Having skills or knowledge on fashion alone is not enough to allow students to be independent and stop looking for jobs. The implementation of this project is a great start for them to fall in love and venture into fashion entrepreneurship (Noorkartina, Hock-Eam, Norhafezah, & Jan-Jan, 2015). But students need support in the form of practical activities or hands-on work to enable them to acquire knowledge from their environment (Gibb, Syed Zamberi, 2012; Botha, 2010). Teaching and learning should not only rely on classroom learning alone but the instructor must be creative and involve much of the existing environment as possible in enhancing student cognitive, psychomotor and affective skills (Bell, 2010; Buck Institute for Education, 2012; Roessingh & Chambers, 2011). By providing a specific entrepreneurship learning environment with real experience and interaction with business clients, it can help students in developing their entrepreneurial skills (Syed Zamberi, 2012; Doğan, 2015; Norashidah, Norasmah, & Noraishah, 2009).

This PoPBL runway project provided the opportunity to put forward the ideas in designing corporate wear based on clients' needs. In addition to that, students were able to work and receive extensive exposure, support and direct guidance from industry experts as well as gaining countless benefits of soft skills (Blaszczynski & Green, 2012; Fatmawati & Hafizoah, 2017). The results of this study supports the Educational Transformation Plan (Higher Education, 2013-2025) which aims to produce more job creators rather than job seekers among university graduates. This program can also be a precursor to other universities to multiply such programmes in order to nurture students' soft skills as well as entrepreneurship interest among university students.

Suggestion

Since the program was carried out for only five weeks, so it was quite challenging for the students to complete the project. They had to complete the task in great hurry. This makes it difficult for students to find the right time to

meet with their organisation representatives. Therefore, it is recommended that allocation of more time need to be considered, to avoid students from feeling tormented. In addition, it is hoped that further studies be conducted to study the effectiveness of community engagement in improving students' soft skills, especially entrepreneurship. A comprehensive data collection by using mix quantitative and qualitative methods should be carried out as this action research involves only a small sample and data collection is carried out through a descriptive qualitative survey.

References

Bell, S. (2010). Project-based learning for the 21st century: skills for the future. *The Clearing House*, *83*, 39-43.

Botha, M. (2010). A project-based learning approach as a method of teaching entrepreneurship to a large group of undergraduate students in South Africa. *Education as Change*. *14*. 213-232. 10.1080/16823206.2010.522059.

Buck Institute for Education. (2012*). Introduction to project based learning*. Retrieved from http://www.bie.org/store/item/ pbl_handbook?sitelink= PBLHandbook& gclid= CM7Q2dHg7cCFbMbtAodaRgAAg

Blaszczynski, C. & Green, D. J. (2012). Effective strategies and activities for developing soft skills, part 1. *Journal of Applied Research for Business Instruction,* 1-7.

Brundiers, K., & Wiek, A. (2011). Educating students in real world sustainability research: Vision and implementation. *Innovative Higher Education*, *36*(2), 107-124.

Colakoglu, S. N., & Sally, A. S. (2013). The development of critical thinking skills through a service-learning oriented entrepreneurship course. *Journal of Entrepreneurship Education*, *16*(special issue), 115-124.

Chang, J., & Rieple, A. (2013). Assessing students' entrepreneurial skills development in live projects. *Journal of Small Business and Enterprise Development, 30*(1), 225-241.

Doğan, E. (2015). The effect of entrepreneurship education on entrepreneurial intentions of university students in Turkey. *Ekonometri ve Istatistik Sayi, 23*, 79-93.

Du, X., & Jensen, L. P. (2010). *Project-organised and problem-based learning [Electronical Version].* Retrieved Oktober 2018 from http://www.control.aau.dk/-lpj/POL/Kursusnavn.html

Du Toit, A., Havenga, M., & Van der Walt, M. (2016). Consumer Studies teacher students' affective experiences during project-based learning], *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie, 35*(1), a1362. http://dx.doi.org/10.4102/

Fatmawati Latada & Hafizoah Kassim. (2017). Problem-oriented project based learning (PoPBL): An initiative to encourage soft skills expansion among

students at a public university, *Journal of Global Business and Social Entrepreneurship (GBSE)*, *1*(3), 75-83.

Habók, A., & Nagy, J. (2016). In-service teachers' perceptions of project-based learning. *SpringerPlus, 5(*83). doi: 10.1186/s40064-016-1725-4.

Mitchell, S., Foulger, T. S., Wetzel, K., & Rathkey, C. (2009). The negotiated project approach: project-based learning without leaving the standards behind. *Early Childhood Educational Journal, 36*, 339—346.

Noraini Ibrahim & Shahliza Abd. Halim (2013). Implementation of Project-oriented problem-based learning (PoPBL) in introduction to programming course. *The 4th International Research Symposium on Problem-Based Learning 2013*, 279-288.

Norashidah Hashim, Norasmah Othman, & Noraishah Buang. (2009). Konsep kesediaan keusahawanan berdasarkan kajian kes usahawan Industri Kecil dan Sederhana (IKS) di Malaysia. *Jurnal Pendidikan Malaysia, 34*(1), 187-203.

Noorkartina, M., Hock-Eam, L., Norhafezah, Y., & Jan-Jan , S. (2015). Estimating the effect of entrepreneur education on graduates' intention to be entrepreneurs. *Education and Training, 57*(8/9), 874-890.

Pazhani, S. S, & Shanmuga T. (2012). Need for soft skills development towards managerial efficiency. *International Journal of Management Research and Review*, *2*(11), 1895-1901.

Rahimah, J., Mass Hareza, A., Suhaida, A., & Arasinah, K. (2019). Impact of fashion entrepreneurship programme on entrepreneurial interests, intention and competencies. *Journal of Technical Education and Training, 11*(1), 119-128.

Roessingh, H., & Chambers, W. (2011). Project-based learning and pedagogy in teacher preparation: Staking out the theoretical mid-ground. International *Journal of Teaching and Learning in higher education, 23*(1), 60—71.

Sumarti, S. S, & Sudarmin, W. (2015). Project based learning model development on buffer solution materials with soft skills entrepreneur oriented. *The International Journal of Engineering and Science*, *4*(3), 5-10.

Swafford, M. D., & Dainty, H. T. (2010). Learning environment: Respecting diversity and exceptionality. *National Standards for Teachers of Family and Consumer Sciences*, 205.

Syed Zamberi, A. (2012). The need for inclusion of entrepreneurship education in Malaysia lower and higher learning institutions. *Education and Training, 55*(2), 191-203.

Chapter 4

Implementing Community-Based Learning in Plant Science

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Keywords: community-based learning, plant science, challenges

Introduction

This chapter presents a case study on implementation of community-based learning (CBL) projects in the Department of Cell and Molecular Biology, Faculty of Biotechnology and Biomolecular Sciences (FBSB), Universiti Putra Malaysia (UPM). Driven by the need to meet the future demands of plant scientists, two projects were piloted in 2018 with an objective to pique student's interest in plant science through community engagement through undergraduate elective plant science courses at the department. One involved students preparing demonstration and interacting with secondary school students to help develop their understanding of genetically modified (GM) plants and in the other, students planted ornamental plants with bioremediation property and cleaned a river in a village.

CBL or service-learning can be described as an educational experience in which students engage in activities that meet community needs while at the same time promote greater understanding of the course content and development of the student as a whole (Bringe & Hatcher, 1996; Flecky, 2011). CBL models incorporate direct service-learning, community-based research and problem-based service learning (Mooney & Edwards, 2001; Dallimor, Rochefort & Simonelli, 2010). Instructors who have implemented the models have emphasised the significance of such learning environments across a variety of disciplines such as applied computer science (Fischer, Rohde & Wulf, 2007); medicine (Amalba, van Mook, Mogre & Scherpbier, 2016); occupational therapy and speech pathology (Jones, McAllister & Lyle, 2016) and education (Cooper, 2007). The studies suggest that CBL is associated with increases in interpersonnal skills, self-directed learning, active collaboration, civic responsibilities and improvements in academic development. In Malaysia, the concept of CBL is now taking its shape with the recent release of Malaysia Education Blueprint 2015-2025 whereby CBL was identified as one of the key strategies towards a more holistic and integrated curricular (Ministry of Education Malaysia, 2015). The Shift 1 which accommodates the CBL strategies (Ministry of Education Malaysia, 2015; p. E12) is as follows:

> *"Shift Number One: holistic, entrepreneurial and balanced graduates where every graduate will have the relevant disciplinary knowledge, skills, morality as well as appropriate*

behaviours, mindsets, cultural and civilisation literacy to advance them to a high level of personal wellbeing."

Ideally, studies in plant science should acquaint students with nature. However, the traditional, lecture-based curriculum confines everything in the classrooms and disconnect students from the outside world. The disconnection, combined with several other factors including greater preference for animal-related and medical degrees as well as disengagement from plant science at the school level may have contributed to the declining student numbers in plant science (Lavesly, Paxton, Collins, Baker & Knight, 2014). An experiential approach to course instruction is one of the promising means to engage a wide student audience with plant science (Spelt et al., 2009). Researchers recognises interest as a motivational factor that can be divided into two: situational and individual interest (Hidi & Renninger, 2006). In the present context, a relatively enduring predisposition to engage in certain activities is considered individual interest, for example students who are readily interested to learn about plant science since before joining the class. On the other hand, situational interest can be generated by specific environmental stimuli such as unusual sights or sound. The latter, which can be delivered through CBL, may evoke the development of life-long individual interest.

Conceptualisation and Planning Stage

In FBSB, all four undergraduate programmes: Cell and Molecular Biology, Biochemistry, Microbiology and Biotechnology have been implementing CBL as part of the curriculum. In most cases, the CBL initiatives for each programme were devised independently by the lecturers involved. There were also activities that involved students from other programmes, but more often than not, they missed the planning stage and only participate during the event day. Both CBL initiatives reported in this paper are part of a research project funded by UPM via "*Geran Insentif Penyelidikan untuk Pengajaran dan Pembelajaran (GIPP)*". For an inexperienced early-career lecturer, distilling the insights from relevant literature, and then producing a well-designed CBL module, can be a very intimidating task. What more if one has to work within a short period of time and be bound by the semester period.

When planning the CBL projects, we first determined that the selected modules were appropriate in terms of achieving their objectives in a community setting while at the same time adhering to the course outcomes. The CBL projects accounted for 15% to 30% of an entire course assessment, categorised under a continuous assessment. Despite having the research proposal written several months ahead, the actual conceptualisation and planning stage for a specific project in that particular semester only happened at the start of the semester. The projects were planned for elective plant science courses, where students can choose between a few other electives offered by the department in that semester. In this case, peer pressure rather than individual motivation is likely the main factor that informs a student's choice. The course also has to meet a minimum number of registered students before it can be offered.

For the first project (Activity A, Table 1), we chose to work with a familiar community, our department's adopted school, *Sekolah Menengah Kebangsaaan (SMK) Jalan 3* at *Bandar Baru Bangi*. Among the challenges faced at this stage were the difference between the school and university timetable, school's policy on student's involvement with extra-curricular activity, small number of undergraduate students registering for the elective course and unclear expectation due to lack of experience. As for the second project (Activity B, Table 1), it was part of a bigger project assisted by lecturers from the Department of Biochemistry and a good number of students took the elective course. However, we also faced some obstacles for this project as we cannot get approval from local authorities in time.

Table 1: *Summary of Community-Based Learning (CBL) Projects in Plant Science at the Department of Cell and Molecular Biology*

	Activity A	**Activity B**
Year, Semester and Course	Year 3, Semester 2 2018/2019, Applied Plant Molecular and Cell Biology	Year 3, Semester 1 2018/2019, Applied Plant Cell and Tissue Culture
Learning aims	To communicate an understanding of transgenic plants to secondary students through scientific poster and/or demonstration	To reduce pollution in a village through cleaning and planting trees with bioremediation property while enhancing awareness, knowledge and interest in nature preservation
Additional information	Students were assigned to group of 2 and directly involved in planning as well as conceptualization stage	Students were assigned to group of 6 or 7 and only involved during the outreach event
Assessment components	• Proposal presentation (group) • Poster and/or demonstration (group) • Reflective writing (individual e-portfolio)	• Proposal presentation (group) • Participation during outreach event (individual) • Report (group)
Percentage of CBL assessment	30%	15%
Student learning hours	18 contact hours and 20 hours of independent revision	6 contact hours and 10 hours of independent revision
Number of students	6	38

Critical Assessment of CBL Implementation

Since the main objective of the CBL activities is to pique the students' interest in the subject, we did not directly assess grades. Instead, we focus on the integral part which is students' reflective account and evaluation questionnaires that was done via Google Form. This type of assessment provides a rich source of data that can be used to evaluate the effectiveness of the CBL activities in piquing student's interest in plant science. For both activities, student's attendance was recorded at 100%, suggesting that both activities clearly engage the students. They were all very excited when initially presented with this type of project and eager to start. As for Activity A, the first test was replaced with proposal presentation that contributed 10% for CBL assessment, which makes them even more motivated. We can see that they are more interested in outdoor learning. Students who just did not engage much in the classroom suddenly gain confidence and willingly participate during outdoor learning session. Majority of them are satisfied with the CBL activities (Question 1, Table 2) except for one student who rated 3 for activity B;

> "In my opinion, I'm not really satisfied with the activity being done as we did not get the chance to set up the model in the river but still it was fun to help a little bit in cleaning the place. Just hoping people will realise how important it is to protect the environment ".

Table 2: *Student perception on CBL activities*

No.	Question	Response	
		Activity A	**Activity B**
1.	On a scale of 1 to 5 (1 being not very, 5 being very much), how satisfied were you with the event?	66.7% rated 5 33.3% rated 4	69.2% rated 5 26.9% rated 4 3.8% rated 3
2.	On a scale of 1 to 5 (1 being not very, 5 being very much), how relevant and helpful do you think it was for helping you to understand more about the plant science?	83.3% rated 5 16.7% rated 4	69.2% rated 5 26.9% rated 4 3.8% rated 2

The activities were also proved to be relevant in helping the students to understand more about plant science with greater number of students rated 5 and 4 for Question 2 (Table 2). The same student who rated 3 for Question 1 rated 2 for Question 2. As pointed out earlier, the ability to understand a subject and relate it to their daily lives will spark a life-long interest. According to Hidi and Renninnger (2006); knowledge, positive emotion, and personal value are the three factors that contribute to the development of interest. An increase in

knowledge may positively affect individuals as they feel more competent engaging in any given task. Researches have shown that both individual and situational interest can play a powerful role in determining future endeavour (Harackiewicz and Hulleman, 2010).

In accordance with the positive responses in Table 2, the students were mostly happy with the activities, even though it is obvious that some of them were upset with the running of the programme especially for Activity B (Table 3). Their appreciation of how their subject is applied in real-world situations is evident.

Table 3: *Student's feedback* on CBL activities*

Activity A
Execute more programme like this.
Time management.
Require more AJK to handle the programme.
Nothing much. Everything was perfect.
Need better timing next time.
The activity was not clear. Problem 1) Less teamwork. 2) Last minute planning.
Activity B
No, all good.
There should be variety of activities.
Should do this kind of activity in other courses as well.
I think the activity is quite good for us to relate plant science with our environment, but to cater for the problem with floating material, plan B should be in place in order for students to not only grab rubbish to clean the river.
The event was really good and inspiring. However, the river could get even more contaminated than it already is since it took so long to get approval from JPS for this activity.
Such a great opportunity to be involved in a great event like this.
This is such a good event, even though we faced an issue regarding the approval to put the floating material into the river, we still managed to do something to help the villagers. Personally, I did not face any problem during the event and everything went smoothly. I'm one of the students who help building the floating material and along the way, I learnt a lot of things and it was such a great experience. The postgraduate students involved in this project were really good and smart.
Maybe we can make a trip to a crop plantation and livestock farm in the village to capture nice pictures and lastly we can give some money or gifts as an appreciation to the villagers.
I am happy and did enjoyed the programme very much.
I hope later on we can run the programme as planned since there were so many activities that cannot be carried out this time due to miscommunication.

The activities were quite good for us as we are exposed to the community and taught how to communicate with them.

I am feeling very happy and satisfied that I was able to help the villagers. Also, I'm happy for the opportunity to join this type of community work. I learnt a lot of new things. I hope can apply them in my life.

I had so much fun during this event.

I think, the programme is overall okay.

I think it was a good activity and it really helps us to know more and learn how protect the nature. However, there is a room for improvement where every students should be allowed to participate in building the floating material so that we all get the chance to learn.

I was quite disappointed that we were unable to do certain activities on that day because of the issue with private authority and other stuff. Hopefully this can be improved in the future.

A few students were complaining about the time required for CBL activities, mainly for Activity A (Table 3). The problem with time management is associated with lack of planning and a rigid schedule, as mentioned earlier. We also acknowledged that the students had to deal with significant workloads at the same time, from other courses or from college activities. Even though the average learning hours required for each activity are appropriate, it can easily become excessive when combined with other activities. When it comes to reflective writing assignment for Activity A, difficulties arise in relation to the level of critical thinking and self-awareness since the students were generally not experienced in reflection on personal experiences. This may also influenced by the less positive attitudes toward academic writing as usually observed in non-native English speakers (Bustamante and Eom, 2017).

Potential Challenges Associated with Adoption of CBL

It is crucial to clearly understand what CBL is and the related aims at both a course and, if relevant, departmental level before implementing this teaching and learning approach, especially in an unfamiliar environment. Since CBL is largely a curricular endeavour which requires a significant amount of time and effort, community and students should mutually benefit from the CBL experience. Students' attitude towards outdoor learning might also influence the initial implementation stage as some might be reluctant to work in group or just not interested. Luckily for both CBL projects reported here, we did not face any problems with initial apprehension or negativity from the students. Depending on the complexity of the proposed activity, the planning process, which is often the most challenging, may take a few months to streamline all the concepts, partners, modules, learning activities and course evaluation (Gonzales, 2014; Bedri, Frein and Dowling, 2017). It would be helpful to have Service Learning Committee at the faculty level to make recommendations

regarding requirements for courses, students and community, as suggested by Bringle and Hatcher (1996) in the Comprehensive Action Plan for Service Learning model. Properly planned activity will likely to result in high level of satisfaction for both students and community involved. While involvement in CBL is a very rewarding experience, significant time commitment from student cannot go unnoticed especially in the early stage. We might have a grand proposal in mind but forgot to take into account their workloads for the semester. Maybe students can be made aware of potential difficulties which may arise during CBL projects through an induction period (McDonnel, Ennis and Shoemaker, 2011; Bedri, Frein and Dowling, 2017), especially on the time management and conflicts to avoid such disappointments due to overwhelming expectation. Considering all the potential challenges including a few that have been discussed in this paper, it is important to understand the factors that motivate and deter the use of CBL to ensure this engagement movement continue to flourish.

Conclusion

The pedagogy of CBL offers great potential for benefiting student's academic and personal skills. This powerful learning design can also stimulate student's interest in specific subject. Embarking on this journey with little to none experience in handling CBL, can be overwhelming for the lecturers and also the students. In this paper, we have discussed some of the challenges related to implementation of CBL in plant science based on two case studies. Even though what we presented here are just a prelude, we can conclude that the success of a CBL experience relies on a number of factors: meticulous planning, effective management of project activities and effective assessment. All the factors have to be taken in careful consideration by academics who are interested in implementing a CBL project.

References

Ainley, M., Hidi, S. & Berndorf, D. (2002). Interest, learning and the psychological processes that mediate their relationship. *Journal of Educational Psychology.* 94(3), 545-561.

Amalba A, van Mook W.N.K.A., Mogre V. & Scherpbier, A.J.J.A. (2016) The perceived usefulness of community based education and service (COBES) regarding students' rural workplace choices. *BMC Medical Edu*. 16, 130

Bedri, Z., de Frein, R. & Dowling, G. (2017) Community-based learning: A primer. *Irish Journal of Academic Practice*. *6*(1), 1-26

Bringle, R.G. & Hatcher, J.A. (1996) Implementing service learning in higher education. *Journal of Higher Education*, *67*(2), 221-239.

Bustamante, A. & Eom, M. (2017) Linguistically diverse students' attitudes towards writing in English. *Texas Journal of Literacy Education*, *5*(1), 44-56

Cooper JE (2007) Strengthening the case for community-based learning in teacher education. *J Teacher Edu. 58*, 245-255

Dallimore, E., Rochefort, D., & Simonelli, K. (2010) Community-based learning and research. In C Wehlburg (Eds.), *New Directions for Teaching and Learning* (pp. 15-22). San Francisco, CA: Wiley Publishers.

Fishcer, G., Rohde, M., Wulf, V. (2007) Community-based learning: The core competency of residential, research-based universities. *Intl J Computer-Supported Collab Learning*. *2*, 9-40

Flecky, K. (2011) Foundations of Service learning. In Flecky, K. and Gitlow, L. (eds.). *Service learning in occupational therapy education*. Jones and Bartlett.

Gonzales, L.C. (2014) Teaching plant science in school and community settings. In Quave, C.L. (Ed.), Innovative strategies for teaching in the plant sciences (pp. 161-185) Springer Science + Busines Media New York

Harackiewicz, J.M. & Hulleman, C.S. (2010) The importance of interest: The role of achievement goals and task values in promoting the development of interest. Social and Personality Psychology Compass, 4(1): 42-52

Hidi, S. & Renninger, K.A. (2006) The four phase model of interest development. Educational Psychologist, 41(2):111-127.

Jones D, McAllister L, Lyle D (2016) Community-based service-learning: a rural Australian perspective on student and academic outcomes of participation. Intl J Res Service-Learning Community Engagement 4: 181-197

Lavesly, A., Paxton, S., Collins, R., Baker, A. & Knight, C. (2014) Engaging students with plant science: the Plant Science TREE. New Pyhtologist, 203: 1041-1048

Ministry of Education Malaysia (2015) Malaysia Education Blueprint 2015-2025 (Higher Education) pp 1-15. Putrajaya, Malaysia.

McDonnell, C.M., Ennis, P. & Shoemaker, L. (2011) Now for the science bit: Implementing community-based learning in chemistry. Education + Training. 53(2/3): 218-236

Mooney, L. and Edwards, B. (2001) Experiential learning in sociology: Service learning and other community-based learning initiatives. Teaching Sociology, 29: 181-194

Spelt, E.J.H., Biemans, J.A., Tobi, H., Luning, P.A. & Mulder, M. (2009) Teaching and learning in interdisciplinary higher education: A systematic review. Educ. Psychol. Rev. 21(4):365–378.

Chapter 5

Getting to Know the Scholarship of Teaching and Learning: A Typology from Reflections of an Academic's Teaching Journey

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Keywords: self-reflections, autoethnography

Introduction

Teaching involves the exchange of information between an instructor and his/her students. Research studies have emphasised on the importance of instructor's presence in learning by the concept of *talaqqi*, which means, learning happens through face-to-face instructions between a teacher and a learner (Mustafa & Basri, 2014; Abd Rahim, Yakob & Abd. Rahman, 2016; Yusof, Razali, Omar, Abdelgelil & Hamzah, 2018), and teachers are there to verify their students' comprehension as well as to rectify their mistakes in learning.

Academician have different experiences, challenges and struggles in their teaching journey. It is oftentimes through face-to-face interaction between a teacher and his/her students that the teacher understood his/her students' learning obstacles, and made reflections and improvements to his/her current teaching practices, so that the quality of learning can be improved (Swart, Luwes, Olwagen, Greyling & Korff, 2016). Hatch (2006) had highlighted the fact that teaching is a lonely journey, as teachers seldom have the opportunity to share their success stories with others. He recognised the importance of making teachers' profession public, so that it can foster collaboration and camaraderie among communities of practice, known as the scholarship of teaching and learning (SoTL).

The practice of SoTL has dated back as far as 30 years ago. Cross (1986) had coined the term Classroom Researcher, in reference to college teachers, in which she believed plays a vital role in optimising student learning in higher education. This practice not only benefits the instructors and learners, but also broadens the understanding about learning, and experiences and experiments in teaching. Today, SoTL has been a more commonly used term for classroom research. It brings a broader meaning by which instructors consciously reflect on their teaching goals and pedagogies as a means to build a supportive student learning environment, in a spiralling process, to refine and explore new ways of efficient teaching (McKinney, 2007).

Shulman (2006) explained the role of SoTL and how one can embark on such journey, as following:

> *"Our interest in engaging in such work was summarised by three P's, our professional interest, our pragmatic responsibilities, and the pressures of policy. Scholarship of teaching and learning supports our individual and professional roles, our practical responsibilities to our students and our institutions, and our social and political obligations to those that support and take responsibility for higher education. We should be making all three journeys and we need a really good horse"* (Shulman, 2000, p. 6).

Perhaps, it is worth noting from this quote that SoTL is a journey that involves individual and communal efforts. This is incongruent with Cross (1996) who vouched that classroom research provides a stimulus to communities who shared the same mission, which is *to teach*. It should not be a lonely journey, but a continuous effort of networking with other academics and support systems to make the journey possible. However, as the saying goes, a journey of a thousand mile begins with a single step, each academic must have his/her commencement point where he/she begins his/her SoTL journey. This study henceforth aims to answer the question: How does the journey in finding the scholarship of teaching and learning look like?

These vignettes will foreground the findings of this paper.

Vignettes

> *My journey as a senior lecturer officially started in mid 2014. Back then, I was enthusiastic and even dreamt of having a utopian classroom. After a long study leave, it was finally time for me to give back to the university. Coming from a family of teachers, I felt that I have always have the passion and grit as a teacher. Thus, teaching is not something unfamiliar to me. At that time, however, I do not know what "scholarship of teaching and learning" (SOTL) is.*
>
> *The first plunge…the Olympic pool…*
>
> *The semester commenced. I was assigned to a group of students for the course Educational Technology. This is a compulsory course for every programme at the Faculty of Educational Studies, henceforth, I know that I will be teaching different group of students every semester. For my first class, most of the students were male and they were boisterous. They were loud and vocal, and could not pay much attention at my teaching. Classroom management was tough, students came late to class, absent rates were high.*

Soon, I felt tired and frustrated and it was not even half way into the semester. Each time I got to class, I always had this thinking at the back of my head, "Will my teaching impact them in any way?" but at the same time, I felt like a loser. I looked up on the Internet for some activities to try in the classroom, but when I tried those activities, the results were not promising. I was not able to transform the atmosphere of the classroom.

My first semester of teaching ended with me feeling hopeless and beaten up. My hopes and dreams about the utopian classroom were shattered. Although I was given several words of encouragements by my colleagues, I felt that it was an overwhelming experience for me. It took me four months to realise that enthusiasm alone did not suffice. I may be compassionate, but my strategies were weak. Perhaps, I did not even have a strategy in teaching?

Reality sinks in…

When I realised that I needed to have more than just the passion to teach, I started to ask myself several questions. "Do I really know them?" "Do I know myself and my capabilities?" I need to know who my students are – what do they like, what activities would attract them, how can I get their attention and interests? I need to upgrade my capacities – what can I do, what can't I do and what should I do about it, how can I become more competent in teaching, what are the current pedagogical trends that I can adopt? I then realised that there was a generation gap between my students and I. These questions became the pre-cursors to my instructional design. They guided me in designing my teaching, and they continue to appear recursively throughout the design process.

Realising the generation gap, I started picking up some pedagogies that I presume would work in the digital age, and one of them was gamification. Drawing from Vygotsky's school of thought that playing is a part of learning, I presume that this pedagogy would work both for my students and I, with the aim to let my students experience meaningful learning and achieve the learning outcomes at the same time. Apparently, this pedagogy worked! I started to get the satisfaction in teaching, and my students have shown tremendous interest in learning. This built up my motivation and affirmed my passion in teaching.

New spirit…the splashing pool…

Over the years, I became more interested to find out and try several approaches in teaching. I scoured several teaching materials online and attended several Continuous Professional Development (CPD) courses to improve my teaching. Each topic that I will be teaching every week was carefully planned and I made sure that there must be at least one student-centred activity during each lesson. I kept thinking of ways to keep my students occupied and become active learners in classroom. Before I realized it, I have become addicted and invested a lot of time and effort (and even money!) in trying to implement new teaching methods.

After a couple of weeks, I thought I should get my students' feedbacks to my approach in teaching. Although I felt that my teaching has been relatively better compared to my first semester, I wanted to make sure that my students felt the same way too. I collected their feedbacks through questionnaires and interviews - with the hope to write an action research paper on my approach in teaching.

My SoTL journey took flight…

I started to write about my quest in trying to gamify my instruction and submitted the paper to a conference workshop for early career academics. During the workshop, I was paired with a mentor who was currently an adjunct professor at Carnegie Mellon University. I maintained my contact with her and we communicated regularly. My first paper on SoTL was later indexed in Scopus a couple of months after the conference workshop. I was invited as a facilitator for a CPD course for new academics to share my SoTL journey, with the hope that they too, can better understand and navigate their own journey as a new academic.

Since then, most of my papers that I wrote were related to SoTL. I secured two SoTL-related grants which was the Grant for Initiatives in Teaching and Learning endowed by the Center for Academic Development (CADe), UPM. CADe encouraged me to participate in conferences and innovation competitions in teaching and learning by providing funds. Through the competitions, my research studies in SoTL have won several medals at national and international level.

I came to realise that my journey as an academic was not lonely after all. It was through my participations in conferences and competitions that I met with alike-minded people, from whom I was able to continuously upgrade my

capacities as an academic and in the scholarship of teaching and learning.

Methodology

An authoethnographic approach is adopted in this study as a means to explicitly understand the self (Ellis, 2004), which in this study, is myself; as a means to connect to a wider social and cultural context. This method is deemed useful especially for SoTL which involves several processes of reflections, discerning, evaluating and crystallising (Swart et al., 2016); and juxtaposing them with other people's experiences. By using this method, I hope to be able to promote self-reflection, understanding of self and others, and qualitative inquiry – so that I can make connection with others in various disciplines.

Data were collected through personal journals that included self-reflections and recalling past experiences, feelings and thoughts. These data were coded – a process which involved several "shop talking" (Saldana, 2016, p. 231) with my mentor as a means to clarify emergent ideas and producing fresh insights about the data. Memos and memos over memos were written to build up understanding and explicate the elements of SoTL.

Results and Findings

A grounded theory approach was used as the analysis technique to categorise, sort and build the findings into a typology of processes involved in the journey of SoTL. The typologies are (i) wandering, (ii) scrutinising emerging phenomenon, (iii) patching up, and (v) disseminating. This typology is recursive and works in a loop that is illustrated in Figure 1 at the end of these elaborations.

(1) Wandering

Oftentimes, a teacher does not realise that he/she is already involved in SoTL. At this stage, the teacher starts with initial realisation that there is "trouble" in teaching. He/she is constantly looking for, and choosing the right method to generally address the "trouble." His/her aim is focused on the "trouble" that he/she is currently facing in the classroom, and how he/she can take the "trouble" out of the way. It is not really clear what the "trouble" is and what must be corrected. This stage involves several trial-and-errors in teaching methods by the teacher.

(2) Scrutinising Emerging Phenomenon

The teacher later realizes that several trial-and-errors have not worked in the classroom. If they do, very minimum improvement in classroom teaching is

observed even though a multitude of initial efforts have been done. At this stage, the teacher starts to scrutinise each "trouble" in the classroom (including students' learning obstacles, the teacher's teaching methods, the atmosphere and the like) and single out each phenomenon that emerged the "trouble." He/she later is able to identify and choose the "trouble" that needs the most attention and priority. The teacher now has a clearer vision in addressing the "trouble" and starts to look for specific "aid" for the "trouble."

(3) Patching Up

The teacher is able to prescribe the "aid" for each "trouble," hence the patching up stage may have several outputs. The teacher will start to attend CPD courses, talk to colleagues and look up for further information to improve him/herself and his/her classroom. He/she starts to mend and amend his/her current practices as a mean to transform learning in the classroom. Oftentimes, teaching revelation and innovation happen at this stage when the teacher tries new techniques on his/her students. Although some of the techniques may not work, the teacher builds resiliency and bounced back to address the "trouble" until it is solved. This stage (stage iii) and the previous stage (stage ii) are recursive in nature, as the teacher may revisit each stage, back and forth. The passion and spirit of SoTL has built up.

(4) Disseminating

The teacher gets sure that the new technique works for his/her students. Because of his/her passion has grown and several amount of time and effort has been invested in trying to improve his/her teaching, the teacher voluntarily carries out mini research to affirm that the new technique leaves an impact on his/her teaching. The teacher publicly shares his/her experience and findings with colleagues and communities of practice through discussions, conferences and the like and became advocates. Some teachers go to the extent of writing and publishing papers so that their practices and findings are shareable to a larger community who shares the same spirit and passion. This adds to the scholarliness of his/her teaching method. The typology of SoTL journey is illustrated in Figure 1.

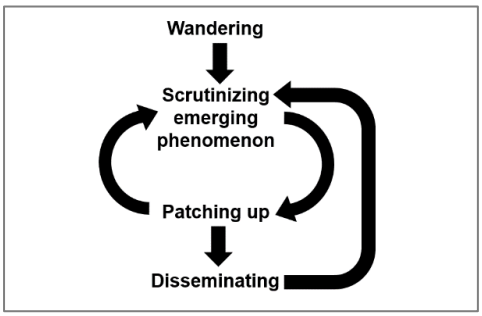

Figure 1: *Typology of the Scholarship of Teaching and Learning Journey*

From Figure 1, the SoTL journey can be explained by a teacher first *wandering* about his/her teaching in general. He/she later gets to the stage where he/she starts to *scrutinise emerging phenomenon* that occurs in his/her classroom and is able to identify each and every obstacle (like student's learning styles, teacher's pedagogy, and environment). He/she later *patches up* the loop holes that were identified in the previous stage, and starts to execute plans to improve his/her classroom. Innovation often happens at this stage. The second and third stage are recursive as the teacher often gets back and forth between scrutinising the problem and executing solutions as this involves trials-and-errors. The teacher then affirms his/her innovation by carrying out studies and sharing the results publicly to a larger community through discussions, conferences and publications. Cross (1996) asserted that a research conducted in a classroom can only be enhanced by sharing the methods and results with the community, namely learners and teaching colleagues. In addition, a teacher is entitled to a SoTL stamp once his work is published using a peer-reviewed procedure, rather than sharing it on social media sites (Gurung & Wilson, 2013). After the fourth stage, the teacher then moves on to tackle another problem in his/her classroom that was identified on the second stage, and the loop goes on. As Gurung and Wilson (2013) put it, the hallmark of a good teacher lies in his/her continuous engagement with SoTL.

Conclusion

In the attempt to answer the question, "How does the journey in finding the scholarship of teaching and learning look like?" this research used vignettes as a foreground and a jump board to gain an insight into an academic's SoTL journey. As a result, I came up with a typology of SoTL journey that may be adopted and adapted by academicians. These findings and the typology of the SoTL journey that emerged from this study cannot be generalised as the aim of a qualitative research is to understand a phenomenon in depth, but it can be used as a reference and guide for one's SoTL journey.

Additionally, as the spirit of autoethnography is to explore personal experience and connect to a wider cultural, social and context, I welcome any applications of the SoTL journey typology and I am interested to know if it can, in any way, help others embark on their SoTL journey. I invite all scholars and instructors who share the same spirit and passion in SoTL who have come across this paper to respond to it – either how they arrive to their own awareness of SoTL, how they use this typology in their practice of SoTL, how learners benefit their practice of this typology, or how it can enhance classroom research in any way – so that my SoTL journey will be a continuing one with great companionship along the way.

References

Abd Rahim, S. I., Yakob, M. A. & Abd. Rahman, F. (2016) Talaqqi Method in Teaching and Learning for the Preservation of Islamic Knowledge: Developing the Basic Criteria. In S.K. Ab. Manan et al. (Eds.), *Contemporary Issues and Development in the Global Halal Industry*, Springer Science+Business Media: Singapore.

Ellis, C. (2004). The ethnographic I: A methodological novel about autoethnography. Walnut Creek: AltaMira Press.

Cross, K. P. (1986, September). A proposal to improve teching or what "taking teaching seriously" should mean. *AAHE Bulletin, 39*(1), 9-14.

Cross, K. P. & Steadman, M. H. (1996). *Classroom research: Implementing the scholarship of teaching.* San Francisco: Jossey-Bass.

Gurung, R. A. R. & Wilson, J. H. (2013). Advancing Scholarly Research on Teaching and Learning. *Review of New Directions for Teaching and Learning,* (136), 1-6.

Hatch, T. (2006). Into the classroom: Developing the scholarship of teaching and learning. Jossey-Bass: San Francisco.

McKinney, K. (2007). Enhancing learning through the scholarship of teaching and learning. Bolton: Anker Publishing Company, Inc.

Mustafa, N. M. & Basri, M. (2014). A preliminary study on mobile quranic memorization for remote education learning using RFID technology: KUIS as a study case. *Proceeding of the Global Conference On Language Practice & Information Technology (GLIT 2014)*, 160-165.

Saldana, J. (2009). The coding manual for qualitative researchers. Sage: London.

Shulman, L. S. (2000). *From Minsk to Pinsk: Why a scholarship of teaching and learning?* Paper presented at the meeting for Carnegie Academy for the Scholarship of Teaching and Learning (CASTL), 1-6.

Swart, A. J., Luwes, N., Olwagen, L., Greyling, C. & Korff, C. (2016). Scholarship of teaching and learning: 'what the hell' are we getting ourselves into? *European Journal of Engineering Education*, 1-15.

Yusof, N. H., Razali, M. A. M., Omar, N., Abdelgelil, M. F. M., & Hamzah, M. S. (2018). Concept and Execution of Talaqqi and Musyafahah Method in Learning Al-Quran. *International Journal of Academic Research in Business and Social Sciences, 8*(11), 559–565.

Chapter 6

Challenges and Responses to the Scholarship of Teaching and Learning Paradigm among Clinical Lecturers

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Keywords: challenges, responses, clinical lecturers

Introduction

The way of how teaching and learning is now conducted is way different from how it was done a decade or two before. Gone are the days where the 'boring' one- or two-hours lectures by the earlier generations are welcomed. In this era of generation Y learners, teaching needs to be both 'enjoyable' and innovative. This presents a huge challenge for a clinician, who now has to teach in a new role as a clinical lecturer. The clinician has spent most of his/her time in consultation rooms or hospitals treating one to one patient but now rather scarily have to face a room full of knowledge-thirsty and tech-savvy young minds. This scenario also applies to medical students, who acquire digital knowledge at an alarming fast rate.

As imprinted in the latest Education blueprint, innovative teaching is being outlined as one of the strategies to enhance the teaching methods in order to improve learning (Ministry of Education Malaysia, 2015; 2017).This is to create a learning environment that is more dynamic and conducive so as to improve the overall quality of teaching and learning through a more practical based knowledge curriculum that will equip the young minds with skills to work in an ever challenging environment.

Based on the aforesaid context, a new clinical lecturer faces several challenges. Firstly, the clinician lecturer is in an unfamiliar teaching position. Secondly, they face Gen Y learners with different learning expectation who are extremely comfortable with the use of mobile apps and electronic methods of assessment (Eddy, 2011). Thirdly, they are expected to conduct research and publish in high impact journals while facing the increasing workload as a clinician, lecturer and researcher. Given the aforementioned context as clinical lecturers, this chapter will delve into some common challenges and seek possible solutions that may be employed to enhance SoTL.

Methodology

A thorough literature search was done, going back to literature as old as 30 years to explore the challenges that clinical lecturers face and to seek ways of overcoming these challenges. Relevant articles were searched from Google Scholar, Scopus and Ovid in January 2019 by the authors.

Results

Table 1 summarises some of the key articles and the corresponding findings on the possible challenges facing educators and related responses.

Table 1: *Summary of challenges and responses of key articles*

No	Article title	Author,year	Challenges	Solutions
1	Constructivism and troublesome knowledge. In Overcoming barriers to student understanding	Perkins, 2006	Knowledge that can have the following pitfalls as following: Inert knowledge, Ritual knowledge, Conceptually difficult, alien knowledge, tacit knowledge	-
2	Threshold capabilities: threshold concepts and knowledge capability linked through variation theory	Baillie, 2012	Tacit knowledge: slangs that are common sense to some and nonsense to others	-
3	Developing research competence to support evidence-based practice.	Burke, 2005	Anti-research culture	-
4	Barriers to evidence-based nursing: a focus group study.	Hannes,2007	Anti-research culture	-
5	The roles of Australian chairs in clinical nursing.	Dunn & Yates, 2000	A sharp divide between the role of educators,	-

			practitioners as well as researchers	
6	Train-the-trainers: implementing outcomes-based teaching and learning in Malaysian higher education	Biggs & Tang, 2011		In house teaching course (KAP course)
7	The Reflective Practitioner: How Professionals Think in Action	Schon, 1983		Active mentoring
8	Community of practice: a brief introduction. Learning in Doing	Wenger, 1998		Active mentoring
9	Communities of practice: learning, meaning, and identity	Wenger, 1990		Active mentoring
10	Learning to teach teachers	Hollins, 2014		Active mentoring
11	The challenges facing healthcare lecturers and professors to lead and promote a research-based culture for practice	Girot, 2010		Encouraging a research-based culture
12	Clinical academic medicine: the way forward	Pusey & Thakker, 2004		Overcoming pitfalls in performing research
13	Training in academic medicine.	Royal College of Physicians, 2000		Overcoming pitfalls in performing research
14	The tenure-track clinician scientist: A new career pathway to promote recruitment into clinical academic medicine.	Academy of Medical Sciences, 2000		Overcoming pitfalls in performing research

Based on the aforesaid information in Table 1, the challenges and possible responses are offered and described.

Challenges

1) The experienced clinician in an unfamiliar ground

   Many clinical lecturers have spent most of their time in treating and managing all kind of medical cases, from non-urgent to urgent and even life-threatening conditions in clinics or hospital that are equipped to handle such cases. Now far away from all that chaos, they find themselves in a classroom faced with often blank stare and eager young minds that cannot wait to acquire new knowledge while often offering a critical feedback of the quality of teaching received.

   This is in addition with the need to use innovative teaching methods and participate in many curriculum committees and employing various methods of assessment. This is way different from what the clinicians have done do far in their career i.e. managing patients through their physical and psychosocial medical problems.

   As noted in previous literature, further knowledge transfer, teaching or learning can be a difficult task to achieve. Knowledge can be a difficult concept to learn or teach because it can have one of the following pitfalls which include being conceptually difficult, inert, alien, tacit, or ritual (Perkins, 2006). These are defined as the following:

   (i) Inert knowledge— a knowledge that is only useful in concept, not in real life e.g. the world is round and the football is round;

   (ii) Ritual knowledge— a set of knowledge that is rather meaningless such as describing patient clinical examination findings in a template instead of presenting the real findings that is present which often annoys or upset the examiners in clinical examinations;

   (iii) Conceptually difficult— both the teachers and learners get confused with a relatively difficult concepts and interpret it wrongly, mixing it often with a wrong understanding of the subject matter such a difficult computed tomography (CT) scan of the abdomen to interpret especially by the “inexperienced eyes”.

   (iv) Alien knowledge—defined as a set of knowledge that is so uncommon and rather difficult to master, often causing massive confusion in the learner, e.g. learning a new surgical technique

   (v) Tacit knowledge— understandings regarding a set of knowledge that is culturally more understandable by the natives rather than by novice teachers or learners. For example, is the slangs of a

common language practised in different community or people of different states or different concepts that are considered as 'common sense' to the experienced members (Baillie, Bowden, & Meyer, 2012).

2) The learning and teaching expectations of the Gen-Y young minds

Generation Y is tech savvy and often dislikes the general method of teaching with long lectures even with a seemingly modern technology such as presentation slides. While it seems fashionable and trendy to use web-based learning tools for teaching, the process of preparing the lesson still require the same or more time as compared to when preparing traditional presentation slides for lectures.

3) Heavy workload burden

New clinicians are burdened with a heavy clinic and hospital workload, with an additional duty of teaching and doing research. Given that most of the medical school training was to mould the clinician into primarily experts in managing cases, this may put the clinician in an unwanted limbo position. They are also constantly at risk of being called to the wards or operating rooms while conducting lectures.

4) Choosing the right career pathway

Recently introduced by many public universities is the four-career pathway, namely the experienced practitioner, the experienced researcher, experienced administrator and of course, the experienced teacher. There was a great excitement in the air when the teaching pathway was introduced as many clinicians thought that if teaching hours are increased, the chances of progressing through the academic ranks will be easier. However, many were left disappointed when it was stressed that research is still needed especially in the field of SoTL which tends to be more social sciences based. In addition, clinical lecturers usually lack experience in applying for ethical approval or grants. This becomes a stumbling block and hinders their desire of conducting research.

5) Lack of experience in publishing

Most clinical lecturers do not possess the competency to write scientific articles and face difficulty in getting their work published in high impact journals. This definitely presents a great challenge to the new academics. English language proficiency is also another challenge that these academics need to overcome in order to get their work published in reputable journals.

6) "Anti-research culture"

Many young clinical academics face the burden of doing research in tandem with teaching and clinical practice. This can sometimes be counter-productive and such environment creates an anti-research culture that impedes the already dim hopes of performing any research at all (Burke, 2005; Hannes, 2007). This can create a sharp divide among three groups of imminent professional, namely practitioners, researchers and also educators – roles that are supposed to carried all at one go by the budding academics (Dunn & Yates, 2000). Failure to do research will sometimes lead to a lack of knowledge in the latest update in guidelines for specific areas and may affect both teaching and the quality of clinical practice.

Possible Responses

1) In house teaching course (KAP course)

Under the provision of the Centre for Learning and Teaching, Higher Education Leadership Academy (AKePT) Malaysia, an advanced programme called the "Quality Teaching for Learning" (QTL) was started. It intends to enrich trainers with needed skills to design an in-house training programme in outcome-based learning and teaching in their own institutions using the "constructive alignment model" (Biggs & Tang, 2011). The objective of this training programme was to:

(i) inculcate in trainers with understanding of the principle of constructive alignment and its application in the required manner in cohort with senior institutional administrators;

(ii) identify reasons for poor implementation in the institute of higher learning and based on these finding, develop institution-based staff development programme;

(iii) ensure trainers understand how to develop Learning Outcomes (ILOs), design Teaching/Learning Activities (TLAs) and Assessment Tasks (ATs) before putting it forward in the curriculum plan;

(iv) ensure trainers keep a proper portfolio of the teaching materials. This is essential to allow formative assessment of staff going for the teaching training programme and allow continuous and ad-hoc monitoring of the QTL in their own institutions (Biggs & Tang, 2011)

At the faculty or departmental level, a more localised and hands-on training programme that is both practical and effective needs to be implemented. This will include three aspects:

(i) The understanding of teaching and learning theories;

(ii) Continuous and active input on the professional development of the future occupation(s) that the learner will embrace;

(iii) Active mentoring. This will enable the development of 'reflective and competent practitioner" through a process of domestication (Schön, 1983; Wenger, 1998; Wenger, 1999). Emphasis could be given on teaching and learning theories and educational research, that is relevant to a future real working environment. By following this training program, teachers will be more competent to impart knowledge that will reshape both their own and the young minds' beliefs, knowledge and eventual practices of the future profession (Hollins, 2014).

2) Organising web tools workshops

To enhance learning, various workshops are organised by the respective faculties regarding new web-based learning tools (Alexander, 2006). This include the famous web-based e-tools such as Kahoot, Socrative, Padlet, and Edmodo among others. This can enhance both the learning experience while encouraging feedback to improve the teaching as a whole. As young minds often prefer quizzes administered through these tools, new academics should embrace and learn about this exciting new and innovative skills.

3) Participation in publishing workshops

A notable step taken by many higher institutions has been the introduction of regular publishing workshop (Ebrahim, 2015). Most of these workshops are either free or requires a minimal fee. The objective of such workshops is often intended to help novice writers to be equipped with the essential skills to write and publish in high impact journals. This will then increase the chances of manuscript acceptance in a quality journal.

One of the most demotivating aspects for a new author is having articles repeatedly rejected. Most academics will be able to endure this painful rejection but some may give up altogether. Motivation and reassessment of the reason for rejection may lead to a improved revised version of the manuscript which may increase the overall chance of acceptance. Once academics have an article that is finally accepted after many tries, this will in turn increase their motivation to write more.

4) Mentor-mentee programme

Some faculties have been proactive in pairing novice and senior academics (Girot, 2010). Senior academics will be able to share their rich experience in publishing papers and completing research projects as well as thriving in the new wave of teaching and learning termed as SoTL.

Senior academics can help novice academics grow by including them as collaborators in their research. Once confidence is ingrained in these budding academics, these younger members can be the principal investigators of their own research projects and even start writing their own research articles.

5) Need to encourage love for research

There is a need to inculcate a research culture early in career life. This can be done through mentorship by senior professors and through innovative methods of using case studies to promote research among these budding researchers (Girot, 2010). Ultimately the key solution will lie in exploring the lecturer's own perception and views of the importance of research in helping them transfer the latest knowledge to their students that will ultimately lead them to understand better the importance of research (Girot, 2010).

6) Need to overcome pitfalls in performing research

Enhancing SoTL among medical academics entails the challenge of overcoming the pitfalls of conducting research such as the lack of funds, lack of time and tight deadlines (Pusey & Thakker, 2004). All these limitations should be addressed in additions to other factors that can promote research such as innovative methods such as ad personam (i.e. one to one personal tutoring) and frequent training sessions in new research methods and applied statistics to keep the love for research burning (Royal College of Physicians, 2000; Academy of Medical Sciences, 2000)

Conclusion

This chapter has shown that new clinical lecturers face various challenges that they need to grapple in the teaching-learning environment. This means that they need to learn to strike a balance when managing the various roles that they play in order to carry out effective SoTL related works. Although the responses offered may not be the panacea for all clinical lecturers but at least, it serves as a guide to create a more conducive environment that can help them flourish in their SoTL journey.

References

Academy of Medical Sciences. *The tenure-track clinician scientist: A new-career pathway to promote recruitment into clinical academic medicine*. The Savill Report. London: AMS, 2000.

Ale Ebrahim, N. (2015). Strategies to enhance research visibility, impact & citations. *Research Tools in Education Series*, *6*(1), 1-162.

Alexander, B. (2006). Web 2.0: A new wave of innovation for teaching and learning? *Educause Review*, *41*(2), 32.

Baillie, C., Bowden, J. A., & Meyer, J. H. F. (2012). Threshold capabilities: threshold concepts and knowledge capability linked through variation theory. *Higher Education*, *65*(2), 227– 246. doi:10.1007/s10734-012-9540-5

Biggs, J. & Tang, C. (2011). Train-the-trainers: implementing outcomes-based teaching and learning in Malaysian higher education. *Malaysian Journal of Learning and Instruction*, *8*, 1-19

Burke L.E, Schlenk, E.A., Sereika, S,M., Cohen, S,M., Happ, M.B. & Dorman, J.S. (2005). Developing research competence to support evidence-based practice, *J Prof Nurs*, *21*(6), 358–63.

Dunn, S. & Yates, P. (2000) The roles of Australian chairs in clinical nursing. *J Adv Nurs*, *31*(1), 165–71.

Eddy, N. (2011). *Cloud computing: Cloud, mobile apps, public storage are top IT trends for 2012 and beyond.* Retrieved from http://www.eweek.com/c/a/Cloud-Computing/Cloud- Mobile-Apps-Public-Storage-Are-Top-IT-Trends-for-2012-and-Beyond-Gartner-130060/

Girot, E. A. (2010). The challenges facing healthcare lecturers and professors to lead and promote a research-based culture for practice. *Journal of Research in Nursing*, *15*(3), 245–57.

Hannes, K., Vandersmissen, J., De Blaeser, L., Peeters, G., Goedhuys, J., & Aertgeerts, B. (2007). Barriers to evidence-based nursing: a focus group study. *J Adv Nurs*, *60*(2), 162–71.

Hollins, E.R., Luna, C., & Lopez, S. (2014) Learning to teach teachers. *Teaching Education*, 25(1), 99-124, DOI: 10.1080/10476210.2012.75595

Ministry of Education Malaysia (2017). *Annual report 2016: Malaysia education blueprint 2013–2025.* Retrieved from https://www.moe.gov.my/images/KPM/UKK/2017/08_Ogo/MEB%202016%20Annual%20Report.pdf

Ministry of Education Malaysia (2015). *Executive summary Malaysia education blueprint 2015–2025 (higher education)*. Retrieved from https://www.um.edu.my/docs/default-source/about-um_document/media-centre/um-magazine/4-executive-summary-pppm-2015-2025.pdf?sfvrsn=4

Perkins, D. (2006). Constructivism and troublesome knowledge. *In Overcoming barriers to student understanding* (pp. 57-71). Routledge.

Pusey, C., & Thakker, R. (2004). Clinical academic medicine: the way forward. *Clinical Medicine*, *4*(6), 483-488.

Royal College of Physicians (2000). *Training in academic medicine*. London: RCP.

Schon, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books Inc. *New York, NY*.

Wenger, E. (1998). Community of practice: a brief introduction. *Learning in Doing. 15*(4), 1–7. doi:10.2277/0521663636

Wenger, E. (1999). *Communities of practice: learning, meaning, and identity*. Cambridge University Press.

Chapter 7

Flipped and Conventional Methods in Teaching: A Hybrid Approach

Nabilah Abu Bakar & Izian Abd Karim

Keywords: flipped learning, hybrid method, engineering

Introduction

Flipped learning is a teaching model that reverses the role in learning, where the lecture is conducted prior to coming to class (usually via self-reading or watching instructional video) and the assignments are done during class using various in-class activities. The conventional lecture which involves the understanding of concepts and derivations is done at the students' own pace before the class. This requires them to do some 'self-learning' so that they could participate in class activities. To ensure students' involvement, a quiz is usually given either online or at the beginning of class.

The flipped learning method has gained a lot of interests in the higher education level. However, the implementation of this method in the engineering field is still lacking and there are currently very limited studies dedicated to this approach (Kerr, 2015). The flipped learning method has been implemented in wide ranges of engineering courses, however, it cannot be certain that a particular subject works best with this method (Kerr, 2015). Her study concluded that there is a need to conduct more research to provide a guideline for the implementation of flipped classes in this field.

Generally, positive impact of the flipped method has been reported by many research (Zainuddin & Attaran, 2015; Prashar, 2015; Touchton, 2015; Lucke, Dunn & Christie, 2016; Murphy, Chang & Suaray, 2016; Tomas, Evans, Doyle & Skamp, 2019). Gardner, Willey, Vessalas and Li (2014) concluded in their study that approximately 60% to 70% of the students in the Civil Engineering field prefer flipped learning compared to the conventional approach. However, some students complain about the extra time they need to spend on this method. Another study by Swartz, Velegol and Laman (2013) in 'flipping' Civil Engineering courses suggested that the implementation of the method opens up the possibilities of other activities such as guest speakers and self-directed learning exercises as more time is available during class. The students are also found to be prepared to come to class and ask better questions. Baytiyeh and Naja (2016) performed a comparative study on the performances of students using conventional and flipped methods for learning, taught by the same instructor. It was found that the test scores were slightly higher using the flipped method, however, students gave positive feedback on the improvement of critical thinking and learning abilities. A similar study performed by Cabi (2018) found

that there were no significant differences between the scores of the two different learning strategies.

There are still lacking systematic study on the effectiveness of the hybrid method of learning in the engineering field. Harrison, Saito, Markee and Herzog (2016) examined the effectiveness of flipping only one section of an engineering course by comparing to the conventional learning method. It is found that the hybrid-flipped method yields a negative impact on the total course marks, possible due to poor use of video by the students. However, a positive impact on the hybrid method was observed by Lax, Morris and Kolber (2016). In their study, this method was implemented in a large biology course and the results of students' assessments were compared to the control class with only the conventional learning method.

The hybrid approach in teaching and learning was implemented in a course in the Civil Engineering field, which is the Structural Analysis II taken by second-year students in Universiti Putra Malaysia (UPM). This chapter will discuss the implementation and effectiveness of the hybrid method and could be used for guidance in other related courses.

Methodology

This study was performed on the course of Structural Analysis II, taken by second-year undergraduate students from the Civil Engineering field. This subject is only offered in the second semester in each academic year, where each semester consists of 14 instructional weeks. The subject covers the analysis of indeterminate structures, and approximately 90% of the content is calculation based.

This course was taught by two instructors, where the first instructor taught the first 7 weeks of class (part 1), and the second instructor took over the class afterward (part 2). The hybrid approach was used in this course, where the flipped method was implemented in part 1, while part 2 utilised the conventional teaching method. The development of the hybrid method for this course is shown in Figure 1.

As shown in Figure 1, the flipped method was implemented on more basic topics where the understanding of the concept is crucial for the remaining of the course. Various activities both online and in-class were implemented using the flipped method. Prior to attending the classes, students were required to watch videos and answer the quizzes which were developed using the online platform EDpuzzle. The purpose of the video is for students to attend the lecture with some basic knowledge, resulting in a more engaging student-centered classroom. The sample of the video uploaded is shown in Figure 2.

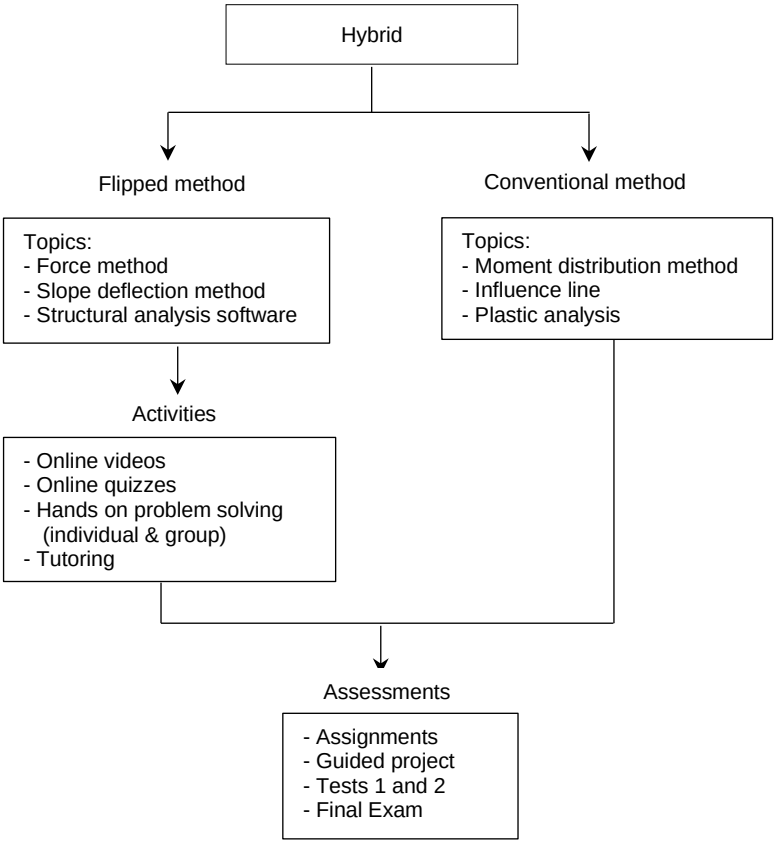

Figure 1: *Development of the hybrid method for this study*

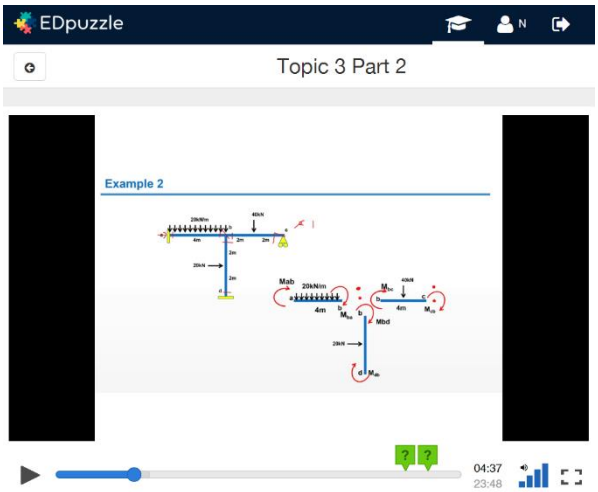

Figure 2: *Sample video that has been made and uploaded in EDpuzzle*

Using the flipped method, the time available during class was utilised by having hands-on problem-solving, both individually and in groups. This could promote critical thinking and teamwork, which are essential skills required for engineers. Students were sometimes required to explain the concepts and steps of solutions to enhance their understanding, and at the same time help their peers (tutoring) to understand better. In the conventional method, PowerPoint presentations were used with explanations on the whiteboard on a specific topic. This gives very little time for class activities, and students were given time to ask questions at the end of the class.

The assessments of this course consist of assignments, guided project, standardised tests, and a final examination. Approximately 60% of the grade is contributed by the coursework marks, while the remaining is from the final exam. The student must obtain at least 50% of the overall marks in order to pass the course.

The hybrid method was conducted on students enrolled in the course during the academic years of 2015/2016, 2016/2017 and 2017/2018, while comparison of the students' performances was made based on the earlier year of 2014/2015, where only the conventional method was applied. The summary of the study done from different academic years is presented in Table 1.

Table 1: *Summary of the study done for different academic years*

Academic year	No of students	Method of teaching/ learning
2014/2015	46	Conventional
2015/2016	70	Hybrid
2016/2017	60	Hybrid
2017/2018	42 + 35*	Hybrid

*Repeaters from the previous semester

The findings were discussed based on the test and exam results which were compared to the same subject taught by the instructors in the previous semester. In addition, a survey was also conducted to obtain students' feedback on the method implemented.

A general finding by the authors is that a high percentage of students of academic year 2016/2017 were having challenges in more difficult courses (such as structural analysis and hydraulics) with very high failure rates. This observation is agreed upon by the lecturers who taught the students since the first year, possibly due to the intake of the cohort. Hence, in the year 2016/2017, 42% of the students failed this subject, resulting in 35 students having to repeat the subject the following year (2017/2018, see Table 1). As shown in Figure 3 for Test 1 results, when the analysis included the repeating students, the graph tended to skew to the right, with decreasing high achievers and increasing failure rate. This finding is consistent for all assessments (Test 2, final exam); hence

the repeating students will not be included in the analysis for 2017/2018 academic year.

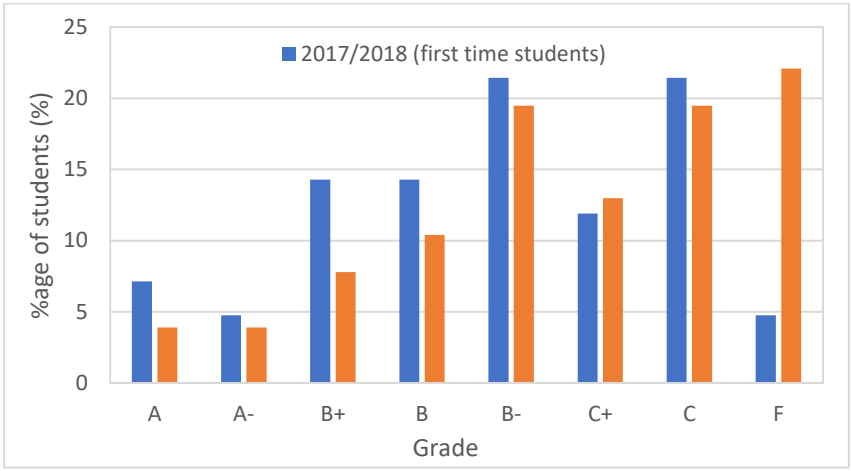

Figure 3: *Test 1 results of the year 2017/2018, comparing first-time students and all students including repeaters*

Results and Findings

Results of the Summative Assessment

Summative assessments in terms of Tests 1 and 2 and final examinations were conducted to evaluate students' understanding of the subject content. The effectiveness of the hybrid approach was evaluated by comparing the results of these assessments to the academic year where the conventional method of teaching is implemented (year 2014/2015).

The usage of the hybrid method in teaching and learning was found to have a positive impact on the students. The result can be seen in Figure 4, which shows the comparison of students' grade for Test 1 in four different academic years. The total number of students attaining grades A and B after the hybrid method was implemented show a significant increment compared to year 2014/2015 where the conventional method of teaching was used. In addition, a markedly low number of students obtained grade C after the implementation of the hybrid approach was observed, except for year 2017/2018. In terms of students failing the test, however, mixed results are observed when the students are learning using the hybrid approach. Years 2015/2016 and 2017/2018 show a drastically reduced number of failures, however, in year 2016/2017, the number of students failing the test increased compared to the conventional teaching. This possibly shows that the hybrid method could boost up the understanding of the average students, however, students who are having academic difficulties might not benefit from this method. As mentioned, the cohort of students taking the subject

in year 2016/2017 was observed to have difficulties in challenging subjects across the department.

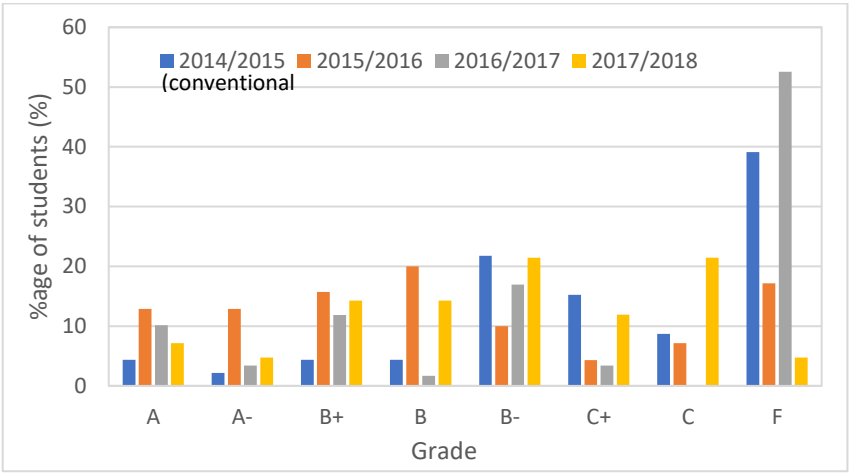

Figure 4: *Comparisons of Test 1 results for four academic years*

As shown in Figure 5, a significant improvement in students' grade was observed in Test 2 after the hybrid method was implemented. The number of students who obtained grades A and B increased, while the number of students who failed the test reduced. However, the same cannot be said when comparing the students' final examination. It was observed that the number of students receiving grades A and B increased compared to year 2014/2015, however, the number of students who failed did not improve.

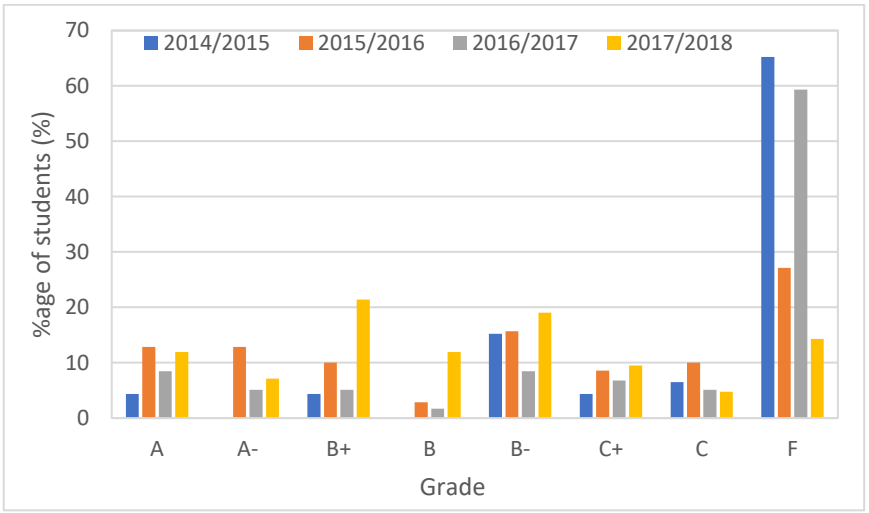

Figure 5*: Comparisons of Test 2 results for the four academic years*

The overall result of the subject is the cumulative marks from the summative assessments and other forms of formative assessments in terms of assignments and project. The overall grade of students enrolling in this subject is shown in Figure 6. In general, the grades improved, with more students achieving higher grades under the hybrid approach compared to year 2014/2015. It should also be noted that the number of students failing the subject reduced from 20% to 10%, with exception of year 2016/2017. In this year, an overwhelming 40% of the students obtained grade F. However, the general distribution of grades remained unchanged.

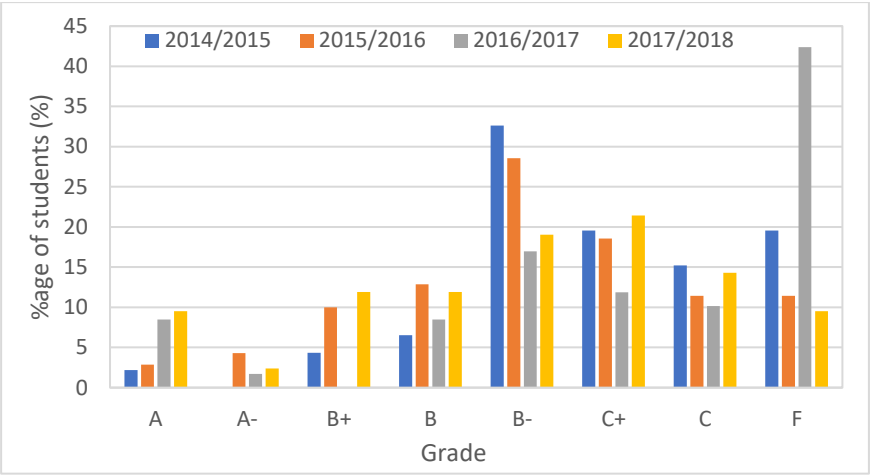

Figure 6: *Comparisons of overall course result for four academic years*

Benefits of the Hybrid Approach

The hybrid approach, which combines the use of flipped and conventional learnings, was found to be beneficial in students' learning. In the hybrid approach, the specific topics covered in the flipped and conventional methods of teaching is as outlined in Figure 2. The benefits of the hybrid approach is illustrated by observing the final exam results of students (for topics that were covered under the different methods specified. As shown in Figure 7, the students' final examination results using the two different methods show very similar trends in terms of the grades obtained for year 2015/2016. This shows that the use of two different methods in a subject yield similar results in terms of students' performances in the assessments. The usage of the flipped method in the conceptual (earlier) topics was found to be beneficial as it strengthened students' understanding of the later topics taught using the conventional classroom approach.

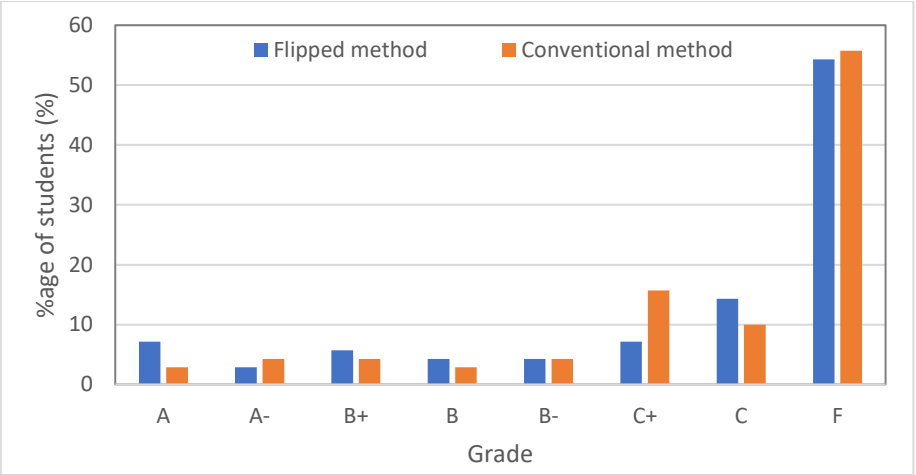

Figure 7: *Comparison of the final exam results in 2015/2016 academic year based on the topics using different approaches in teaching and learning*

Due to the implementation of the flipped method, learning time in the classroom was utilised with interesting activities as shown in Figure 8, to enhance students' understanding and develop their interest in structural engineering.

(a) 'guess the structure' quiz

(b) group works

Figure 8: *Activities conducted during class*

Students' Perspective of the Flipped Method

A survey was conducted, specifically targeted on the flipped method implementation on students' perception. Two questionnaires were given out, the

first one was to gauge students' awareness on flipped method at the beginning of the semester (entrance survey), while the second was given at the end of week 7, to obtain their feedback of the effectiveness of this method (exit survey).

In the entrance survey, the students were asked on their prior experience in the flipped method and the average preparation time spent for classes. For the academic year of 2015/2016, there were 43 respondents, and the survey was given in the first week of the semester. Approximately 81% of the students have never heard about the flipped method before, while the remaining have been introduced either during their pre-university (foundation/ matriculation) or in other courses.

The level of students' interest when first introduced to the flipped method were reflected in Figure 9 for academic year 2015/2016. Approximately half of the students were having neutral feelings when first introduced, while 35% were interested to learn using this method. This is very encouraging since this method depends highly on students' effort and willingness to participate. In general, most of the students were willing to participate and learn the course using this approach, however, some needed to be convinced that this method would be useful for them. This finding was similar throughout the study years.

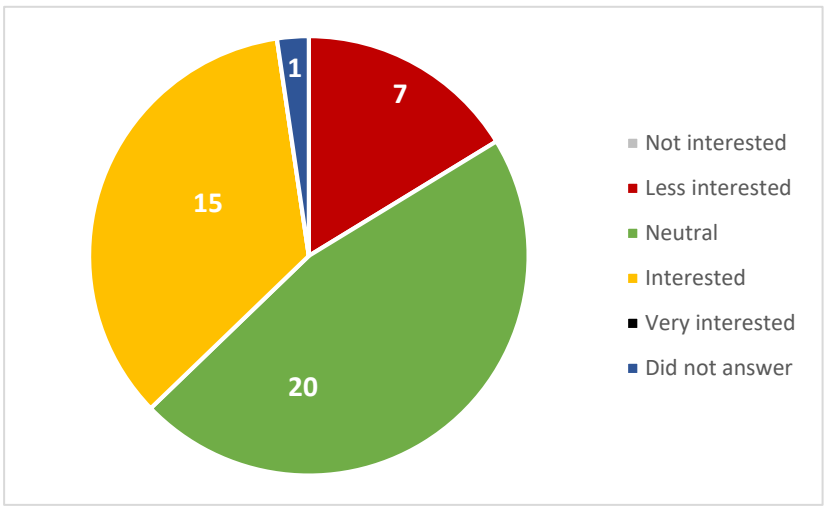

Figure 9: *Students' level of interest in learning using this method (2015/2016)*

When asked on the amount of preparation the students did before coming to class, the overwhelming majority (70%) reported that they sometimes prepare for their class while approximately 16% reported that they often do the preparation. In average, they reported having spent approximately 1 hour for preparation before coming to class.

In the exit survey, the students were asked on whether the flipped classroom method should be continued for this subject, and their responses are shown in Figure 10, for academic years of 2016/2017 and 2017/2018. In general, students from the latter academic year show a more favourable response using this approach, with 38% agreeing to continue, and only 8% disagreed. The students from 2016/2017 academic year, however, show a negative response for this method, with overwhelming 26% disagreed that this method should be continued, and only 22% of the students were in favour of it. This could also correlate with the poor performance of the 2016/2017 academic year, which showed that underperforming students may not have benefitted from this method.

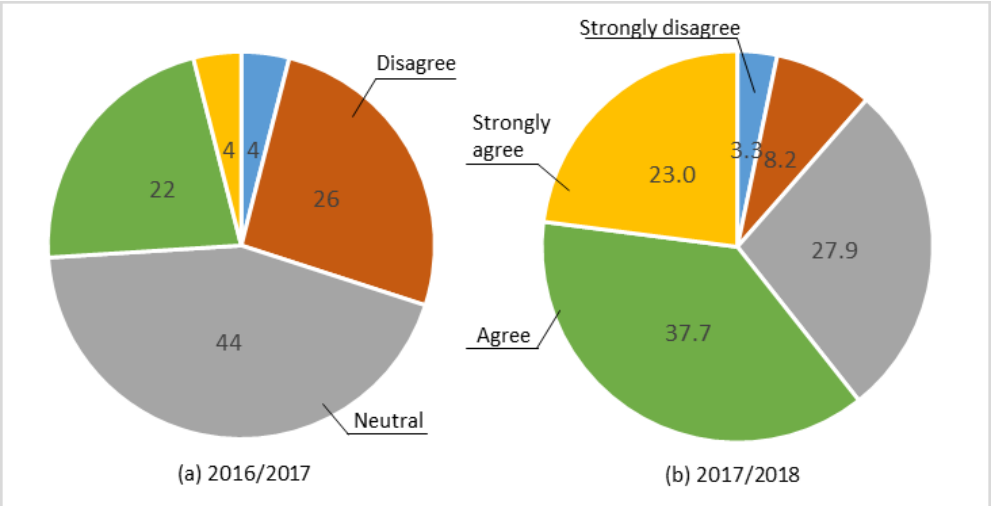

Figure 10: *The response of students (in percentage) on whether the flipped classroom method should be continued for this subject from two different academic years*

On a positive note, students commented that this method forced them to study and understand the contents before attending the class, and allowed more exercises to be conducted during the class. Students also remarked that this method allowed them to re-watch the video to understand the concept better, and they generally re-watched the video 2 times after.

This method is however not without drawbacks. Students commented that the flipped method did not allow them to ask questions while watching the video in order to clarify on matters they did not understand. As recommended by previous studies, the video duration should be limited to 15 minutes, as a longer video will lead students to boredom. Even though the video is available a week before the class, students typically watched the video a day before the class started, some even a few hours before. Hence, some students commented that this method disrupted their daily schedule, especially if they had assignments to be completed the day before the class. The authors believed that for this method to be fully successful, students should also change their attitude to ensure that their

tasks (assignments, projects) were completed way ahead of the due date. The summary of the comments made by students is shown in Table 2.

Table 2: *Comments by students on the flipped method*

Positive	Negative
• The videos can be repeated to enhance understanding • Can prepare earlier for class • Save time during class to do more examples • Explanation in video is easy to understand • Forces students to study	• Not able to directly ask question while learning • Do not have time to watch when there are assignments • Loose focus in long videos • Need better sound system • Forgot to watch video • Problem with internet connection • Slides are not provided (have to take own notes) • Disturb daily schedule

Conclusions

A hybrid approach which incorporated flipped and conventional methods of teaching and learning was implemented in Structural Analysis II, a course taken by second-year students in the Civil Engineering field. The method was implemented in three academic years (2015/2016, 2016/2017 and 2017/2018), and the students' performances were compared with the academic year of 2014/2015 when the traditional teaching method was used. The implementation of the hybrid approach has been discussed, and the findings showed that it yielded consistently better results in students compared to the conventional method of teaching, except for the academic year of 2016/2017. More students were found to achieve higher grades (A and B) in their assessments under this approach compared to the conventional method. However, it should be noted that some mixed result was observed, where the hybrid approach enhanced the understanding of students with better academic performance. It should be noted that students with lower academic performance may not benefit from this approach. This finding also correlated with their responses and comments on the effectiveness of this method. The advantages and drawbacks of this method have been discussed which will be useful for instructors considering to implement this method in their classes.

References

Baytiyeh H. & Naja M.K. (2016). Students' perceptions of the flipped classroom model in an engineering course: a case study. *European Journal of Engineering Education*, 1-14.

Cabi E. (2018). The impact of the flipped classroom model on students' academic achievement. *Internal Review of Research in Open and Distributed Learning*, *19*(3), 202-221.

Gardner A., Willey K., Vessalas K. & Li J. (2014). Experiences with flipped learning in subjects in consecutive stages of a Civil Engineering programme. *Proceedings of the AAEE2014 Conference Wellington*, New Zealand.

Goetz K. (2000). Perspectives on team teaching. *EGallery*, *1*(4).

Kerr B. (2015). The flipped classroom in engineering education: A survey of the research. *Proceedings of the International Conference on Interactive Collaborative Learning*, Florence, Italy.

Harrison D.J., Saito L., Markee N. & Herzog S. (2016). Assessing the effectiveness of a hybrid-flipped model of learning on fluid mechanics instruction: overall course performance, homework, and far- and near-transfer of learning. *European Journal of Engineering Education*, 1-17.

Lax N., Morris J. & Kolber B.J. (2016). A partial flip classroom exercise in a large introductory general biology course increases performance at multiple levels. *Journal of Biological Education*, 1-15.

Lucke T., Dunn P.K. and Christie M. (2016). Activating learning in engineering education using ICT and the concept of 'flipping the classroom'. *European Journal of Engineering Education*, *42*(1), 45-57.

Murphy J., Chang J.M. and Suaray K. (2015). Student performance and attitudes in a collaborative and flipped linear algebra course. *International Journal of Mathematical Education in Science and Technology*, *47*(5), 653-673.

Prashar A. (2015). Assessing the flipped classroom in operations management: a pilot study. *Journal of Education for Business*, *90*(3), p. 126-138.

Swartz B., Velegol S.B. and Laman J.A. (2013). Three approaches to flipping CE courses: Faculty perspectives and suggestions. *120th ASEE Annual Conference and Exposition*, Atlanta.

Tomas L., Evans N., Doyle T. and Skamp K. (2019). Are the first year students ready for a flipped classroom? A case for a flipped learning continuum. *International Journal of Educational Technology in Higher Education*, *16*(5), 1-22.

Touchton M. (2015). Flipping the classroom and student performance in advanced statistics: evidence from a quasi-experiment. *Journal of Political Science Education*, *11*(1), 28-44.

Zainuddin Z. and Attaran M. (2015). Malaysian students' perceptions of flipped classroom: a case study. *Innovations in Engineering and Teaching International*, *53*(6), 660-670.

Chapter 8

Students' Involvement in Community Services as Authentic Learning

Masnida Hj. Hussin

Keywords: authentic learning, community services

Introduction

Authentic learning is one of the established types of learning in the teaching and learning (T&L) process at higher education. It fulfils students' comprehension towards topics and concepts that are being taught in the classroom by providing to apply these concepts in solving problems based on real life situations. One approach to provide a feasible T&L process for authenticating the task is to engage the students in its community where they are most accustomed and contented. Participation of students in community services is a regular practice and required as a necessary activity in higher education (Paula, 2013; Purnamasari, 2017). The students' involvement in such services could effectively improve the sense of belonging and social responsibility among students towards the community. The involvement in community services also encourage the students to connect lessons learned in the classroom with real-life situations.

Due to the broad perspectives of community service activities that the students can get involved within, it is challenging to design an authentic learning process and evaluation mechanism. There are several learning factors which need to be assessed and this includes the risk of inappropriate choice of activities that eventually leads to the failure of authentic learning. In the context of evaluation mechanism, issues of item development, technical measures of reliability and validity, effective scoring designs, and satisfaction level by the community needs to be properly deliberated in such learning process (Thorhallur, Heather & Lori, 2015; Leda & Erica, 2006). Thorhallur, Heather and Lori claimed that the goals for authentic learning through social services can range from understanding of cultural abilities to civic behaviours. Dobos (2016) designed elements of authentic learning for assessing on how the knowledge will be used in real-life while Milner, Myers and O'Byrne (2015) proposed a five-stage processes of exploring real-life issues/problems where it can be used as learning elements to discover the whole community involvement process. These are i) preparing for task, ii) collecting data, iii) applying professional knowledge, iv) making judgment and v) deciding and/or recommending. With the same paradigm, Rowntree (2015) proposed five key activities in the process of authentic assessment namely *why assess, what to assess*, *how to assess*, *how to interpret*, and *how-to response*. There are many studies on authentic learning using the Internet, but it is difficult to conduct online assessment for this type of learning as it

comprises a crucial evaluation element (i.e. peer review and feedback) (Thorhallur, Heather & Lori, 2015; Dobos 2016).

Authentic Learning Elements in Community Services

Students' involvement in community services can be part of authentic learning by training their critical thinking and exploratory skills. Such involvement or participation can be from wide-ranging community activities such as raising funds by donating and selling used goods, environmental projects, delivering speeches advocating financial literacy, coaching a youth sports team, working with the local health department, cleaning up trash at community spaces and school mentoring.

Note that the learning process require stages of knowledge and experience for improving the quality of life. It is due to variability in choosing the right learning stage to meet the personal capability in an authentic manner that is devoted to embed with the real environment (Roth, van Eijck, Reis, & Hsu, 2019). By referring Lund (2016), there are four components in authentic learning: i) activity that involves real-world problems, ii) use of open-ended inquiry, thinking skills and metacognition, iii) engage in discourse and social learning in a community of learners and iv) direct learning for project work. With due regards to those elements, we designed four related components for matching community service activities with the authentic learning components as shown in Table 1.

Table 1: *Four components for matching community service activities with authentic learning components*

No.	Component	Description
1	**Identification**	• The students need to choose the right community that is relevant and significant to their course programme. • The community can be in the form of non-profit organisation, school, government agency, kindergarten etc. • Further, they need to give justification on why they choose the community including the target population/age. • They also need to understand the community background and local sensitivity. This is an important input for designing an appropriate activity. • The activity is supposed to provide and meet the community needs without causing any displeasure or demotivation. It is important to identify the social needs in order to design suitable activities for the students to get involved in community services. • In order to obtain clear information about the community, initial investigations should be conducted; followed by

		agreement and approval from the community representative (i.e., village headman).
2	**Application**	• The application refers to activities that will be designed according to the identified community. • The activity must fulfil the needs of the target community while enabling the students to learn from real situations. • There are several key steps in designing the suitable activity for the community. • First, the students must be able to propose the detailed activity workflow. Note that, there are many social activities can be designed for the community benefits such as awareness program (i.e., healthcare, road safety etc.), economy development program (i.e., car booth sale, branding tutorial etc.) and cultural development program (i.e., free classes, donation etc.). • Each programme must have clear objectives and advantages towards the community. It might comprise a single activity or several activities. For example, the road safety awareness programme might include several events such as survey, talk and practical session. • The application also includes details about the role of team members, approval from land/district office (if needed), time and duration, venue, cost, delivery methods, industrial involvement (if any) and number of volunteers (if any).
3	**Verification**	• This component focuses more on how data are being collected and analysed from the activities. • It can be through survey and interview questions or using multimedia in assembling useful data. • The collected data must be analysed and presented in meaningful ways (i.e., systematic report, graph and table). • Hence, it can be shared with the community for comments and verification. • The students need to measure the success of the activities by analysing the feedback and comment from both the peers and community members. • In order to enlighten the authentic learning, the students must be able to analyse the feedback/comments not only through the survey but also through their expression and feeling. • It is a challenge to transform the emotion into statistical information, but their experiences will guide the process. For example, it is on how the students or group of students express their feeling throughout the activities

		(i.e., in the issue of loneliness among adults, aware of community safeties etc.). • They are also required to provide the evidence in order to support the finding and expression while justifying the activity contentment. • Therefore, the verification component is not limited to documentation report where it can be done through video recording. • It includes the effect and sustainability of the community services in developing self-esteem and educational value, in general.
4	**Documentation**	• This component can be presented in general opinion, suggestion or comments. • It aims to measure the knowledge, skill and emotion towards the completed activity. • Specifically, the students should be able to produce a thorough report in aligning knowledge and skills gained with the experience. • The report should include a suggestion section for future improvement in the community. • Students are also required to describe and explain how the critical thinking and decision-making skills could be explored and acquired through the activities. • Further, include more explanation on strategies how they are adapting and managing the real situations that they are unfamiliar with.

Real Problem-Solving Activity

In this work, we propose the authentic learning framework through community services that represents several stages in the learning process. Specifically, in the system model, we aggregate three main components into the community services environment particularly the goal, activity and report (Figure 1). The goal aims to ensure the students' involvement fulfills any parts of T&L domains (i.e., cognitive, psychomotor or affective domains). In this work, we highlighted the authentic learning which the affective domain can be appropriately measured through community services. The affective domain addresses the acquisition of attitudes and values (Thies, 2014; Thorhallur, Heather & Lori, 2015) that drives better Teaching and Learning (T&L) process. The community services are supposed to encourage students' reflection towards social competencies such as communication and collaboration. Note that, the affective domain which comprises several levels (i.e., receiving, responding, valuing, organisation, and characterisation) can analyse the real situation activity where the behaviour and

emotion can be revealed and expressed. Meanwhile, the report is to justify all evidences collected and analysed during the activity. The key component is the activity; which takes place in between participant (students) and the community. Those components are inter-related to each other to achieve the T&L process while explicitly enhancing students' soft-skill and community lifestyle.

Figure 1: *Community Services-based Authentic Model*

Basically, the affective domain consists of levels that address the learner's interests, attitudes, values, and appreciation of a given topic or content area (Furnham, Nuygards, & Chamorro-Premuzic, 2013). It is part of Bloom's taxonomy besides cognitive and psychomotor domains. The affective domain is mainly used for identifying, understanding and addressing how people learn. It describes the learning process demonstrated by behaviors of awareness, interest, attention, concern, responsibility, ability to listen and respond in interactions with others (Tanya, 2014; Gelmon & Spring, 2018). Such abilities are being identified as a part of elements needed in the T&L process where it is appropriate to be tested on several situations. In comprehensive T&L process, the affective domains itself is difficult to value and measure. It is because the classroom-based learning methodology does not explicitly reflect the learners' soft-skills.

The authentic learning process through affective components is not an easy task due to the influence of beliefs and emotions which are unpredictable. This in turn causes the students to normally hide and hold the idea/opinion to themselves rather than openly sharing their perspectives. Therefore, in order to adapt the affective domain with a real situation like community services, it is important to suitably match and organise the activity with the students' interest and concern. For example, we let the student to choose the community that they are willing to contribute to. Furthermore, by letting them to decide which community that they intend to work with, it allows the student to know the community more while allowing them to expose their own capability (Roth, 2019). Consequently, with their own self-interest, the students are able to design suitable activity that addresses the social issues of the community.

In response to that, we designed five experimental levels embedded in the five levels of the affective domain. It aims to assess the students' understanding and emotions through the designed activities and stages. The five experimental levels (so called; FIEL), given in Figure 2 represents the students beliefs and emotions towards the affective domains, accordingly.

Figure 2: *The Five Experimental Levels (FIEL)*

Specifically, each level in FIEL represents distinct meaning and motivation towards the designed activity. Table 1 defines the meaning for each FIEL's level. Such levelling process is able to provide clarity in the T&L process for authentic learning in order to evaluate the students' ability to analyse real issues. The FIEL level starts with the identification element where the students are required to analyse the issue through observation and theoretical skills. Then, they need to get involved in the community activity by joining or visiting them to experience the real situation (it resides in the modelling and execution levels). Finally, the outcome from the whole FIEL is where the students are required to provide opinion/justification on how to solve or improve the issues (expressed through the sensing and aligning levels).

The FIEL's level of authentic learning is also intended to make the T&L process enjoyable and easier where there is less formal instructions and rubrics that need to be followed and assembled. Further, the students are free to design and run their own activity. Implicitly, this stimulates their creativity while learning to be independent. The supervisor or lecturer can use any evaluation approaches e.g., video conferencing, interview session, pictures as well as report documentation to ensure that the students really complete the given assignment. Those

evidence can be saved and used as part of materials for future activities. It also works as means to improve the community from time to time (continuous improvement) through long term engagement and commitment from the university.

Table 2: *FIEL Denotations*

FIEL level	Denotations
Identification	Ability to identify and choose the right community and team members.
Modelling	Ability to propose list of activities while justifying the reason why each activity is needed.
Execution	Ability to organise, perform and join the activity.
Sensing	Ability to complete the activity with formulation of sense and experience during the execution of the activity.
Aligning	Ability to respond to the community while giving suggestion for improvement.

Methodology and Discussion

In our work, we used survey and case study as the methodology for assessing the FIEL framework. In the survey questions, we designed generic and simple questions with regards to the involvement of students in community services. A total of 66 respondents participated in the survey. Those five questions aimed to investigate the students' familiarity and involvement in a community service activity. Figure 3 shows the results from the survey.

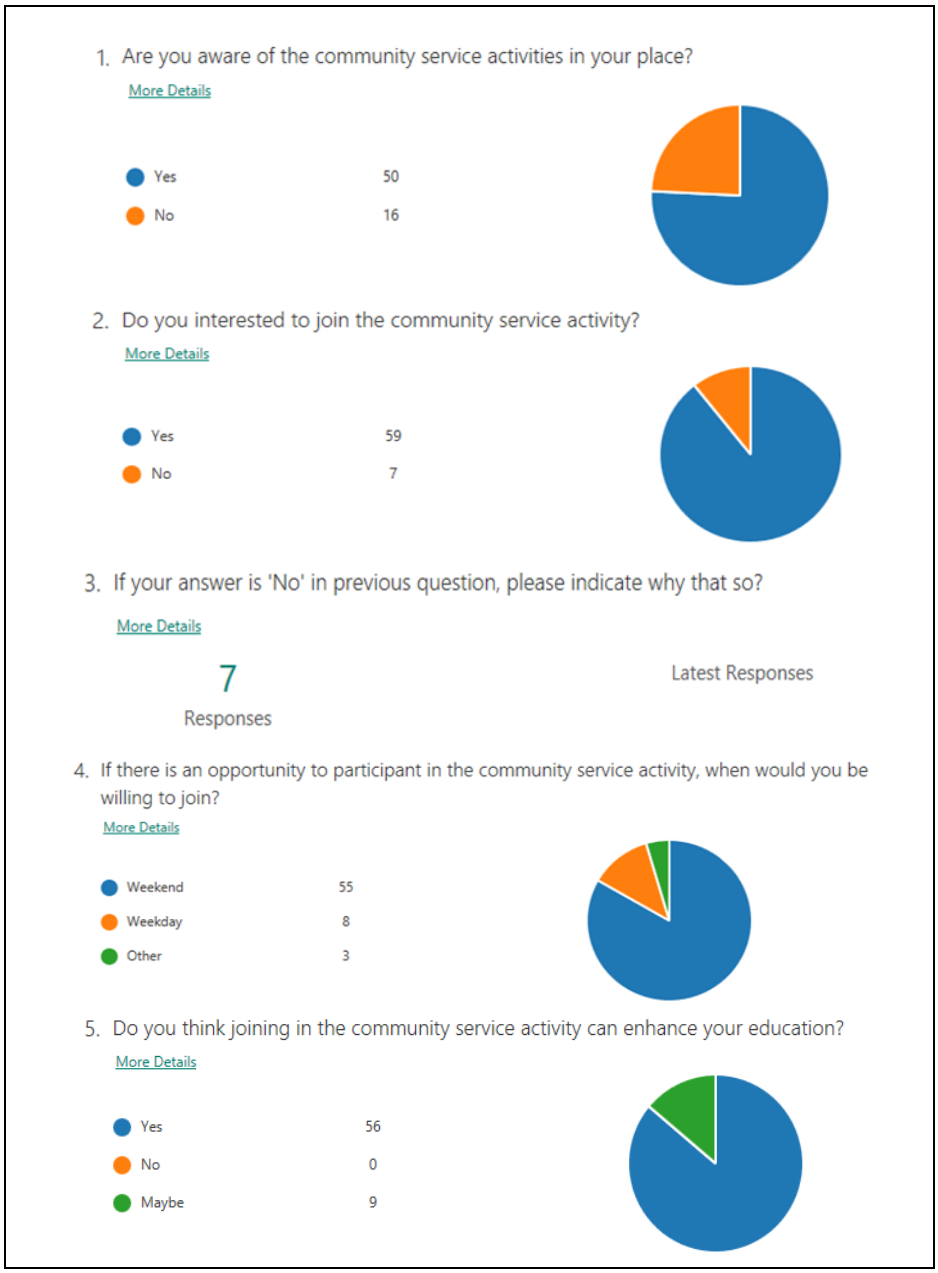

Figure 3: *Responses from the Respondents*

Figure 3 shows that there are 76% of students are alert on the community services being conducted in their neighborhood. This proves that community service activities are regarded as something common. Interestingly, 89.3% of the respondents indicate that they are willing to join community services as part of their academic curriculum despite their packed class schedule. Among them,

several students explicitly did not show their interest towards community services. Based on the reasons, such students are not ready to join the activity due to their personal attitude. We believe that if they are surrounded by the right people who could introduce them to the community, their self-interest towards joining community service activities will grow. In particular, people who have never joined any community services will feel awkward in meeting the community in person. In response to the university's objective and vision, the students should be both academically excellent (with cognitive and psychomotor skills) and are able to understand the real issues/problems that happen in the community (affective study).

Figure 4: *Reasons for not joining the community services*

Most of the students prefer to join the activity during weekends (in average 83%). It shows that they are keen to spend their weekends with the community in order to gain real-situation experiences. Inherently, such feedback leads to remarkable response in the last question. Most of the students believe that the community service activity could help them improve their academic performance.

Due to the good response from the students in the preliminary stage of investigation process, we designed a case study to investigate how the activity is aligned with the FIEL framework (Table 1). Generally, the community case study can be chosen from wide-ranging community service activities such as raising funds by donating used goods, environmental projects, work with local health department, school mentoring etc. We analysed how the case study conducted at the community place is suitable to reflect the FIEL components. For the purpose of this work, we proceed with one community service project as described in Table 3. This project attempts to help lecturers/instructors to assess student's capability in handling the real issues/problems.

Table 3 shows the format how the students should perform their reporting in horizontal structure compared rather than in an essay format. In order to assess students' contentment regarding this reporting mechanism, we asked them to give indication on their report by using a rank: A for *Happy*, B is for *Not Happy* and C for *Neutral*, respectively. Surprisingly, all respondents reporting being happy for the community service reporting style. Some of them verbally mentioned that this reporting style is handy and focused compared to the traditional (essay) reporting format. Such reporting format is technically more understandable and provide clear perspectives based on the activity's direction and item.

Table 3: *Sample of reporting style*

Direction		**Item**
Program Name	:	Colorful Cloud
Description	:	It is an initiative program of students and lecturer from class of Cloud Computing (SKR 4404). It is one of mechanism in the course assessment that aims for better continuous learning i.e., lifelong learning such as……
Objective	:	i. To provide ….. ii. To improve ……..
Role	:	a. Akmal → Director b. Suhaila → Secretary c. …….
Activity	:	Activity 1 - Theory Talk called 'Fly to Cloud Computing' Activity 2 - Experience the Wonder of Cloud Activity 3 - ----- Activity 4 - -----
Community	:	20 students from Collage Vocational Shah Alam that took course ……..
Evidence	:	(Can be pictures/video/blog/media social platform.)

We further interviewed the students who had participated in the community services. The interview aimed to analyse student comments and feedback towards the suitability of authentic components with the FIEL framework (Table 3) as described in the previous section. In particular, the interview is separated according to several dimensions namely satisfaction, programme compactness and learning. In each dimension there are several components that are being evaluated (as shown in Table 4).

Table 4 shows that the satisfaction rate over the community programme stands at 93% while the satisfaction towards teamwork is a bit lesser at 63%. It might be due to the imbalance in team playing among the group member. For programme compactness, interestingly it shows more than 70% of students feels that they enjoyed and were stress-free during the programme implementation. However, time management recorded the lowest score with only 36%. This might be due to last minute preparation which makes the planning process a bit tight. In terms of knowledge and skill, it shows that all respondents feel they have learnt new things and improve their skills (i.e., communication, leadership). Overall, the activities can encourage students to reflect on social competencies such as communication and collaboration.

Table 4: *Feedback towards the Authentic Learning Dimension*

Dimension	Percentage
Satisfaction	
Program Execution	93
Teamwork	63.3
Program Compactness	
Enjoy	73.3
Stress-free	63.6
Difficult	0
Time Management	36
Learning	
Knowledge	100
Skill	93.3

Conclusion

Community service participation is becoming an integral part of education. Such participation combined with formal learning adds values to the students in terms of developing their attitudes and commitment. Therefore, a mechanism in applying such engagement for authentic learning is a necessity. In this work, we developed the authentic process framework in order to value the students' participation in the community service activities. The FIEL framework is designed to be aligned with the affective domain where it promotes positive attitudes among the students. We quantified the FIEL framework through an online survey and community case study. For the online survey, its purpose is to indicate initial views from the students towards the community services and their interest to involve in such activities. Meanwhile, we designed the case study to investigate whether the FIEL components were appropriate with the designed activity. Testimonies of tasks submitted from the activity shows that the FIEL is suitable

and appropriate to be used as a teaching guideline for student-community engagement programme. In the near future, we aim to develop an online evaluation tool according to FIEL for effective reporting and scoring, to make the assessment process flexible and effective. Optimistically, authentic learning through solving real issues is expected to have a positive impact on students' motivation and quality.

References

Dobos, Á. (2016). Innovative learning environments facilitating community-based learning experiences and citizen engagement. *Journal of Education Research*. *10*(3), 185-200.

Furnham, A., Nuygards, S., & Chamorro-Premuzic, T. (2013). Personality, assessment methods and academic performance. *Instructional Science*. 975-987.

Gelmon, S., Holland, B., Driscoll, A. & Spring, A. (2018). *Assessing service-learning and civic engagement: Principles and techniques*. Stylus Publishing LLC.

Leda, C., & Erica, S. (2006). Assessing learning in community service learning: a social approach. *Michigan Journal of Community Service Learning*. *13*(1), 44-55.

Lund, S. (2016). *Making Learning Authentic: An Educational Case Study Describing Student Engagement and Motivation in a Project-Based Learning Environment*. Arizona State University.

Milner, J., Myers, S., & O'Byrne, P. (2015). *Assessment in social work*. Palgrave Macmillan.

Paula, G. (2013). Academic service learning pedagogy in social work: exploration of student and community lived experiences using an interdisciplinary course model of community-university engagement.

Purnamasari, D. (2017). Implementation of authentic learning model in social learning for depelopment of student's social skills (Classroom Action Research at class of VII A in SMP Negeri 7 Bandung). International Journal Pedagogy of Social Studies. 1(2): 8-14.

Roth, W. M., van Eijck, M., Reis, G. & Hsu, P.-L. (2019). *Authentic science revisited: In praise of diversity, heterogeneity, hybridity*. Leiden: Brill Sense.

Rowntree, D. (2015). *Assessing students: How shall we know them?* London: Routledge.

Thies, T. T. (2014). *Affective learning experiences influence positive interactions with anxiety: Comprehensive musicianship with seventh grade jazz students.* PhD (Doctor of Philosophy) thesis, University of Iowa.

Thorhallur O, F., Heather M, M., & Lori, D.-L. (2015). Evaluating impact of small-group discussion on learning utilizing a classroom response system. *Journal of Behavioral Education*, *24*(3), 317-337.

Chapter 9

Enriching Learning Experience through Service-Learning

Muhd Khaizer Omar

Keywords: work-based learning, experiential learning, volunteerism

Introduction

The Malaysian Educational Blueprint 2013-2025 highlights volunteerism as one of the pillars to encourage students' involvement in community service activities. The influence of volunteerism in the forming of grassroots identity is significant for the national growth in terms of values and ethics. Indeed, the involvement in volunteering-typed activities develops human beings that care and it also promotes cooperative relationship among people. In the educational context, volunteerism is regarded as a common practice to encourage student's engagement with the community. However, to guarantee the success of volunteerism, activities related to the community-based project must be developed systematically with proper objectives. Often our understanding of the volunteerism concept is misleading. Hence, the word "volunteerism" itself has often been defined interchangeably and often referred to student activities, which is imprecise and misinterpreted. Therefore, the idea of promoting volunteerism according to the Malaysian Educational Blueprint 2013-2025 blueprint may fail if the concept of volunteerism is unclear. To develop volunteerism spirit among students, the introduction of the service-learning concept is necessary for the Malaysian educational institutions. This chapter promotes service-learning, which is a type of volunteering-type activity, by referring to an existing service-learning model, named the *University of Oklahoma Program for Instructional Innovation* as a guide to the systematic approach of service-learning from the perspectives of Malaysian undergraduates. The service-learning model was introduced and propagated by the University of Oklahoma Instructional Innovation Division. The concept of service-learning embedded in the tertiary level curriculum in the University of Oklahoma with goals to cultivate knowledge transfer, positive cultures and enrich ethical and moral values within communities. The model consists of four pillars: (a) academic achievement (b) civic knowledge, (c) civic engagement, and (d) disciplinary knowledge. The cyclical process from these four elements in the model was employed in the service-learning project in the Malaysian context and investigated to explore whether it could produce a meaningful learning experience. In this qualitative case study, a service-learning project was organised by Malaysian public university undergraduate students with a group of chalet and resort and homestay owners in *Pengkalan Balak,* Malacca, Malaysia. The study found positive transferable employability skills values to tertiary students. The service-learning activities were found not only assisted students to venture the real-life environment once they graduated from their undergraduate program, but also enhanced their intrapersonal and interpersonal skills for future employment.

Trends and Applications of Service-Learning

Service-learning has been adopted into many academic courses for universities throughout the world, and especially in the United States of America. In the case of the United States of America, most of the time the service-learning programme at the university level is a stand-alone organisation governed by students and non-academic staff. The main objective of this organisation is to enrich students' values, skills, and capabilities before they graduate from their programme. The service-learning programmes conducted at the university generally are not limited to university settings. The growth of service-learning projects has been expedited to businesses, schools, and agencies in the United States. In fact, it is incumbent for universities in the United States of America to develop a service-learning project for their students and embed in their course content to strengthening the study programme. This profound idea of developing service-learning organisations at the state universities makes them as the best universities in the world and increases their prestige in providing the best education for students.

As education permeates many new ideas of knowledge transfer, the effects of service-learning become more profound. Service-learning, as an instructional strategy, has been adopted in the University of Oklahoma (OU) at the undergraduate and postgraduate levels. Service-learning devotes student's participation in structured activities which in effect promotes holistic educational alternatives and encompasses cross-disciplinary educational practices. The positive impacts are evident on community surroundings at the state of Oklahoma, whereby, the bilateral relationship between the people and university is flourished. The students enjoy the well-rounded and current educational atmosphere, and at the same time exercise employability skills that are highly required in the employment market. The service-learning model by the *University of Oklahoma Program for Instructional Innovation Division* comprises primal elements that suit with the 21st-century educational ecosystem contends to bring into a new perspective in teaching and learning environment.

The practice of service-learning has become widespread in the state of Oklahoma, United States of America. One of the service-learning organisations under the purview of the university located at Oklahoma State University (OSU). OSU implements the service-learning activities through the campus life organisation, named as Service-Learning Volunteer Centre (SLVC). The primary function of SLVC is one stop-center for students, staff, and faculties to gain information and resources to engage within community services. The objective of this programme is to enhance students' skills through civic engagement and to align students' capabilities and capacities in the life-changing workforce demands. Approximately, 415,755 individual hours of service were recorded in the last five years and from these number over 2,305 students registered as Oklahoma State University volunteers through SLVC (Oklahoma State University, 2019).

SLVC focuses on areas, such as advocacy, domestic violence, educational elderly, environmental, financial literacy, health, homeless, hunger, international literacy, low-income, and national and youth program. Those areas are chosen based upon learning outcomes and students' interests from their academic programme, which combines students existing theoretical and practical knowledge before providing a service-learning project to the community. The intended outcomes for such programmes are such as developing the network, sharing the resource, forming a partnership, impacting social issues, assessing best practices, increasing visibility, learning about community service agencies and resources they need, and providing avenues of recognition.

The service-learning in the educational curriculum context offers systematic projects that exacerbate students' self-reflection and knowledge creation. Compared to volunteering-typed activities, service-learning activities are different in terms of their application and programmes structure because they involve theoretical and practical knowledge in the classroom. Besides, the application of service-learning comprising calculated credit hours based upon several service hours spending by students within service-learning. Moreover, the element of credit calculation in service-learning attracts students to be part of the service-learning project during their academic journeys at the university.

Service-Learning Application in Malaysia

In Malaysian tertiary education system, the concept of volunteerism is not foreign and is practiced quite widely among many tertiary education programs. However, the author contends that the impacts of volunteerism might not be as holistic and effective as compared to service learning. That said, it is important to understand the difference between volunteerism and service-learning. The concept of volunteerism differs from service-learning project in terms of application and programs' structure, where the service-learning in the educational curriculum context offers systematic projects that exacerbate students' self-reflection and knowledge creation. Compared to volunteering-typed activities, service-learning activities are different in terms of their application and programme structure because they involve theoretical and practical knowledge in the classroom. In addition, the application of service-learning comprising calculated credit hours based upon number of service hours spending by students within service-learning. Moreover, credit inculcation in service learning attracts students to be part of service-learning project during their academic journey at the university.

The premise of service-learning is to integrate community services into academic content (Furco, 2001). National Service-Learning Clearinghouse (2006) defined service-learning as a teaching and learning strategy that accommodates learning meaningful community services with instruction and reflections come from the enrichment learning experiences, the community engagement, and the civic responsibility principles. service-learning activities are more on systematic integration between community service and academic knowledge as compared to volunteerism, for example, which is a personal effort to offer assistance that comes in the form of energy and finance.

Due to competition in the graduate market for employment, educational institutions have implemented various strategies to ensure their graduates fit for the job market soon after graduation. The introduction of the performance-based evaluation through grades, cumulative grade point average (CGPA), merits indicates students' performance in academics. However, the outcome of this system does not interpret what is the definition of a high-performance student. Thus, the intention to flourish students' knowledge, skills, and core employability skills that are necessary for the 21st-century workforce (Deba, Jabor, Buntat & Musta'mal, 2014), may fail due to lack of strategy in preparing students for employment.

Skill deficiencies have become a major concern among graduates in the current industrial settings. This dilemma has significantly impacted educational institutions, communities, and industries. Issues such as career readiness, workforce skills levels, and transitional skills from school to workplace of graduates impact the development of a nation. The significant impact of economical movement and the challenges of unemployment are vital to ensure the bright future of our generation.

Global industries have also changed rapidly in terms of employee intakes, trends on economic growth, and market petting strategies. Companies require employees who are capable of initiating and suggesting innovative solutions to problems, not only students who excel in academics or memorisation of knowledge (Crutsinger, Pookulangara, Tran, & Duncan, 2004). For this reason, universities have been pushed to construct a curriculum that integrates experiences into practice (Granello, 2001) enlarge students' capabilities and practicing employment in a real-life setting.

Moreover, mobilisation and globalisation of the economic setting demand employees to be diverse and culturally motivated. Several jobs assigned to our current employees are significantly related to understanding other cultures and work ethics they practice in foreign countries. Students', need to prepare for employment that demands the set of criteria for multicultural awareness and work ethics from different countries (Goldberg & Coufal, 2009).

Service-learning has become one the most favoured topics in research (Hudin, Osman, Shokory, & Ab Wahid, 2018; Latib, Amin, Saud, & Kamin, 2017; Vinitha, 2015), however, it seems to be lacking in terms of practices in the real classroom environment. It is found that the service-learning practices are lacking among educators at any tertiary levels of education although the publicity of this teaching and learning strategy is prevalent in Malaysian higher educational institutions (Manaf, Othman, & Ahmad, 2018; Faraazlina & Zunurain, 2018; Zain, Basri, Mamat, Ghee, Syaril, & Rahman, 2017; Latif, Rahim, Amin, & Peter, 2016; Jalil & Esa, 2012). More importantly, there has been little discussion about the transferable skills that are useful for employment once students completed their undergraduate or postgraduate programme. In addition, the application of service-learning is limited in Malaysia due to lack of promotion through mass media and lack of knowledge about the programme at the school to the university levels. To make matters worse, there is misconception between the concept of volunteerism and service-learning.

Based on the aforesaid stated problems, it is significant to introduce service-learning activities in the curriculum content through academic engagement with the communities. The author believes that service-learning impacts students' interpersonal skills, civic values, and higher-order thinking skills which help them in their future employment (Crews & Stitt-Gohdes, 2013). Present communities and organisation require people willing to serve in localities as well as at the workplaces (Robinson & Torres, 2007). Service-learning activities have also been promoted in universities to integrate students' knowledge and real-life practices. For these reasons, it is essential to highlight the needs of volunteerism through the service-learning system at the tertiary level by inserting the element of volunteerism in the academic curriculum. Therefore, the purpose of this study is to explore the benefits of service-learning application at the university level and to uncover the employability skills element that is valuable for students' future employment.

The University of Oklahoma (OU) Service Learning Model

Service-learning has its root in community services, which is a long-standing American democratic tradition based on the ethical ideas of building good character and developing a good citizen (Allen, 2005). This reciprocal understanding has become essential in developing students in many universities in the United States. The transcendence from the academic experience to employment is vital to assist students preparing for employment. Models of service-learning have been placed within the university missions and objectives in collaboration between a university and the local community. Generally, service-learning serves as a bridge that engages university and communities through students' service-learning projects.

According to Furco and Billig (2002), service-learning project must integrate such components as: (i) be organised in relation to an academic course or curriculum, (ii) have clearly stated learning objectives, (iii) address real community needs in a sustained manner over a period of time; and (iv) assist students in drawing lessons from the service through regularly scheduled, organised reflection or critical analysis activities, such as classroom discussions, presentations, or directed writing. Referring to this guideline, the progressive approach of service-learning demonstrates active learning through the cyclical process of learning and hands-on practices. This activity flourishes a continual practice of knowledge-making through practicalities and reflections.

The model that was chosen for this study is from the University of Oklahoma service-learning model. The model consists of four pillars as independent factors: (i) disciplinary knowledge, (ii) academic achievement, (iii) civic knowledge, and (iv) civic engagement. The conceptual model elucidates the blending of four pillars of service-learning to produce meaningful service-learning activities. Disciplinary knowledge comes from the engagement of academic content (e.g., formal learning instruction in a specific area). Academic engagement leads to civic knowledge transfer through dual processes of amalgamation between gathering information and civic awareness. Civic experience occurs when the practice of civic knowledge comes into reality. The experience comes from civic

activities that lead to disciplinary knowledge depending upon the field an individual is involved with. The cyclical process accumulates the creation of knowledge that is constantly being created by the individual via engagement.

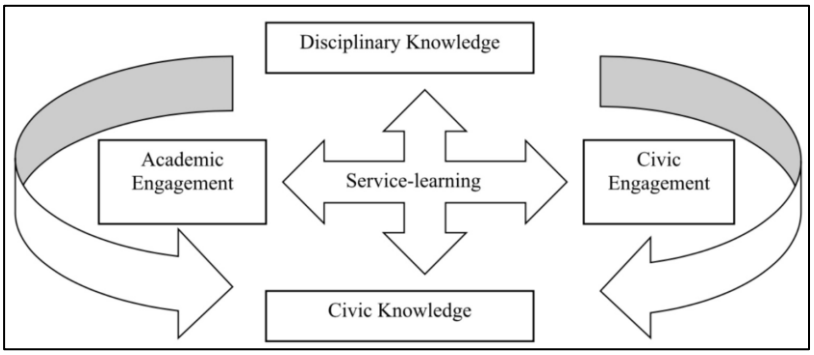

Figure 1:*University of Oklahoma's Service-learning Model*

To train students through participation in community services, service-learning activities must be introduced using systematic approaches. By referring to the model, service-learning activity requires a cyclical process that includes academic engagement, civic knowledge, civic engagement, and disciplinary knowledge (Robinson & Torres, 2007), to achieve meaning, teaching and learning instructions in the educational settings.

The introduction of a service-learning portfolio in teaching and learning procedures assist educators to encourage students' participation in community service activities. The continuity of service-learning as a form of work-based learning improves students' capacities and capabilities to venture into future employment. The possession of educational experiences is meaningful, but also prepares students to succeed in the future workplace environment. Active engagements through experiential learning also need to be done to enhance students' preparedness in the future challenges that come from various environmental settings (Jordan & Shraeder, 2011).

Research Methodology

In this paper, the author analysed the model of OU service-learning application through the implementation of the service-based project in the Malaysian educational settings. A group of 80 second and the third-year students participated in an organised service-learning project with a group of chalet and resort and homestay owners in *Pengkalan Balak,* Malacca, Malaysia. The programme was embedded in a course of the bachelor programme for the duration of one semester. Right after the completion of the programme, 20 out of 80 students were selected as participants for the interview session using the fish-bowl technique. These 20 students were then divided into four focused groups and invited for the interview on four different occasions and designated

time. To proceed with the study, participants were required to sign a letter of consent. All interview sessions were recorded and each interview session took approximately forty-five minutes to one-hour in-length and was conducted in an informal, conversational, and open-ended manner. The narrative was analysed using constant comparative analysis. The interview questions were developed and validated by panel experts. The author defined and explained the concept of service-learning from the lens of the US higher education system and four emerged themes derived from constant comparative analysis: leadership skill, communication skill, critical thinking skill, and teamwork skill. The author considers the meaning and value of his analysis to promote service-learning to the students at the college level, lecturers, and policymakers at the administrative level.

Results and Findings

From the constant comparative analysis, four themes emerged. These themes are: 1) leadership skill, 2) communication skill, 3) critical thinking skill, and 4) teamwork skill. This portion of the narrative was analysed based on employability skills perspectives whereby other narratives are more of value-based which were reported in other articles. Figure 2 describes the emergent of employability skills and the subthemes from the service-learning application.

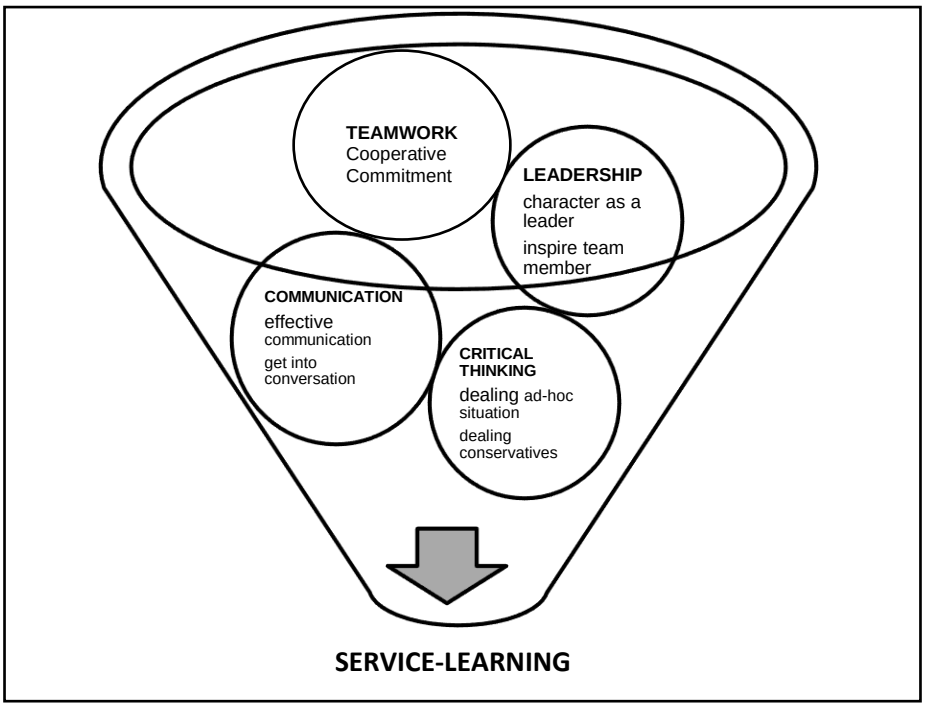

Figure 2: *Employability Skills Themes Emergent*

This study adapted a service-learning model by the University of Oklahoma in planning service-learning activities in a higher educational setting. Each of the pillar (i.e., academic engagement, civic knowledge, civic engagement, and disciplinary knowledge) introduced in this service-learning model was inculcated in the programme in a cyclical fashion. The higher cyclical order ensures that the continuity of the service-learning process happens after student graduates from the university. From the analysis of the data, it was found that the relationship between knowledge creation at the education level and civic engagements within community flourishes students' awareness of the environment of volunteerism. Students who were exposed to volunteer activities as early as the first year of their study at universities and end at the final semester of their course programme were found to have a positively changed attitude on the importance of volunteerism. Hence, the support from the educational institution to encourage service-learning projects among students is imperative.

The author found that service learning has great potential in education as teaching and learning methods. It was found that the accumulation of phase-by-phase process in service-learning also encourages better evaluation and assessment for students' academic performance. It was also found that the integration between classroom learning and the service-based project gives students and educators more choices in instructional settings. As such, it can be said that the adoption of service-learning component in the curriculum empowers and engages students with a constructivist approach. The application of service-learning has become most favorable to students learning and they are ready to involve in any service-learning projects organised by the educational institutions. The formation of employability skills has become the added values in the existing model as each pillar comprises traits in developing student's skills. In this regards, it is believed that the OU service-learning model can help educational stakeholders to design more organised and systematic service-learning projects.

Discussion and Conclusion

A prudent approach to a service-learning project must be carried out concomitantly with the trends in industries. Hence, learning and possession of skills-to-work are important to ensure workforce placement for the graduates (Robinson & Torres, 2007). The ability of service-learning to flourish many aspects of students' capacities and capabilities to become a well-rounded and holistic attribute towards the nation is pertinent in replacing monotonous and stagnant traditional teaching and learning approaches.

Service-learning translates theoretical knowledge comes from the classroom to a real-life working environment by applying practical skills to enrich students' overall learning experience. Hence, continuous efforts need to be made to further promote the development of a curriculum based on service-learning. Teachers should be given sufficient training and exposure to ensure the implementation of service-learning achieves its goals. Educators also need to be more exposed to implementing service-learning in teaching and learning to encourage meaningful learning experience. In ensuring the continuity of employment opportunities among graduates continues to serve in one nation,

service-learning can be one of the best teaching and learning methods to help the educational curriculum being taught at the university level to be transmitted to the industrial settings.

In years to come, a society from diverse backgrounds, ethnicities and religious beliefs will continue to live together under the same 'roof' and acknowledge their differences. Thus, to ensure the peace and harmony among them continue to flourish; the activities related to service-learning can be applied. Service-learning promotes intrinsic values that individuals and groups of people have the inherent right to prosper the positive living and values to be practiced. Service-learning becomes a platform for the generation to transmit all the positive traits. In the educational context, service-learning thrives as authentic learning by engaging student with real-life experience through practicum and will help to improve communication with the public. The experience that comes from service-learning can be beneficial to students who engage in experiential learning and community who become the recipient of knowledge sharing.

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References

Allen, B. F. (2005). Service learning: a guide to selected resources. *Collection building*, *24*(4), 127-132.

Blueprint, M. E. (2016). Blueprint 2013-2025. (2013). Ministry of Education, Malaysia.

Crews, T., & Stitt-Gohdes, W. (2013). Using social Media to develop Business communication skills in a service-learning setting. *The Journal of Research in Business Education*, *55*(1), 53.

Crutsinger, C. A., Pookulangara, S., Tran, G., & Kim, D. (2004). Collaborative service learning: A winning proposition for industry and education. *Journal of Family and Consumer Sciences, 96*(3), 46.

Deba, A. A., Jabor, M. K., Buntat, Y., &; Musta'mal, A. H. (2014). Potential of service-learning on students' interpersonal skills development in technical and vocational education. *Asian Social Science, 10* (21), 1.

Faraazlina, R., & Zunurain, F. (2018). The impacts of community service on students' soft skill development. *Journal of Techno Social*, *9*(2).

Furco, A. (2001). Advancing service‐learning at research universities. *New Directions for Higher Education*, *2001*(114), 67-78.

Furco, A., & Billig, S. H. (Eds.). (2002). *Service learning: The essence of the pedagogy*. IAP.

Goldberg, L. R., & Coufal, K. L. (2009). Reflections on service-learning, critical thinking, and cultural competence. *Journal of College Teaching and Learning*, *6*(6), 39-49.

Granello, D. H., & Sears, S. J. (1999). The school to work opportunities act and the role of the school counsellor. *Professional School Counselling, 3*(2), 108.

Henderson, K. (1984). Volunteerism as leisure. *Nonprofit and Voluntary Sector Quarterly*, *13*(1), 55-63. P.55).

Hudin, N. S., Osman, J., Shokory, S. M., & Ab Wahid, H. (2018). Service learning in higher education: Evidence from Malaysia. *International Journal of Engineering & Technology, 7*(3.30), 474-479.

Jalil, N. A. A. & Esa A. (2012). Kemahiran menyelesaikan masalah menerusi aktiviti kokurikulum (khidmat masyarakat) dalam kalangan pelajar UTHM [Problem solving skills through co-curriculum activities (community service) among UTHM students]. *Prosiding Seminar Pendidikan Pasca Ijazah dalam PTV, 2*, 101-112.

Jordan, M. H., & Schraeder, M. (2011). Enhancing education through service learning: A project overview. *Development and Learning in Organizations: An International Journal*, *25*(5), 21-23.

Latib, A. A., Amin, N. F., Saud, M. S., & Kamin, Y. (2017). Impact of a service learning program to the university and the community. *Advanced Science Letters, 23*(1), 596-599

Latif, A.A., Rahim, M.S.M., Amin, N. F. M., & Peter, C. J. (2016). Kesedaran sosial dan penglibatan mahasiswa dalam program khidmat masyarakat. *Jurnal Pemikir Pendidikan, 7*, 89–100.

Manaf, M., Othman, E., & Ahmad, N. (2018). Impact of community service activities on the soft skills development of polytechnic engineering students Sultan Mizan Zainal Abidin. *Jurnal Kaunseling dan Pendidikan*, *6*(2), 78-86.

Oklahoma State University (2019). Service-learning. Retrieved from https://osuokc.edu/servicelearning

Peoplegiving (2019). Joyful giving, joyful feeling. Retrieved from https://www.peoplegiving.org

Robinson, J. S., & Torres, R. M. (2007). A case study for service-learning: What students learn when given the opportunity? *NACTA Journal*, *51*(4), 2-8.

University of Oklahoma, Service Learning. Learning teaching program. Program for Instructional Innovation. 24 Jan 2010 <http://writingcenter.ou.edu/ltp/>.

Vinitha, P. G. (2015). The role of reflective learning, service-learning and social impact in the sustainability of Malaysian universities (Doctoral dissertation, Universiti Utara Malaysia).

Zain, S. M., Basri, N. E. A., Mamat, L., Ghee, T. K., Syaril, S., & Rahman, N. S. A. (2017). Community service as platform for environmental ethics in citra education. *Journal of Engineering Science and Technology*, *12*, 67-79.

Chapter 10

Students' First Impression, Learning Experience and Feedback on a Prototype Augmented Reality Integrated Water Quality Module

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Keywords: augmented reality, water quality

Introduction

Currently, universities around the world are dominated by the generation Z or the digital natives. They are known to be addicted to the internet (20%), play video games (90%), have short attention span (8 seconds) and are easily bored by traditional lectures in the classroom (MOHE, 2018). For this reason, educators must adapt to the students' learning styles, by utilising adaptive teaching methods and materials. Futuristic learning spaces and technologies promote immersive learning in accomplishing the learning goals, where the best way of learning is through doing and integration (MOHE, 2018). Experiential learning focuses on individuals and can be done through hands-on via technology-enabled learning approaches such as virtual reality (VR) and augmented reality (AR) (MOHE, 2018). Augmented reality (AR) refers to technologies that project digital materials onto real world objects. In 1997, Ronald Azuma formulated a broad definition of AR that consists of three characteristics: (a) the integration of virtual objects and the real world; (b) users can interact with virtual objects in real time; and (c) it is registered in three dimensions (Chiang, Yang & Hwang, 2014). Azuma's definition is currently the most widely accepted (Chiang et al., 2014). The two major categories of AR are image-based AR and location-based AR. The use of AR can be an asset for learning. AR systems allow the learner to interact with the real world in ways that were not possible before. They create new situations that would be impossible to create in the real world or digital environment (Cuendet, 2013). AR is a very efficient technology for higher education. Students can improve their knowledge and skills, especially on complex theories or mechanisms of systems or machinery (Lee, 2012). Liarokapis, Sylaiou, Basu, Mourkoussis, White and Lister (2004) demonstrated that AR can make complicated mechanisms and difficult theories in higher education accepted and understood by students with contextually enriched interaction using AR technology. In the results of their research, Liarokapis et al. (2004) showed an AR view of a student examining an augmented 3D model of a camshaft arrangement in conjunction with a set of real engine components. It is highly likely that AR can make educational environments more productive, pleasurable, and interactive than ever before. AR not only has the power to engage a learner in a variety of interactive ways that has never been possible before but also can provide everyone with a unique discovery path with rich

content from computer-generated three-dimensional environments and models (Lee, 2012).

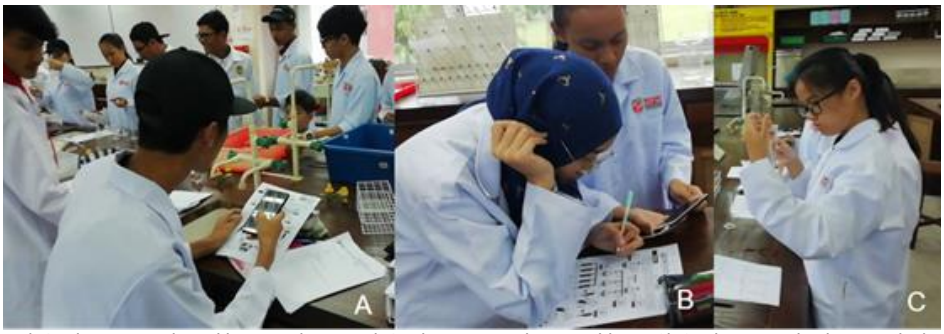
Considering the impact towards learning problems, the main advantages of using AR are: learning gains (43.75%), motivation (31.25%), interaction (15.63%) and collaboration (18.75%). In addition, AR has been effective for better learning performance (53.13%), learning motivation (28.13%), student engagement (15.63%) and positive attitudes (12.50%) (Bacca, Baldirid, Fabregat, Graf & Kinshuk, 2014). AR provides the opportunity for users to interact with computer-generated content from the real world. Educators and technical developers also exploit the capabilities of AR technologies to enable new forms of learning in various subjects (Dunser & Hornecker, 2007; Kondo, 2006; Liu, *et al*, 2007). Malone and Lepper (1987) demonstrated that games can increase motivation and are therefore an essential feature of the lives of children and teenagers. Many educators include AR in games in learning settings and have transferred learner involvement and energy from games to educational activities (Chen, Ho & Lin, 2015). Through instructional games, learners develop higher-order cognitive skills (Sandford & Williamson, 2005).

The idea to incorporate AR elements into the water quality course is to enhance student learning experience, especially during laboratory sessions. In the laboratory, students need to conduct experiments by following an instruction manual and being briefed by a demonstrator. Students tend to forget steps and make many critical mistakes when conducting the experiment. Here, explanatory videos: step-by-step instructional videos will be embedded in the module as AR for the students to access at any time, thus minimising errors and improving the precision of the student's work and understanding on the topic. The objective of this study is to examine the student's impression and learning experience when they are engaged with AR elements. This chapter presents the first impression, learning experience and feedbacks from students as they are engaged with a prototype augmented reality embedded course module.

Methodology

Participants

This prototype AR course module was created for the course: FMA2004 Water Quality and Soil Management. This is a three credit diploma course for the Diploma in Fisheries programme. A total of 39 students participated in the study (Figure 1). The students comprised 41% males and 59 % females. The students' age ranged from 18 to 21 years old and the majority were aged 19 (74.4%). All the students experienced AR for the first time.



A) Students scanning with smartphones; B) Students accessing AR videos; C) Students conducting practical on water quality

Figure 1: *Diploma students engaging with AR course module during a practical session*

Design and Development of a Prototype Course Module

The prototype course module was based on water quality experiment in the laboratory. The module focused on the water nutrient nitrite. The module was designed with simple graphics, organised within a single page. The module is embedded with seven AR trigger images and two QR codes (Figure 2).

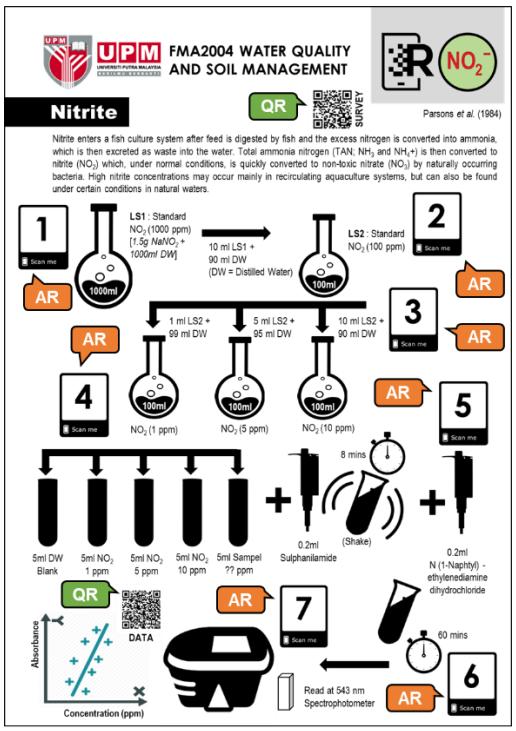


Figure 2: *Prototype water quality course module embedded with seven AR image and two QR codes*

Design and Development of a Prototype AR Scanner

When designing and developing the course module, the video contents of the experiment were recorded and edited beforehand into mp4 format. Seven simple trigger images were designed using Microsoft Power Point and saved as jpeg. The videos and trigger images were uploaded correspondingly to create seven AR trigger content using HP Reveal Studios (https://studio.hpreveal.com). Once completed, HP Reveal mobile application was used to access the AR contents. Scanning the seven AR trigger images will open seven different videos related to the experiment (Figure 3). In addition, two QR codes were created using QR code generator (https://www.qr-code-generator.com). The QR codes linked to a google sheet for data input and to the online AR questionnaire respectively.

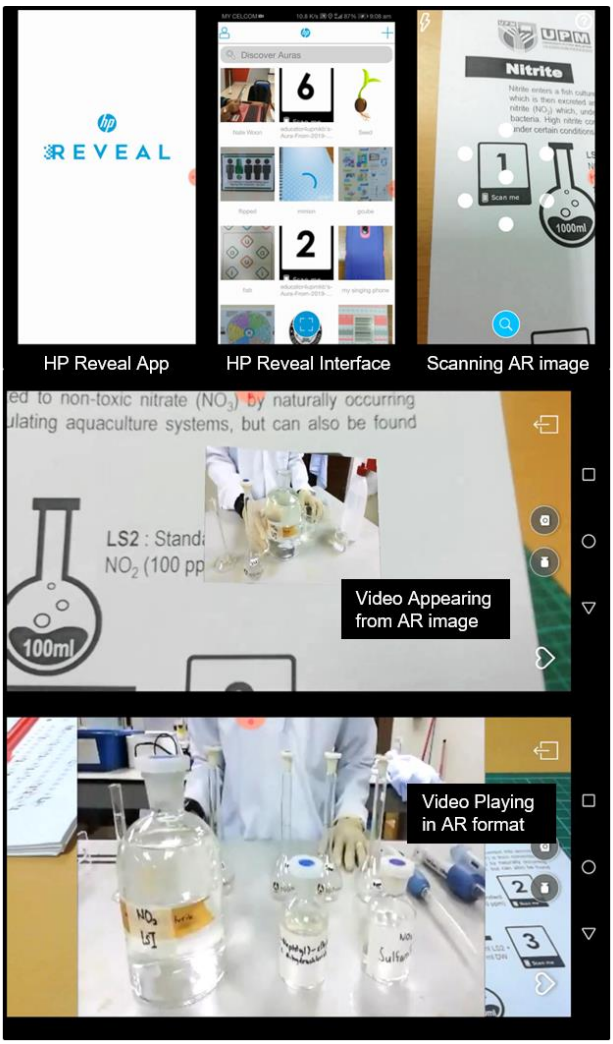


Figure 3: *Interface of HP Reveal mobile scanner with augmented reality embedded course module*

Design of Questionnaire

This study employed both qualitative and quantitative research methods. The main reason for using a mixed method approach is to better answer the research questions and to provide richer data. A questionnaire comprising 20 items was designed to assess the student's first impression, learning experience and feedbacks on AR course module. The items were categorised into six variables: engagement and interest (5 items), cognitive overload (4 items), knowledge acquisition (3 items), interdependence (2 items), flow and processes (3 items) and feelings (3 items). The variables developed were referenced to Bacca, Baldirid, Fabregat, Graf and Kinshuk (2014), Dunleavy, Dede and Mitchell (2009) and Ibáñez, Di Serio, Villarán and Kloos (2014). Students answered the items based on a 5-point Likert scale (Table 1).

Table 1: *Questionnaire on student's learning experience with AR content*

Variable	Questions	Scale
1. Engagement & Interest	1. I am more engaged with learning through using AR.	Likert Scale 1 – 5
	2. Using AR was fun.	
	3. I prefer using AR to learn.	
	4. I am interested to know more about this subject.	
	5. I could learn about the concepts with less effort.	
2. Cognitive Overload	6. I learn so much information.	Strongly Agree – 5 Agree – 4 Neutral – 3 Disagree – 2 Strongly Disagree - 1
	7. There is too much information to process.	
	8. It was tough to learn the technology.	
	9. Solving problems using AR is too exhaustive.	
3. Knowledge Acquisition (Cognitive)	10. I gained more knowledge using AR.	
	11. Using AR enhances my concentration.	

		12.	I remember the basic concepts that was taught.
4.	**Interdependence**	13.	This project enhances our communication with our teammates to solve problems.
		14.	This project enhances working together with teammates to solve problems.
5.	**Flow and Processes**	15.	I was difficult to navigate through the process
		16.	I had no problems to understand the instructions.
		17.	I was able to follow the steps easily.
6.	**Feelings (Affective benefits)**	18.	It was rewarding to be able to solve the problems using AR.
		19.	This AR module gave me a sense of enjoyment.
		20.	I have a feeling of success when I use AR to solve problems.

Results and Findings

Engagement and Interest

The majority of students gave positive feedback for engagement and interest as shown in Table 2.

Table 2: *Student response on engagement and interest of AR interaction.*

	Questions	**Percentage**		
		+ve	Neutral	-ve
1.	I am more engaged with learning through AR.	70.8	12.8	15.4
2.	Using AR was fun.	79.5	5.1	15.4
3.	I prefer using AR to learn.	71.8	10.3	17.9

4.	I am interested to know more about this subject	79.5	17.9	2.6
5.	I could learn about the concepts with less effort.	79.5	17.9	2.6

Overall, students agreed (average 75.22%) that AR improved their engagement and interest (Table 2). Three items shared the highest percentage of positive scores (79.5%), where students agreed that using AR was fun, increased their interest about the subject and made learning easier for them. A good percentage of students also indicated that they prefer using AR for learning (71.8%) and made learning experience more engaging (70.8%).

Cognitive Overload

In general, the students exhibited a mixed reaction as indicated in Table 3. Overall, students did not experience cognitive overload (51.9%). Students indicated that they learned much information (79.5%) when engaging with the AR module. The elements of cognitive overload were exhibited where students indicated that there was too much information to process (58.9%) while a third of the students (30.8%) indicated a neutral response. The items about the using AR to solve problems received mix responses from the students. While the majority of students indicated no difficulties to solve problems using AR (41%), slightly more than a third of the students also indicated that it was exhaustive to solve problems using AR (33%). Another group remained neutral (25%).

Table 3: *Student response on cognitive overload of AR interaction*

	Questions	**Percentage**		
		+ve	Neutral	-ve
1.	I learn so much information.	79.5	12.8	7.7
2.	There is too much information to process.	10.2	30.8	58.9
3.	It was tough to learn the technology.	28.2	41	26.1
4.	Solving problems using AR is too exhaustive.	41	25	33.3

Knowledge Acquisition

In general, the students exhibited a positive feedback (Table 4). Overall, students agreed that AR improved their knowledge acquisition (71.8%). Within this variable, the highest percentage of students agreed they gained more knowledge using AR (74.4%). Students also agreed that using AR enhances their concentration (74.3%). A high percentage of students agreed that they remember the basic concepts of the experiment (66.7%).

Table 4: *Student response on knowledge acquisition of AR interaction*

	Questions	Percentage		
		+ve	Neutral	-ve
1.	I gained more knowledge using AR.	74.4	17.9	7.7
2.	Using AR enhances my concentration.	74.3	15.4	10.2
3.	I remember the basic concepts that was being taught.	66.7	25.6	7.7

Interdependence

In general, the students gave positive feedback with regards to this variable (Table 5). Overall, students agreed that AR improved their communication and teamwork (79.1%). Within this variable, the highest percentage of students agreed using AR enhanced their teamwork (81.5%). Students also agreed that using AR enhanced their communication among teammates when engaging with AR content (76.9%).

Table 5: *Student response on interdependence of AR interaction*

	Questions	Percentage		
		+ve	Neutral	-ve
1.	This project enhances our communication with our teammates to solve questions.	76.9	15.4	2.6
2.	This project enhances working together with teammates to solve problems.	15.4	12.8	7.9

Flow and Processes

The students exhibited a mixed reaction as shown in Table 6. Overall, students were able to track the flow and processes when engaging with AR contents (58.9%).

Students indicated that they were able to follow the steps easily (74.4%) and had no problem understanding the instructions (71.8%) when engaging with the AR module. The item — navigating difficulties using AR received a mix response from the students. More than a third of students indicated having difficulties to solve problems using AR (35.9%), while slightly more than a third of students remained neutral (33.3%).

Table 6: *Student response on flow and processes of AR interaction*

	Questions	Percentage		
		Positive	Neutral	Negative
1.	I was difficult to navigate through the process.	35.9	33.3	30.7
2.	I had no problems to understand the instructions.	71.8	20.5	7.9
3.	I was able to follow the steps easily.	74.4	20.5	5.1

Feelings

The students exhibited a very positive feelings about AR interaction (Table 7). Overall, the majority of students enjoyed using AR (82%) and felt that it was rewarding (71.8%) using AR. They also had a feeling of success solving problems through the use of AR (74.4%).

Table 7: *Student response on feelings about AR interaction*

	Questions	Percentage		
		Positive	Neutral	Negative
1.	It was rewarding to be able to solve the problems using AR.	71.8	20.5	7.7
2.	This AR module gave me a sense of enjoyment.	82	5.1	12.8
3.	I have a feeling of success when I use AR to solve problems.	74.4	17.9	7.7

Comments and Feedback

In the last section of the questionnaire, students were encouraged to express their feelings and provide personal feedbacks in their own words after experiencing the AR contents. A total of 34 students gave their comments and feedbacks and the majority were positive (82%). The overall experience by students can be expressed as easy, fun, enjoyable, engaging, interesting, new-experience and easy to understand (Table 8). Table 9 shows that students are concerned about problems with the internet connectivity, no access to mobile data or wifi (Table 9).

Table 8: *Student's positive comments and feedback on AR content interaction*

Best, I love it, The best, Fun, Enjoyable, *Mantap* and fun.
Good use of technology, It was a new experience.
Great and Easy to understand.
Having a great time using the module.
I had fun using AR. I gained new experience with that technology and it was very easy for me to understand the methods for the particular experiment. I hope that other experiments will be conducted through AR technology as well.
It was rather fun and more engaging for someone who enjoys VR as it uses on the educational field than the entertainment field.
Extremely interesting as it runs in line with modern technology.
My first experience of using is very easy to understand and east to understand.
I still understand the AR module because it's a practical demonstration.
It have so much fun than the original methods of doing experiments. This also hep students to gain more knowledge about how ICT work. The AR was more close to student nowadays where student is more engaged to modern technologies.
Really interesting and makes me more comfortable and confident using the laboratory apparatus according to the instructions.
Easier to understand the procedure of the experiment using AR module because it has an explanation video.
It was great and I wish to use it always. I can conduct the experiment easily using module AR.
Interesting and easy to understand. My comment needs to add pause, reverse, forward and other buttons for user convenience.
First experience using AR module, got a new experience.

Table 9: *Student's negative comments and feedback on AR content interaction*

It is difficult as the AR cannot function efficiently, it may be a new breakthrough to education but it is still lacking.
It was a nice experience but I prefer the previous way because my phone is not so good and always lagging, I also can't buy a new one because I didn't have money.
At first it's a bit confusing but with the help of lab assistant and other friends, I can use it correctly. But it took me almost half an hour to figure how to work it out.
No internet connection during these module and highly recommended admin to give an access the internet using this module.
The biggest problem is the every floor of the building have weaker strength of WiFi, so it will be harder to conduct AR and it takes more time to see the instruction compare to listen to lecturer, and not every people got own paid mobile data for that.
It's hard not to have wifi and internet data.

Discussion and Conclusion

This project used AR elements (videos) to enrich student's experience laboratory experiments. In the design and the development of the AR embedded module, marker-based AR was applied. The analysis from the respondents indicated positive experiences in four variables: *engagement and interest, knowledge acquisition, interdependence* and *feelings.* Two variables that gave a mixed response were *cognitive overload* and *flow and processes*. The findings corroborated with the main advantages of AR in education: learning gains (43.75), motivation (31.25%), facilitate interaction (15.63%) and collaboration (18.75%) (Bacca *et al*., 2014). In another water quality AR study, students who were engaged with EcoMOBILE showed significant learning gains (Kamarainen *et al*., 2013). Studies have shown that the use of AR contributed to increased academic achievement and promoted positive emotional experience (Ibáñez *et al*., 2014; Akcayir, *et al*., 2016).

For the variable, *cognitive overload,* most respondents agreed that they gained a lot of information. Unfortunately this turned out to be a disadvantage as the students had too much information to process. This phenomenon has been observed in younger students (6^{th} graders) when they used AR. Many of the students indicated that it was difficult to learn the technology and process the information at the same time (Dunleavy et al., 2009). The variable — *flow and processes* showed that students had difficulty to navigate through the process. This was because of the main hardware issues of the smartphones. The students' personal feedback indicated that internet connectivity was the main issue that hindered their experiences with AR (Table 9). As this prototype module was interlinked with the HP Reveal app that needed internet connectivity to function, the issue with internet connectivity was expected. The problems with hardware or software are not uncommon among students who were engaged with AR (Dunleavy *et al*., 2009).

Base on the findings of the six variables of learning experiences, it can be concluded that the use of AR was able to increase the engagement and interest, improve knowledge acquisition, interdependence, flow and processes, and feelings of the students. These findings were further supported by the personal comments and feedbacks expressed by individual students. Nevertheless, some students experienced certain levels of cognitive overload. The main issue that lowered the AR experience and caused some cognitive overload were related to internet connectivity. This problem was amplified because experiencing HP Reveal AR requires good internet connectivity. While majority of students had no problems with the internet, students without internet access had to rely on other students. These students were very much less involved in the learning process and their frustrations are reflected in their feedbacks. The information gathered from the students was very important and useful for further design and development of the projected applications to be constructed.

Based on the positive response from the students, the authors will continue with the project to design and develop an AR scanner, based on the unity platform (https://unity3d.com). The product will be a standalone mobile application that can be downloaded into any mobile device and be able to scan all AR markers

embedded in the course module. The application will be able to work without internet connectivity and this feature will be able to solve the problem of poor internet connectivity as experienced by the students in this study.

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References

Akcayir, M., Akcayir, G., Mirac, H. & Ocak, M.A. (2016). Augmented reality in science laboratories: The effects of augmented reality on university student's laboratory skills and attitudes toward science laboratories. *Computers in Human Behavior, 57*(2016), 334-342.

Bacca, J., Baldirid, S., Fabregat, R. Graf, S. & Kinshuk (2014). Augmented Reality Trends in Education: A Systematic Review of Research and Applications. *Educational Technology & Society, 17*(4), 133-149.

Birnbaum, R. (1982). Games & Simulations in higher education. *Simulations & Games, 13*(1), 3-11.

Chen, C.H., Ho, C-H. & Lin, J-B. (2015). The development of an augmented reality game-based learning environment. *Procedia – Social and Behavioral Sciences, 174*(2015): 216-220.

Chiang, T.H.C., Yang, S.J.H. & Hwang, G-J. (2014). Students' online interactive patterns in augmented reality-based inquiry activities. *Computers & Education, 78*, 97-108.

Cuendet, S., Bonnard, Q., Do-Lenh, S. & Dillenbourg, P. (2013). Designing augmented reality for the classroom. *Computers and Education, 68*(2013): 557-569.

MOHE (Ministry of Higher Education, Malaysia). (2018). *Framing Malaysian Higher Education 4.0: Future-Proof Talents*. Perputakaan Negara Malaysia.

Dünser, A., & Hornecker, E. (2007). An observational study of children interacting with an augmented story book. Proceedings of 2nd International Conference of E-Learning and Games (Edutainment 2007), CUHK, Hong Kong. pp. 305-315.

Dunleavy, M., Dede, C., & Mitchell, R. (2009). Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning. *Journal of science Education and Technology*, *18*(1), 7-22.

Hays, R. T. (2005). The Effectiveness of Instructional Games: A Literature Review and Discussion. Orlando: Technical Report 2005-004 Naval Air Warfare Center Learning Systems Division.

Ibáñez, M. B., Di Serio, Á., Villarán, D., & Kloos, C. D. (2014). Experimenting with electromagnetism using augmented reality: Impact on flow student

experience and educational effectiveness. *Computers & Education*, 71(2014), 1-13.

Kamarainen, A.M., Metcalf, S., Grotzer, T., Browne, A., Mazzuca, D., Tutwiler, M.S. & Dede, C (2013). EcoMOBILE: Integrating augmented reality and probeware with environmental education field trips. *Computers & Education,* 68(2014), 545-556.

Kondo, T. (2006). Augmented Learning Environment using mixed reality. Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2006. Honolulu, Hawaii, USA, pp. 83-87.

Lee, K. (2012). Augmented Reality in Education and Training. *TechTrends, 56*(2): 13-21.

Liu, W., Cheok, A. D., M-L, C.L., and Theng, Y-L. (2007). Mixed reality classroom: Learning from entertainment. Proceedings of the 2nd international conference on Digital Interactive Media in Entertainment and Arts. Perth, Australia, pp. 65-72.

Liarokapis F., Sylaiou S., Basu A., Mourkoussis N., White M. & Lister, P.F. (2004). An Interactive Visualisation Interface for Virtual Museums. In: *Proceedings of the 5th International Symposium on Virtual Reality, Archaeology and Cultural Heritage* (VAST), Brussels, pp. 47-56.

Malone, T.W. & Lepper, M.R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. E. Snow & M. J. Farr (Eds.). Aptitude, Learning, and Instruction, Vol 3. Cognitive and affective process analyses (pp. 223-253). Hillsdale, NJ: Lawrence Erlbaum.

Smith, D.R. & Munro, E. (2009). Educational card games. *Physics Education, 44*(5): 479-483.

Suhaimi, A.T. (2018). *Changing the game in higher education*. Keynote Presentation. Seminar Pendidikan 4.0: Menelusuri Pendidikan Holistik dan Global. Universiti Teknologi MARA.

Squire, K., Giovenetto, L., Devane, B., and Shree, D. (2005). From users to designers: Building a self-organizing game-based learning environment. *Techtrends*, 49(5), 34-42.

Zyda, M. (2005). From visual simulation to virtual reality to games. IEEE Computer. September, pp 25–32.

Chapter 11

Mind Mapping Session in Computer Network course for Ecological Science Students in Universiti Putra Malaysia

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Keywords: mind-mapping, satisfaction

Introduction

Currently, the Faculty of Human Ecology together with the Faculty of Computer Science and Information Technology in UPM are offering the Bachelor of Human Development Science with Information Technology. In this programme, ecological science students are required to take computer science courses as their compulsory subjects. Figure 1 shows the list of compulsory courses required by the Bachelor of Human Development Science with Information Technology programme.

a. Compulsory Minor (23 credits)

COURSE CODE	COURSE NAME	Kr	K	A/T	PREREQUISITE
SKR3200	Communication and Computer Network	3	3	0	None
SSE3001	Introduction to Software Engineering	3	3	0	SSK 3101
SSE3150	Web Application Development	3	2	1	SSK 3101
SSE4300	Software Project Management	3	3	0	SSE3301/SSE3001
SSK3003	Discrete Structures	3	3	0	None
SSK3100	Computer Programming I	4	3	1	None
SSK3101	Computer Programming II	4	3	1	SSK 3100

Figure 1: *Compulsory courses for Bachelor of Human Development Science with Information Technology*

One of the biggest challenges is to facilitate the ecological science students to learn the technical and theoretical part of computer science subject, namely Communication and Computer Network (SKR3200) course. It is necessary to assist these non-computer science students to learn the theoretical part i.e., the computer network terminologies and trends, together with its practical part which is network device configuration such as router and switch. To ensure that their understanding in each topic is achieved, mind-maps are used. Mind maps are a well-established study aid tool (O'Connor, 2011; Santiago, 2011).

Methodology

Mind-mapping sessions were conducted whereas students were required to do their mind-mapping after each main topic had been completed. A total of six

mind-mapping sessions were conducted with 30 minutes for each session in groups throughout Semester 1-2018/2019. Currently, there are some existing rubrics to assess the mind-map (Chen & Zhang, 2017; Coutinho, 2014; Evrekli, Inel, & Balim, 2010; Swestyani, 2018). The assessment rubric from University of Minnesota model (Coutinho, 2014) was used as an assessment method to evaluate their mind-maps due to its simplicity. At the end of the semester, a survey was conducted to measure the students' satisfaction and preference towards mind-mapping activities and reflection of teaching and learning of computer network's technical knowledge.

Results and Findings

Table 1 shows the results of student satisfaction about the mind-mapping session. The survey results have shown that, most of the students enjoyed and highly valued the mind-mapping sessions.

Table 1: *Student satisfaction about the mind-mapping session*

No.	Question	Response
1.	On a scale of 1 to 5 (1 not at all, 5 a lot), how much have you enjoyed the mind- mapping session?	13 rated 5, 5 rated 4 and 1 rated 3.
2.	On a scale of 1 to 5 (1 not at all, 5 a lot), how much value did you get from the mind-mapping session overall?	11 rated 5, 5 rated 4 and 3 rated 3.

Table 2 shows the results of student preferences of the mind-mapping session. The survey results showed that 10 out of 19 student stated that a 30 minute session is not sufficient. They agreed on the current settings that the session is effective to be done in a group manner instead of individually and they preferred to draw the mind map during class and not at home.

Table 2: *Student preference about the mind-mapping session*

No.	Question	Response
3.	The 30 minutes for each session is sufficient?	9 responded Yes, 10 responded No
4.	Which one do you prefer, the mind-mapping session to be done at home or during class?	18 responded during class, 1 responded at home.
5.	Which one do you prefer, the mind-mapping session to be done at individually or in group?	All responded in group

Table 3 shows the comments when they were asked what was the best part of their experience during the mind-mapping session. From the comments, it is obvious that sharing ideas together is something that the students enjoyed.

Table 3: *Student comments on the question, "What is the best part of your experience in mind-mapping session?"*

Do it together with my teammates.
Write the topic of mind map
berkongsi idea dan bincang bersama2 jika tidak paham sesuatu...sangat menyeronokkan
Finishing and submitting part
Share idea among groupmates
Get to know and discuss about the topic that we have study together with friends
can see an overview what i've learnt before
part utk pilih subtopic
In writing the mind map and also decorating the mind map together.
Brainstorming the significance content that need to be put in the mind map.haha
After finish
Team work
I can understand a little bit more because when i do the mind mapping, i will need to revise first and somehow i can remember some important points.
Get creative and know what's important sub topic discuss among members
Observe our member doing the mind map
I can revise the topics in class and exchange ideas on that particular topics with my group members. It does help me a lot to understand better :)
Revise the topic learned
Bonding time understand better
when my groupmate really cant accept other creativity then he or she try to make it more creative

Table 4 shows the suggested actions in order to improve the mind-mapping session. Some of the students wanted longer sessions infused with additional background music for motivations.

Table 4: *Student comments on the question, "If you could change one thing about the mind-mapping session, what would it be?"*

No changes
More information include in mind map
masa yang lama untuk menbincangkan topik dalam satu kumpulan..sbb agak menyeronokkan bertukar idea
Sharing session

Nothing to change.
maybe can be done before starting lecture
tiada yang perlu diubah.. sangat menarik
The time to complete should be longer.
With music background in class to trigger the mode of doing mind mapping.
Make it colour
I learn how to simplify
We will be given more time to finish the mind mapping.
Make it more fun by giving quizz or choose the best mind map in every session. So we could know what's lacking in mind map that we did
Make it colourful
Nothing
Its the best
I should be active more in the session, n let my group mate smile a lot,

Figure 2 shows the snapshot of the final results taken from the *Sistem Maklumat Pelajar* (SMP), UPM. The overall results show that the biggest portion i.e., almost 25% of the students achieved the highest grade. While there may be many other external factors contributing to the excellent results, it is believed that the mind-mapping activities could have enhanced students understanding on the theoretical and technical aspects of this course.

Pensyarah : IDAWATY BINTI AHMAD
Kod Kursus : SKR3200
Kumpulan : 1

GRED	JUMLAH PELAJAR	PERATUS (%)
A	7	25.93
A-	4	14.81
B+	5	18.52
B	3	11.11
B-	2	7.41
C+	3	11.11
C	2	7.41
C-	1	3.70
D+	0	0.00

Figure 2: *Final results of SKR3200 course*

Conclusion

Educators could consider using mind maps to diversify their teaching-learning approach in computer related courses given that students enjoyed their learning experience. One way forward is to increase the number of mind map sessions and conduct each session in groups. Mind map is a simple tool to use to visually represent more complex information in text form. This method is useful to concretise students' ideas into graphical representation of what is inside their mind. By doing so, mind mapping makes it possible for students to organise and understand information better.

References

Chen, B. & Zhang, Y. (2017). A rubric based technology-enhanced assessment approach to improve students' meta-cognitive awareness and learning achievement. *Proceedings of International Conference of Education Innovation through Technology (EITT)*. doi: 10.1109/EITT.2017.34.

Coutinho, E. (2014). Concept maps: Evaluation models for educators. *Journal of Business and Management Sciences*, *2*(5), 111-117. doi:10.12691/jbms-2-5-4.

Evrekli, E, Inel, D. & Balim, A.G. (2010). Development of scoring system to assess mind map. *Procedia Social and Behavioural Sciences*, *2*(2), 2330-2334.

Santiago, H. C. (2011). Visual mapping to enhance learning and critical thinking skill. *The Journal of Optometric Education*, *36*(3), 125-139.

O'Connor, R. (2011). The use of mind maps as an assessment tool. *Proceedings of International Conference on Engaging Pedagogy* (ICEP11).

Swestyani, S. (2018). An analysis of logical thinking using mind mapping. *Journal of Physics: Conference Series*, *1022*(1), doi: 10.1088/1742-6596/1022/1/012020.

Chapter 12

Methodological and Psychological Considerations in the Scholarship of Teaching and Learning

Irwan Hanish & Ruweyda Abdalla

Keywords: methodology, quantitative, qualitative

Introduction

Clarity in the paradigmatic direction is vital in any large-scale educational movements. This is especially essential in Scholarship of Teaching and Learning (SoTL) as it involves academicians from diverse disciplinary backgrounds. Such diversity, while enriches the repertoire of perspectives in SoTL, also presents a challenge. Academicians coming from different disciplines often use specific research methodologies that have been refined for their fields of expertise. For instance, the methods commonly practised by Microbiologists would be starkly different from those of Phonologists. Such differences will inevitably colour the way lecturers in both fields value various approaches when they engage in SoTL research. Accordingly, the understanding of distinctions between methodological paradigms is crucial to progress SoTL educational movement in a coherent and productive path. This chapter outlines a conceptual framework that may guide academicians in their methodological and psychological considerations in SoTL research.

Quantitative Methods Provide the 'Breadth' for Teaching and Learning Analyses

SoTL as a research enterprise directs its attention towards human subjects (i.e. lecturers and students) as well as their pedagogical interactions. As such, SoTL benefits highly from approaches in Psychology, which is the study of the mind and its influence on behaviours. Modern Psychology values highly the notion of controlled experimentations, which often involve simulating daily experiences in a more regulated environment. Within this process, researchers assign a numerical value to the data and analyse them through sophisticated statistical approaches. This quantitative paradigm intends to transplant the methodological scheme that underlines the natural sciences (such as Biology, Chemistry and Physics) into SoTL. It concerns itself with measuring quantities. To do this successfully, SoTL researchers may implement a sequence of steps.

It begins by researchers operationalising the crucial terminologies relevant to their hypothesis. For example, to show that learning via gamification improves students' understanding of a topic, the researchers operationalise it by defining what 'games' are and what constitutes 'improved understanding'. Important for

its validity, this operationalisation must also render those definitions both observable and quantifiable (Martin, 2003; Michell, 2003). The quantitative dimension of this process also necessitates the conversion of observations, such as the specific teaching and learning behaviours as well as their effects, into numerical units (Michell, 2003; Weathington, Cunningham, & Pittenger, 2010).

Second, SoTL researchers must identify both the independent variables (causal factors, for instance, 'gamification') and the dependent variables (causal effects, such as the 'improvement of understanding'). This identification allows the researchers to assign numerical values towards these variables and then design a study to observe any possible effects following manipulation of individual variables. Ideally, this involves conducting the teaching and learning activity in controlled environments. Following up with the previous example, the lecturers may need to randomise and divide their students into two groups: one in which the learning session occurs with the gamification, and another without it. Other confounding variables, such as which individual lecturers are involved, or the specific subtopics being taught, must be kept constant (we address the practical challenges of these later in the chapter). In addition, SoTL researchers may use multiple surveys in the form of questionnaires or quizzes, all of which aim to capture the effects of the experiment as quantifiable data.

Finally, these sets of quantifiable data are parsed through statistical analyses. The researchers, then, interpret any meaningful correlations and comparisons from those sets of data. In the best-case scenario, the statistical analyses would reveal the existence of possible causal relations, for example, that the inclusion of games during teaching and learning session *causes* an increment in students' understanding. Through inductive generalisation, the SoTL researchers then discuss how other lecturers can replicate this beneficial increment in different class settings for different topics or even different disciplines of knowledge.

Advantages and Limitations of Quantitative Methods

This quantitative paradigm confers many advantages. It lowers the barrier of entry into SoTL research for university lecturers in the natural sciences, be it from the fields of Microbiology or Petrochemistry or Aerospace Engineering. Lecturers from these fields may find it more comfortable with how quantitative SoTL research is philosophically framed, owing to its similarity to methodological thinking which underlies the scientific study of non-human objects in their respective fields. It simplifies human complexity into hypothetical statements that can be falsified, quantified and inductively generalised. More importantly, quantitative methods, at least in principle, allow for the gathering of large data points and, with the help of processing software, quicker analyses of those data points. This provides the 'breadth' of understanding of pedagogy and guides the lecturers towards approaches that are effective for other students within the wider population.

Nevertheless, if accepted fully and on its own, the quantitative paradigm may impede SoTL advancements in the long run. This paradigm relies on precarious foundations both in terms of the practical limitations and its more deep-seated

philosophical assumptions. Unlike the natural sciences, variables within teaching and learning sessions cannot be neatly controlled in laboratory-like conditions. Each high-quality teaching and learning session has its unique dynamic, highlighted by the real-time psychological interactions between the diverse personalities of students and lecturers, as well as the specific nature of the materials being taught. Controlling all these variables to the level of constancy similar to experiments on microorganisms, olefins or avionics, is arduous. The strict control of these variables during day-to-day classes demands more preparation and coordination from both the lecturers and students. This prospect is discouragingly unsustainable; it consumes excessive time and energy of the lecturers and students on top of their existing teaching and learning responsibilities. Furthermore, even if the strict control of variables were somehow achieved during the teaching and learning experiments, SoTL researchers would face the more challenging undertaking of obtaining the same conditions if they want to replicate the experiments.

More critically, even if the researchers manage to overcome all these practical limitations of SoTL study, the conclusions they arrive at are still questionable based on its underlying assumptions.

Progressing SoTL through quantitative methods assumes several propositions regarding the nature of teaching and learning. First, the quantitative paradigm assumes that the researcher (the lecturer conducting SoTL study) is separate from the subjects (the students as observed participants) and that the act of quantifying the subjects' behaviours are not affecting those behaviours. In other words, it assumes that the students will always behave in controlled laboratory-like environments similar to when they are in normal class settings. This is unlikely. The psychological effects of observations on subjects' behaviours have been reported in multiple fields, such as in social care service (Sedgwick & Greenwood, 2015) and epidemiological studies of infection control (Chen, Vander Weg, Hofmann, & Reisinger, 2015). This awareness is vital for SoTL researchers, particularly lecturers from the natural sciences, more so than those from the human sciences (such as the social sciences, arts or humanities). SoTL researchers from the natural sciences are less affected by this observer effect when studying non-human biological, physical or chemical objects. Therefore, they become unaccustomed to the required shift in methodological thinking when conducting SoTL.

In addition, this quantitative paradigm assumes the subjects of SoTL (i.e. students, lecturers and their pedagogical interactions) can be studied objectively; that is, the researchers view the subjects of SoTL as phenomenal objects independent of the mind. These phenomena can then be observed and measured to provide the researchers with the true knowledge of the reality of teaching and learning. This assumption has its historical roots in the 'Vienna Circle' movement (Stadler, 2015). This movement promoted *positivism*, which is the belief that knowledge advances only via the scientific approaches of experimentations and observations (Uebel, 2013). Its central doctrine holds that all statements are meaningless unless they can be empirically observed (such as in the controlled SoTL experiments) or logically demonstrated (for example, through logical or mathematical proofs) (Martin-Löf, 2013). The general direction

of scientific knowledge, according to positivism, is pronounced by one of its celebrated proponents, Auguste Comte in the Course of Positive Philosophy (*Cours de Philosophie Positive*):

> '*From the study of the development of human intelligence, in all directions, and through all times, the discovery arises of a great fundamental law, each branch of our knowledge passes successively through three different theoretical conditions: the theological, or fictitious; the metaphysical, or abstract; and the scientific, or positive.'* (Levine & Lenzer, 1977, p. 71)

In other words, to advance our understanding of the world, scientists must abandon routes of knowing which rely on the existence of God or unquantifiable rational abstractions. Instead, they must solely rely on the scientific approaches that utilise experiments and observations. Within the SoTL context, the full commitment to positivistic quantitative paradigm authorises only certain kinds of questions, methods and conclusions. It assumes that SoTL researchers can understand the students, lecturers and their behaviours through measurements. Indeed, anything unquantifiable about the nature of teaching and learning must be dismissed from SoTL investigations in order to seek verifiable knowledge.

Such a commitment places SoTL researchers on the risky epistemological ground. Its positivistic foundation has been severely challenged in the Philosophy of Science (Costa & Shimp, 2011; Martin, 2003; Michell, 2003). SoTL researchers who view teaching and learning only as objective phenomena may underestimate its social realities. They also risk being oblivious to their subjective part in constructing those realities. It unnecessarily closes other avenues of understanding education that may take the unquantifiable forms. Furthermore, by reducing the educational activities into numerical values, lecturers who conduct SoTL study may unconsciously overlook critical qualitative aspects of their students' lived experiences. It inevitably leads to distorted conclusions which may be convincingly displayed on statistical diagrams but resemble very little of the daily learning experiences in life.

Therefore, while quantitative methods are invaluable in providing the 'breadth' of analyses, researchers require a complementary methodological approach that overlays the non-measurable dimensions of SoTL research.

Qualitative Methods Assess Psychological 'Depth' of Teaching and Learning Experiences

Concerning itself more with the quality of phenomena, an inquiry in qualitative methods is not delimited to what can be measured; qualitative SoTL researchers focus on patterns of meaning and the context in which the patterns occur.

In contrast to the emphasis on reaching an artificially controlled environment, qualitative SoTL researchers seek to understand a teaching and learning phenomenon in its natural conditions – a 'real-world inquiry' (Robson & McCartan, 2016). Accordingly, the qualitative paradigm in SoTL differs from its quantitative

counterpart not only in terms of techniques and procedures. It is primarily a different way of viewing the students, lecturers and their educational interactions. It holds to a more modest epistemological claim. In this claim about what they can know, the researchers do not see themselves as detached observers while the subjects of SoTL (i.e. students, lecturers and their experiences) are objective entities that can be fully understood through controlled measurements. Instead, each student is considered an engaged participant, not merely an observed subject of research.

Furthermore, rather than denying the existence of their own subjectivity, the qualitative SoTL researchers acknowledge its existence and then manage its effects through *bracketing* (or *epoché*) and *reflexivity. Bracketing* refers to the continuous effort by the SoTL researchers to actively 'bracket' or 'put out of play' what they know about the subjects (Sorsa, Kiikkala, & Åstedt-Kurki, 2015; Tufford & Newman, 2012). In *reflexivity*, the SoTL researchers acknowledge and reflect upon their influences towards the research process and document this reflexion in the findings to be rigorously examined (Shaw, 2010). They can combine these two strategies to different degrees depending on the type of qualitative research being employed and the questions it aims to address. Indeed, it is based on the research questions that the SoTL researchers may select from well-established methods, including Grounded Theory (Ellis, Strauss, & Corbin, 1992; Wuetherick, 2010), Thematic Analysis (Birmingham & Wilkinson, 2016; Castleberry & Nolen, 2018), Discourse Analysis (Rumenapp, 2016; Seale, 2018), Interpretative Phenomenological Analysis (Smith, 2011; Tufford & Newman, 2012) and Narrative Analysis (Bruner, 2003; Jens Brockmeier & Hanna Meretoja, 2014).

Principles in Implementing Qualitative Methods in SoTL

Given such a variety of methods, SoTL researchers may adhere to certain methodological principles in order to perform qualitative research successfully. First, the type of data collected is *naturalistic*; that is, the researchers must not summarise or paraphrase all the data generated during the collection. The aim is to prevent, or at least minimise, any loss or reduction of the data from its natural form. For example, in interviewing student participants, SoTL researchers should record the interview using an audio or video device instead of writing the main points mentioned. This step will preserve as much as possible all qualitative data generated, such as the syntactic expressions, tones of voice and emotional cues. These surrounding qualities inform the researchers of the contexts, intents and meanings of the main content (the words being said) in the later analysis. An excellent qualitative SoTL study, when performed well, leads to profound thematic discoveries about the teaching and learning experience without destroying the experiential complexity.

Second, researchers must explore all opportunities in improving the *validity* of the study. In this discussion, *validity* refers to how suitable the methodological approaches and procedures are to achieve the research aims. For example, the aim could be to understand how gamification affects the personal learning experience of students. Here, the SoTL researchers (lecturers) who conduct the

discourse must pay careful attention to what ‘games’ or ‘learning’ mean to the students. They must bracket their own understanding of what ‘games’ and ‘learning’ mean to them as lecturers, preventing their impositions on the meaning-constituting process of the students.

Additionally, unlike the quantitative methods where the answers were pre-encoded as readily available options (and thus limiting the participants’ choices), the qualitative methods allow the participants to challenge the preconceived notions of the researchers. Put simply, the researchers’ questions can be questioned by the participants. Besides promoting validity, this two-way interaction allows participants to become an active part of enriching the theory-generation process alongside the SoTL researchers themselves.

Finally, qualitative SoTL researchers relate differently to the principles of *replicability* and *generalisability*. Within natural sciences and quantitative psychological studies, *replicability* means the ability of an experiment to yield the same results when conducted by other individuals, in a different laboratory, and at a different time (Finkel, Eastwick, & Reis, 2017). Related to this concept, *generalisability* refers to what extent one can extrapolate the results of an experiment as explanations for phenomena outside that context (Murad, Katabi, Benkhadra, Montori, & Learning, 2018). In the qualitative paradigm, *replicability* and *generalisability* are not the primary aims, and must not be pursued at the expense of the ‘depth’ of a phenomenon. Each participant has a unique lived experience towards teaching and learning, which others cannot replicate in its entirety.

For this reason, qualitative SoTL researchers do not take each account of participants’ experience superficially. For example, a student’s learning experience is not viewed as a single point of numerically-coded attributes among multiple data points within a student population. On the contrary, the researchers rigorously investigate the multi-layered meanings that the experiential account contain, and how the experience is situated within the broader meanings within the psychological, social and cultural contexts.

Advantages and Limitations of Qualitative SoTL Methods

Adherence to these principles will infuse qualitative SoTL research with multiple advantages. In each study, the researchers engage the students with open-ended inquiry instead of a predetermined set of answering options to serve a hypothesis. Such an investigative approach exposes the researchers to direct, first-hand understanding of students’ experiences, which can be more valuable than what is gained from sterile numerical data points (Maxwell, 2013; Patton, 2002). Moreover, the higher flexibility of the data collection process allows for novel and naturally emerging themes to occur. During the engagement with the students, the original research inquiry may evolve and expand, fuelled by the real-time inputs from the students, leading to new thematic discoveries (Choy, 2014; Creswell, 2018; Ridder, Miles, Michael Huberman, & Saldaña, 2014). Perhaps, the most durable advantage of qualitative SoTL methods is its ability to capture the multi-layered ‘depth’ of how students experience teaching and

learning in the real world. Unlike the quantitative approaches, the qualitative paradigm does not treat the human experience as discrete variables. It aims to reach the essence of that experience without destroying its complexity, opening the possibilities to generate new ways of perceiving existing data and theories. These new ways of perceiving can help SoTL researchers develop hypotheses that can later be tested through quantitative methods. Most importantly, through the immersion into the students' lived experiences, the lecturers (as SoTL researchers) may earn new, fascinating insights about their students as individual learners – the human part of their stories (Jacob & Furgerson, 2012, p. 1; Patton, 2002, p. 433).

Nevertheless, the qualitative methods also restrict the SoTL researchers to some limitations. The first and most apparent, the qualitative paradigm is more difficult to be well-understood within the broader scientific community. One reason is, compared to their quantitative counterparts, qualitative researchers often find it more challenging to demonstrate replicability and generalisability in their studies. Also, the expectations of what constitutes a 'scientific' study have been pervasively influenced by positivism (described earlier). This influence often occurs unconsciously in countries that do not teach Philosophy of Science as part of their science curricula. As scientific understanding relies on the reduction of nature into measurable entities, it is tempting to do the same with human beings. This paradigm may change soon as the qualitative methods become more integral within the mainstream community of human sciences such as Psychology (Biggerstaff, 2012; Jamali, 2018). However, as it is, SoTL researchers should expect serious resistance from other lecturers within their own disciplines, particularly those from the natural sciences.

Additionally, compared to the quantitative approach, the naturalistic data collection presents the SoTL researchers with a massive amount of raw information (e.g. large volumes of interview transcripts). This practical reality makes the analysis, interpretation and presentation of findings laborious and time-consuming (Anderson, 2010; Creswell, 2018; Slotnick & Janesick, 2011). Another challenge is maintaining the anonymity and confidentiality of student participants, especially when the findings are shared locally within small faculties. Finally, as addressed earlier in the discussion regarding replicability and generalisability, qualitative findings may not explain similar phenomena in the broader population. Even when it is successful in affording a profound understanding of students' lived experience (more 'depth'), its qualitative nature does not lead to theories that encompass other students whose contexts are different (less 'breadth').

Given these inherent disadvantages, disproportionate attention towards qualitative methods will hinder the general progress of SoTL. A more balanced consideration between the quantitative and qualitative methods is in order.

The Middle Path of SoTL: A Purposeful Combination of Methods

University lecturers, both as SoTL researchers and practitioners (who may focus more on practising what have been researched by others), must journey on the balance beam between the two methodological paradigms. On one side, through over-reliance on the quantitative methods, SoTL as an educational movement risks expanding only the surface-level understanding but has little underneath to sustain it. On the other, over-emphasis on the qualitative methods alone will deprive SoTL of the powerful analytical tools of statistical probability. To remain in balance, individual lecturers may consider several points.

Firstly, while engaging in SoTL research or practise, the lecturers must respect the epistemic limits of both methods. For instance, in implementing a quantitative experiment, SoTL researchers may remind themselves that they are in fact segregating the complex teaching and learning experiences into parts, which are then being measured individually, known as 'partitioning' (Harré, 1993). Conclusions gathered by studying these parts, even when the null hypothesis is refuted, may resemble little to the behavioural realities of the real-world experience of the students. On the other hand, qualitative SoTL researchers must be aware that their findings, although deeply discerning and useful to their own students, may have limited representativeness towards other students in different pedagogical, psychological and social landscapes.

Secondly, as lecturers embark on SoTL, they may discover their individual preference for one method over the other. Nevertheless, familiarity with both methods remains vital. It grants the theoretical tools for the researchers to remain agile in addressing specific inquiries, allowing them to explore different approaches when needs arise. For the practitioners, it provides the conceptual appreciations for them to make the best of the information they encounter in the SoTL literature. Table 1 summarises various aspects of quantitative and qualitative methods that should be considered in pluralistic methodological deliberations. Concrete examples of these methods can be learned from and shared with others through engaging the scholarly journals and active participation in international conferences (Tables 2 and 3 provide some recent examples of both). In addition, SoTL researchers must also engage with the general public and others outside the SoTL circles (e.g. colleagues who are less interested in the teaching aspects of academia, educational policymakers, and student leaders). This can be achieved through public seminars, traditional media or social media engagements. Constant two-way communications with the educational community at large are indispensable to ensure that SoTL, as an educational movement, maintains the correct course of direction.

Table 1: *Methodological differences between quantitative and qualitative SoTL research*

	Quantitative methods	**Qualitative methods**
Nature of inquiry	Numerical measurements, controlled setting with the objective focus	Qualities (experiential dimension of accounts), naturalistic setting with the subjective focus
Main epistemological positions	Positivism, Empiricism, Materialism	Phenomenology, Social Constructionism
Theoretical framework	Rigid and well-structured. Rigour derives from detachment from subjectivity and application of statistics	Flexible and less-structured. Rigour derives from the integration of subjectivity, bracketing and reflexivity
The range of understanding the phenomena	Surface layer. Seeks explanations for variables in larger populations. More subjects. 'Breadth'.	Multiple layers. Seeks explorations of lived experiences in individuals. Fewer subjects. 'Depth'.
The distance between the researcher to students' experience	Farther	Closer
Data analysis	SPSS or other statistical tools	Thematic explorations
Replicability and generalisability	Higher	Lower
Depth and flexibility of explanatory analysis	Lower	Higher

Table 2: *Examples of scholarly journals which encourage publications on SoTL*

Name	Homepage
Active Learning in Higher education	https://journals.sagepub.com/home/alh
College Teaching	https://www.tandfonline.com/toc/vcol20/current
Journal of Further and Higher Education	https://www.tandfonline.com/toc/cjfh20/current
Journal on Excellence in College Teaching	http://www.celt.muohio.edu/ject/
Journal of Perspectives in Applied Academic Practice (JPAAP)	https://jpaap.napier.ac.uk/index.php/JPAAP
The Journal of Effective Teaching	https://uncw.edu/jet/
The Journal of Scholarship of Teaching and Learning	https://scholarworks.iu.edu/journals/index.php/josotl
Research in Higher Education	https://link.springer.com/journal/11162
Teaching in Higher Education	https://www.tandfonline.com/toc/cthe20/current
Transformative Dialogues: Teaching and Learning Journal	https://www.kpu.ca/td

Table 3*: Examples of international SoTL conferences and the regions where they were recently held*

Name	Region (Country)
Lilly-Asia: Evidence-Based Teaching and Learning Conference	Asia (Hong Kong)
SoTL-Asia Conference	Asia (Singapore)
EuroSoTL Conference	Europe (Sweden)
ISSOTL Conference	North America & Europe (USA, Norway)
Annual International Conference on Scholarship of Teaching and Learning in Higher Education	Africa (South Africa)

Biennial SoTL in the South Conference/Annual Cut SoTL Conference	Africa (South Africa)
Annual Conference of the Scholarship of Teaching and Learning	Asia (UAE)
SoTL Commons Conference	North America (USA)

Ethics must also be emphasised. These general ethical considerations similarly apply to both quantitative and qualitative methods: (1) the absence of deceptions, where students are not being unduly manipulated and are fully informed about the SoTL studies conducted; (2) the inclusion of informed consent, where students voluntarily accept the terms of the studies after they have understood those terms; and (3) the permission to withdraw from the entire studies or individual elements of the studies (e.g. a specific questions in a discourse analysis), which they can freely choose at any point, with no academic or social penalties (Elmes, Kantowitz, & Roediger, 2002; Kantowitz, Roediger, & Elmes, 2014). In class, lecturers should place the getting of high-quality research data as secondary to the high-quality educational experience of their students. Researchers must also strive to protect the privacy and confidentiality of the participants throughout a SoTL study and after its completion. High level of ethical practices will encourage broader involvements of new researchers and participants into SoTL research.

Finally, for continuous improvement of SoTL quality, researchers must consider triangulating their research, in which multiple approaches are used to cross-validate one another (Biggerstaff, 2012; Miles, Huberman, & Saldana, 2019). For instance, in examining how an intervention (such as a new gamification activity) affects learning experience, several approaches can be helpful. Researchers may conduct similar data collections at different points in time: the first week of a semester and the first week before the final exam (where the students may have a different experience towards gamification, influenced by exam anxieties), or in a more extended longitudinal design across multiple semesters. Additionally, data may be collected by more than one researcher (e.g. an interview conducted by a lecturer who teaches the topic and a lecturer whom the students have not met before). Similarly, the same study may involve participants from unrelated fields (e.g. by using the same line of discursive investigation to two groups of students: one from the natural sciences and another from the human sciences). Through those multiplicities of engagement from different vantage points, researchers incrementally strengthen its research findings over time (Biggerstaff, 2012; Frost, 2009; Olsen, Haralambos & Holborn, 2004), and therefore raise the overall quality of SoTL literature collectively.

As an educational vision, SoTL must be reflected differently from the natural sciences. Specifically, SoTL researchers should not narrowly look only for theories or practises which are applicable across multiple teaching and learning contexts. While such theories and practices are appreciated when discovered, finding ‘universal pedagogical laws’ should not be the primary goal. Rather, the collective vision of SoTL must be towards the recognition of superordinate themes that permeate good theories and practises, even when those individual

theories and practices are not replicable across contexts. To put this in practical terms, SoTL paradigm must not confine itself to seeking techniques that are experimentally shown to work in all teaching situations all the time. Instead, it is about developing a sizeable scholarly database of diverse theories and practices, even when they may superficially seem limited in scope. The SoTL practitioners will then read those reports, select ones that have the closest approximation to their pedagogical context, and then test them in class. Subsequently, they will then report their recommendations or criticisms to further contribute to the SoTL literature.

Admittedly, this paradigmatic direction does not align with the conventional expectations in the natural sciences, which aim to discover generalisable laws and theories (Potochnik, 2017). In an ideal SoTL paradigm, researchers view the students as more than biological objects whose cognitions and behaviours are reducible to observable cause-and-effect events. In contrast, students (and the lecturers themselves) are multifaceted human beings. Their experiences and relationships with learning may operate in ways dissimilar to many systems studied in the natural sciences. The students and lecturers are not singularly material beings (al-Attas, 2014; Nagel, 2012), and there are first-person subjective realities about the mind that third-person objective accounts cannot capture (Nagel, 1974). The meaning they imbue into an educational experience is contingent upon the context in which that experience occurs (Berger & Luckmann, 2011), which consequently affects the agency of their cognitions and behaviours (Giddens, 2013). Appreciating this distinction between SoTL research paradigm and that of the natural sciences is paramount.

Concluding Remarks

SoTL is a commendable educational enterprise that seeks to improve teaching and learning, both in theory and practise. Since the primary subjects of SoTL research are human beings, it benefits highly from the methodologies of other human sciences, particularly Psychology. Quantitative and qualitative methods are derived from distinct paradigms of scientific knowledge and how such knowledge is generated. Therefore, the understanding of the advantages and limitations of both methods is crucial. Over-reliance on the quantitative approaches will stifle SoTL from the richness of teaching and learning experiences. On the other hand, an over-emphasis of qualitative paradigms risks neglecting the powerful statistical tools to advance SoTL theories.

Purposeful combinations of methods allow researchers to continue building the scholarly SoTL literature and share it to broader educational communities. In selecting specific methods, SoTL researchers and practitioners must develop: (1) the skill of generating the right questions for specific inquiries, (2) the understanding of the theoretical underpinnings of the various methods, and (3) the awareness of the pedagogical context they are in. In the long term, through sincere collective efforts of university lecturers, SoTL will enhance the quality of higher education and meaningfully develop the students to become human beings of excellent character and wisdom.

References

al-Attas, S. M. N. (2014). Prolegomena to the metaphysics of Islām : an exposition of the fundamental elements of the worldview of Islām. Kuala Lumpur: Universiti Teknologi Malaysia (UTM) Press.

Anderson, C. (2010). Presenting and Evaluating Qualitative Research: Strengths and Limitations of Qualitative Research. *American Journal of Pharmaceutical Education*. https://doi.org/74(8):1-7

Berger, P. L., & Luckmann, T. (2011). *The social construction of reality : A treatise in the sociology of knowledge*. New York: Open Road Media.

Biggerstaff, D. (2012). Qualitative Research Methods in Psychology. *In Psychology - Selected Papers*. https://doi.org/10.5772/2410

Birmingham, P., & Wilkinson, D. (2016). *Using Research Instruments - A Guide For Researchers*. London: Routledge.

Bruner, J. (2003). Making stories: Law, literature, life. Cambridge: Harvard University Press.

Castleberry, A., & Nolen, A. (2018). Thematic analysis of qualitative research data: Is it as easy as it sounds? *Currents in Pharmacy Teaching and Learning*, *10*(6), 807–815. https://doi.org/10.1016/J.CPTL.2018.03.019

Chen, L. F., Vander Weg, M. W., Hofmann, D. A., & Reisinger, H. S. (2015). The Hawthorne effect in infection prevention and epidemiology. *Infection Control and Hospital Epidemiology*. https://doi.org/10.1017/ice.2015.216

Choy, L. T. (2014). The strengths and weaknesses of research methodology: comparison and complimentary between qualitative and quantitative approaches. *IOSR Journal of Humanities and Social Science*. https://doi.org/10.9790/0837-194399104

Costa, R. E., & Shimp, C. P. (2011). Methods courses and texts in psychology: “Textbook science” and “tourist brochures.” *Journal of Theoretical and Philosophical Psychology*. https://doi.org/10.1037/a0021575

Creswell, J. W. (2018). *Research design: qualitative, quantitative, and mixed methods approaches.* SAGE Publication, Inc. (5th ed.). Los Angeles: SAGE Publications, Inc.

Ellis, C., Strauss, A., & Corbin, J. (1992). Basics of qualitative research: grounded theory procedures and techniques. *Contemporary Sociology*. https://doi.org/10.2307/2074814

Elmes, D. G., Kantowitz, B. H., & Roediger, H. L. (2002). *Research methods in psychology* (7th ed.). Belmont: Wadsworth Publishing.

Finkel, E. J., Eastwick, P. W., & Reis, H. T. (2017). Replicability and other features of a high-quality science: Toward a balanced and empirical approach. *Journal of Personality and Social Psychology.* https://doi.org/10.1037/pspi0000075

Frost, N. (2009). “Do you know what I mean?”: The use of a pluralistic narrative analysis approach in the interpretation of an interview. *Qualitative Research*, *9*(1), 9–29. https://doi.org/10.1177/1468794108094867

Giddens, A. (2013). *Modernity and Self-Identity: Self and Society in the Late Modern Age*. Cambridge: Polity Press.

Harré, R. (1993). *Social being* (2nd ed.). Hoboken: John Wiley & Sons.

Jacob, S. A., & Furgerson, A. P. (2012). Writing interview protocols and conducting interviews: Tips for students new to the field of qualitative research. *The Qualitative Report*, *17*(T&L Art. 6), 1–10. Retrieved from https://files.eric.ed.gov/fulltext/EJ990034.pdf

Jamali, H. R. (2018). Does research using qualitative methods (grounded theory, ethnography, and phenomenology) have more impact? *Library & Information Science Research*, *40*(3–4), 201–207. https://doi.org/10.1016/J.LISR.2018.09.002

Jens Brockmeier, & Hanna Meretoja. (2014). Understanding narrative hermeneutics. storyworlds: *A Journal Of Narrative Studies*. https://doi.org/10.5250/storyworlds.6.2.0001

Kantowitz, B. H., Roediger, H. L., & Elmes, D. G. (2014). *Experimental Psychology* (10*th* ed.). Stamford: Cengage Learning.

Levine, D. N., & Lenzer, G. (1977). Auguste Comte and Positivism: The Essential Writings. *Contemporary Sociology*. https://doi.org/10.2307/2064834

Martin-Löf, P. (2013). *Verificationism then and now. In Judgement and the Epistemic Foundation of Logic*. https://doi.org/10.1007/978-94-007-5137-8_1

Martin, J. (2003). Positivism, Quantification and the phenomena of psychology. *Theory & Psychology*. https://doi.org/10.1177/0959354303013001760

Maxwell, J. A. (2013). Qualitative research design: An interactive approach. https://doi.org/10.4324/9780203431917

Michell, J. (2003). The Quantitative imperative: Positivism, naive realism and the place of qualitative methods in psychology. *Theory & Psychology*. https://doi.org/10.1177/0959354303013001758

Miles, M. B., Huberman, A. M., & Saldana, J. M. (2019). *Qualitative data analysis: A methods sourcebook* (4th ed.). Los Angeles: SAGE Publications, Inc.

Murad, M. H., Katabi, A., Benkhadra, R., Montori, V. M., & Learning, E. (2018). External validity, generalisability, applicability and directness: A brief primer. *BMJ Evidence-Based Medicine*. https://doi.org/10.1136/ebmed-2017-110800

Nagel, T. (1974). What is it like to be a bat? *The Philosophical Review*, *83*(4), 435. https://doi.org/10.2307/2183914

Nagel, T. (2012). *Mind & cosmos: Why the materialist neo-darwinian conception of nature is almost certainly false*. New York: Oxford University Press.

Olsen, W. K., Haralambos (Ed.), M., & Holborn (Ed.), M. (2004). *Triangulation in social research: Qualitative and quantitative methods can really be mixed. in developments in sociology*. Causeway Press Ltd.

Patton, M. Q. (2002). Two decades of developments in qualitative inquiry: A personal, experiential perspective. *Qualitative Social Work.* https://doi.org/10.1177/1473325002001003636

Potochnik, A. (2017). *Idealization and the aims of science*. Chicago: University of Chicago Press. https://doi.org/10.7208/chicago/9780226507194.001.0001

Ridder, H. G., Miles, M. B., Michael Huberman, A., & Saldaña, J. (2014). *Qualitative data analysis. A methods sourcebook.* Zeitschrift Fur Personalforschung. https://doi.org/10.1177/239700221402800402

Robson, C., & McCartan, K. (2016). *Real world research* (4th ed.). West Sussex: Wiley.

Rumenapp, J. C. (2016). Analyzing discourse analysis: Teachers' views of classroom discourse and student identity. *Linguistics and Education*, *35*, 26–36. https://doi.org/10.1016/J.LINGED.2016.04.002

Seale, C. (2018). *Questionnaires and interviews. In researching society and culture* (4th ed.). London: SAGE Publications Ltd.

Sedgwick, P., & Greenwood, N. (2015). Understanding the Hawthorne effect. *BMJ* (Online). https://doi.org/10.1136/bmj.h4672

Shaw, R. (2010). Embedding reflexivity within experiential qualitative psychology. *Qualitative Research in Psychology*. https://doi.org/10.1080/14780880802699092

Slotnick, R. C., & Janesick, V. J. (2011). Conversations on method: Deconstructing policy through the researcher reflective journal. *The Qualitative Report*. https://doi.org/10.1109/TAC.1971.1099784

Smith, J. A. (2011). Evaluating the contribution of interpretative phenomenological analysis. *Health Psychology Review.* https://doi.org/10.1080/17437199.2010.510659

Sorsa, M. A., Kiikkala, I., & Åstedt-Kurki, P. (2015). Bracketing as a skill in conducting unstructured qualitative interviews. *Nurse Researcher.* https://doi.org/10.7748/nr.22.4.8.e1317

Stadler, F. (2015). Vienna Circle: Logical empiricism. *In International Encyclopedia of the Social & Behavioral Sciences* (2nd ed.). Elsevier.

Tufford, L., & Newman, P. (2012). Bracketing in qualitative research. *Qualitative Social Work*. https://doi.org/10.1177/1473325010368316

Uebel, T. (2013). "Logical positivism"—"logical empiricism": What's in a Name? *Perspectives on Science*, *21*(1), 58–99. https://doi.org/10.1162/POSC_a_00086

Weathington, B. L., Cunningham, C. J. L., & Pittenger, D. J. (2010). *Research methods for the behavioral and social sciences* (1st ed.). Hoboken: John Wiley & Sons.

Wuetherick, B. (2010). Basics of qualitative research: Techniques and procedures for developing grounded theory. *Canadian Journal of University Continuing Education*. https://doi.org/10.21225/D5G01T

Chapter 13

Virtual Reality Simulation as a Strategy to Implement Interprofessional Education for Health Profession Students

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Keywords: interprofessional education, virtual world, obesity

Introduction

Interprofessional collaboration is an emerging approach in the healthcare sector, which enhances professional practices leading to the improvement of patient care and health outcomes (Gilbert, Yan, & Hoffman, 2010; Reeves, Perrier, Goldman, Freeth, & Zwarenstein, 2013). Therefore, preparing the health profession students to the actual needs of the health care system is essential in producing a practice-ready workforce by providing them with interprofessional education (IPE). IPE is a pedagogical approach when two or more professions learn with, from and about each other to improve collaboration and the quality of care (Gilbert et al., 2010). The benefits of IPE are evident for the students. IPE delivery improved their attitudes, expand their interests in patient care, and enhance their medical and clinical knowledge (Nango & Tanaka, 2010). Also, IPE facilitates instructional of clinical content in a meaningful and interactive manner (Levine & Wren, 2013).

The advantages of IPE are well-established. It has been part of the medical school curricula in Canada, USA the UK, Australia and Saudi Arabia (Fallatah, 2016; Khan, Shahnaz, & Gomathi, 2016; Sunguya, Hinthong, Jimba, & Yasuoka, 2014). Nonetheless, little information is known about IPE implementation in developing countries, including those in the South East Asia regions (Sunguya et al., 2014). In Malaysia, the IPE is still at its infancy (Tong et al., 2016). At present, the IPE has not been implemented in our setting for health profession students, highlighting the critical needs of having the IPE in our setting.

Therefore, this article aims to review the challenges of IPE and propose the best strategies for IPE implementation among health professional students with the use of obesity management as a case study. Obesity is selected as a pilot content due to the fact that this is the most common health problem worldwide and Malaysia has the highest rate of obesity prevalence within South East Asia countries (Mohamad Nor et al., 2018). Hence, IPE education in obesity is critically needed as obesity itself is a complex health issue requiring multi-professional management. While the topic has been taught extensively across the health profession syllabus, it is delivered at the uni-professional level. The

use of interprofessional collaborative care has been shown to achieve significant weight loss in obese adults (Nagelkerk et al., 2018).

Currently Available Teaching Strategies and Challenges

Various strategies were identified to support the IPE activities which include IPE rotations in a community setting, IPE training wards, simulation-based programmes, case studies, theme-centered workshops, seminars, and student-led lectures (Khan et al., 2016). From all these activities, the simulation-based programmes were the most common strategies employed to deliver IPE (Khan et al., 2016).

In general, a simulation is an educational approach that represents a real-world scenario to achieve learning goals (Pai, 2018). In health education, simulation is defined as any educational activity that utilises simulation tools to replicate the clinical process (Lateef, 2010). The technique of simulation-based IPE is imparted through standardised patients, human or patient simulations, and simulation manikins in clinical laboratories (Lateef, 2010; Pai, 2018). For example, in a study that was using a real patient-based scenario, a combined technique of interprofessional practice and education was applied (Lamé & Dixon-Woods, 2018). Using a simulated clinical environment, students can perform tasks in small interprofessional groups and pretend to play the role of their respective professions (Bolesta & Chmil, 2014). World Health Organization (WHO, 2013) endorses the simulation as an effective method to assist health professionals in learning collaborative approaches. This important method offers students the opportunity to apply the academic theories and skills in a safe and supervised instructional environment (Lamé & Dixon-Woods, 2018). Also, the learning-by-doing concept using a simulation technique drives greater attention and retention than other learning methods (WHO, 2013).

Although the above strategies can be used for the current system, challenges exist (Table 1). Face-to-face IPE is not feasible as the current curriculum has been individually designed at the uni-professional level, in which each health profession student learns as a single profession group rather than alongside other health professions (Tong et al., 2016). Besides, limited resources and lack of professional supports are commonly observed barriers for IPE implementation in developing countries (Sunguya et al., 2014). Hence, the use of virtual world technologies may offer great opportunities for IPE simulation-based learning for health profession students.

Table 1: *Interprofessional Education Strategies and its Reported Challenges*

Interprofessional Education Strategies	**Reported Challenges**
Simulated-patients	Costly[1] Not easily reproducible without a proper training[1]
Standardised-patients	Busy clinics[2] Patient safety[2]

Case studies and seminar	Logistic concern[3] Scheduling and coordinating various disciplines[4]

Sources: [1]Nestel et al., 2011; [2]Sunguya et al., 2014; [3]Khan et al., 2016; [4]Fallatah, 2016

Virtual World in Health Education

The virtual world has rapidly evolved to support the Industrial Revolution 4.0 in digitalising the education, including for IPE implementation (Gilbert et al., 2010). Together with a simulation-based method, it provides an engaging, immersive learning experience that reflects real-clinical scenarios for health profession students. A virtual world is a computer-based three-dimensional (3D) program performs in the form of online communities. The students appear in these scenarios in personified digital character or also known as an avatar to interact with each other using their avatar graphic. The use of virtual world simulation-based programme has been proven feasible in other studies (Davis, 2015; Hu Au & Lee, 2017). Nonetheless, limited information is available with regards to obesity management as a case study.

The virtual world provides benefits from three perspectives. First, it allows students from a different location to come together for real-time interactive training that is usually not feasible to implement in a real-world setting. Thereby, students can approach knowledge from everywhere and have as much time needed to revise the educational materials and practice skills (Hu Au & Lee, 2017). Second, students can experience virtual world environments that are not easily accessed in the real world (Davis, 2015). For example, in obesity assessment, it requires students to perform a physical examination of body fatness distribution. By having a virtual world platform, students can identify the site of body fatness precisely. They can repeat the assessment based on their level of understanding and at the same time, ensure safe practice of newly attained clinical skills and protect patient's privacy (Bolesta & Chmil, 2014). The similar scenario can also be seen and discussed by other students from different disciplines. Third, the developed simulated-based virtual world platform can be utilised repeatedly to train other students (A. Davis, 2015).

Several platforms create the immersive experience of virtual world landscapes such as The Croquet Consortium, ProtonMedia's Protosphere, Forterra's OLIVE, and Linden Lab's Second Life. Second Life (www.secondlife.com) is one of the platforms that support highly interactive networking. First launched in 2003, Second Life has commonly been used in health education such as in emergency medicine, mental health, patient safety and roles of healthcare professionals (Baker, Wentz, & Woods, 2009; Davis, Hercelinskyj, & Jackson, 2016; Lee & Berge, 2011; Schwaab et al., 2011). However, the use of Second Life for obesity management in implementing IPE is less explored.

A Proposed Strategy: Integrating Simulation-based into Virtual World

In this context, Second Life can potentially be used as a strategy to deliver simulation-based obesity management for IPE implementation. An example is to develop the obesity clinic as an environment in the Second Life platform (Figure 1). In the Second Life platform, students would be able to determine what other professions are doing in the 3-dimensional scenario of the virtual clinic (Figure 1). Students will enter the platform using their own selected avatar, and start exploring the clinic, meet and socialise with other students from different disciplines using voice and text chat. In this platform, they will be able to discuss the case until the end of the process to determine the best possible treatment for the patients. This environment will help to develop technical skills and enhance their soft skills, such as communication and teamwork skills (Davis et al., 2016).

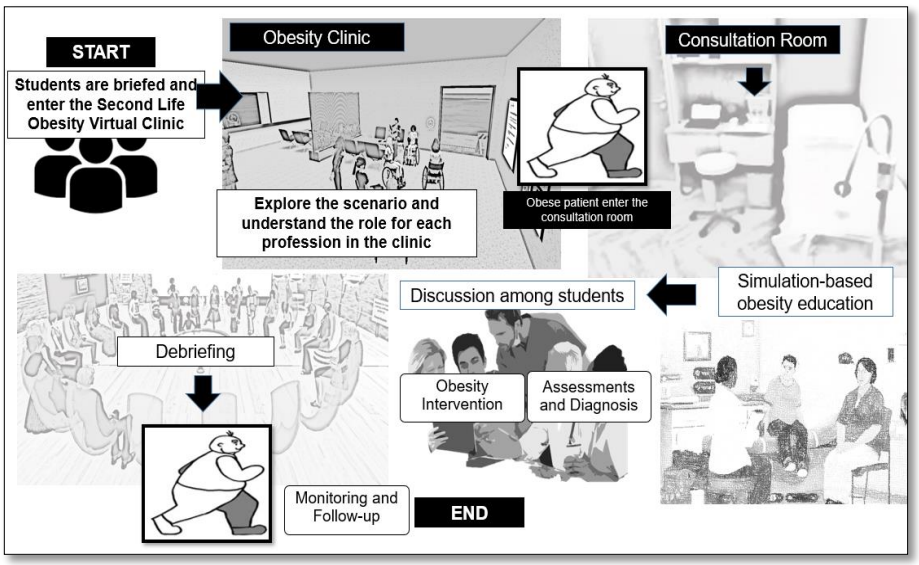

Figure 1: *Imaginary of Virtual Clinic in Simulation-based Obesity Education for IPE Implementation using Second Life Platform (Personal Source)*

In a real-world clinical setting, the patient is seen at an individual session at one time (Figure 2). The obesity care process as visualising in Figure 2 are performed at an individual basis, and the referral to other healthcare professional is given at the end of the consultation. Hence, no collaboration is observed between healthcare professions (Figure 1). The nature of the busy clinics limits the utility of real case to be used in IPE. As a result, students will only understand their roles as healthcare professionals and no collaborative care plan with other students from other disciplines.

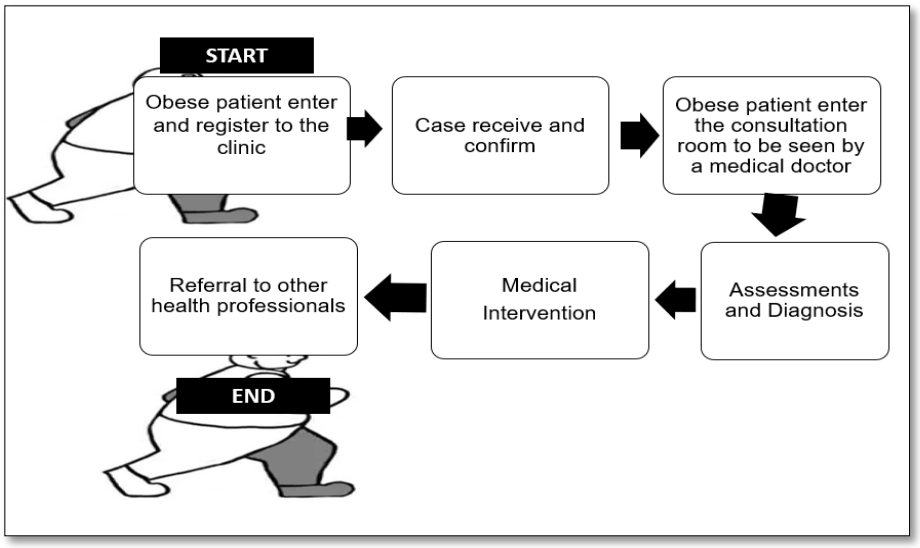

Figure 2: *Simulation-based Obesity Care Process in a Clinical Setting at the Individual Level (Personal Source)*

The previous studies showed that the experiences with the Second Life were encouraging (Lee, & Berge, 2011; Taylor, et al., 2013; Davis et al., 2016). The teaching strategies were engaging and useful for IPE implementation (Davis et al., 2016). Potential challenges associated with the Second Life are also discussed, which include learning time required and technological issues involved in using the platform. Nonetheless, these issues can be easily rectified by using simple activities in the virtual world as a start (Baker et al., 2009).

Conclusion

The challenges in implementing the IPE in the current education system are evident. This review identifies the best potential strategy to integrate IPE education using pedagogical simulation approaches to the virtual environment that would help to close the gap in the current education system. Once developed, it offers plentiful opportunities for the promotion of interprofessional collaboration. With the use of virtual education, students can experience the simulation many times based on their level of understanding and easily repeat the assignment as desired. Besides, the virtual simulated patients would be invaluable as they can provide a relevant clinical scenario close to the real world in preparing students as a work-ready graduate.

References

Baker, S. C., Wentz, R. K., & Woods, M. M. (2009). Using virtual worlds in education: second life® as an educational tool. *Teaching of Psychology, 36*(1), 59–64. Retrieved from https://doi.org/10.1080/00986280802529079

Bolesta, S., & Chmil, J. V. (2014). Interprofessional education among student health professionals using human patient simulation. *American Journal of Pharmaceutical Education, 78*(5), 94. Retrieved from https://doi.org/10.5688/ajpe78594

Davis, A. (2015). Virtual reality simulation: An innovative teaching tool for dietetics experiential education. *The Open Nutrition Journal, 9*, 65–75.

Davis, D. L., Hercelinskyj, G., & Jackson, L. M. (2016). Promoting interprofessional collaboration: A pilot project using simulation. *Journal of Research in Interprofessional Practice & Education, 6*(2), 1–15. Retrieved from https://doi.org/10.22230/jripe.2017v6n2a225

Fallatah, H. I. (2016). Introducing inter-professional education in curricula of Saudi health science schools: An educational projection of Saudi Vision 2030. *Journal of Taibah University Medical Sciences*. Elsevier. Retrieved from https://doi.org/10.1016/j.jtumed.2016.10.008

Gilbert, J. H. V., Yan, J., & Hoffman, S. J. (2010). A WHO report: Framework for action on interprofessional education and collaborative practice. *Journal of Allied Health, 39*(SUPPL. 1), 196–197. Retrieved from https://doi.org/10.1111/j.1741-1130.2007.00144.x

Hu Au, E., & Lee, J. J. (2017). Virtual reality in education: A tool for learning in the experience age. *International Journal of Innovation in Education, 4*(4), 215. Retrieved from https://doi.org/10.1504/IJIIE.2017.10012691

Khan, N. S., Shahnaz, S. I., & Gomathi, K. G. (2016). Currently available tools and teaching strategies for the interprofessional education of students in health professions: Literature review. *Sultan Qaboos University Medical Journal*. Sultan Qaboos University. Retrieved from https://doi.org/10.18295/squmj.2016.16.03.003

Lamé, G., & Dixon-Woods, M. (2018). Using clinical simulation to study how to improve quality and safety in healthcare. *BMJ Simulation and Technology Enhanced Learning*, bmjstel-2018-000370. Retrieved from https://doi.org/10.1136/bmjstel-2018-000370

Lateef, F. (2010). Simulation-based learning: Just like the real thing. *Journal of Emergencies, Trauma, and Shock, 3*(4), 348. Retrieved from https://doi.org/10.4103/0974-2700.70743

Lee, A., & Berge, Z. L. (2011). Second life in healthcare education: Virtual environment's potential to improve patient safety. *Knowledge Management and E-Learning, 3*(1), 17–23.

Levine, D., & Wren, M. (2013). Working together: Interactive interprofessional learning in the classroom. *MedEdPortal*. Retrieved from https://doi.org/10.15766/mep_2374-8265.9329

Mohamad Nor, N. S., Ambak, R., Mohd Zaki, N., Abdul Aziz, N. S., Cheong, S. M., Abd Razak, M. A., & Aris, T. (2018). An update on obesity research pattern among adults in Malaysia: A scoping review. *BMC Women's Health*, *18*(S1), 114. Retrieved from https://doi.org/10.1186/s12905-018-0590-4

Nagelkerk, J., Benkert, R., Pawl, B., Myers, A., Baer, L. J., Rayford, A., & Jakstys, C. (2018). Test of an interprofessional collaborative practice model to improve obesity-related health outcomes in Michigan. *Journal of Interprofessional Education and Practice, 11*, 43–50. Retrieved from https://doi.org/10.1016/j.xjep.2018.02.001

Nango, E., & Tanaka, Y. (2010). Problem-based learning in a multidisciplinary group enhances clinical decision making by medical students: A randomized controlled trial. *Journal of Medical and Dental Sciences, 57*(1), 109–118. Retrieved from https://doi.org/10.11480/jmds.570112

Nestel, D., Tabak, D., Tierney, T., Layat-Burn, C., Robb, A., Clark, S., & Kneebone, R. (2011). Key challenges in simulated patient programs: An international comparative case study. *BMC Medical Education, 11*(1), 69. Retrieved from https://doi.org/10.1186/1472-6920-11-69

Pai, D. (2018). Use of simulation for undergraduate medical education. *International Journal of Advanced Medical and Health Research, 5*(1), 3. Retrieved from https://doi.org/10.4103/IJAMR.IJAMR_63_17

Reeves, S., Perrier, L., Goldman, J., Freeth, D., & Zwarenstein, M. (2013). Interprofessional education: Effects on professional practice (update). *Cochrane Database of Systematic Reviews, 3*, 1–277. Retrieved from https://doi.org/10.1002/14651858.CD002213.pub3.www.cochranelibrary.com

Schwaab, J., Kman, N., Nagel, R., Bahner, D., Martin, D. R., Khandelwal, S., & Nelson, R. (2011). Using second life virtual simulation environment for mock oral emergency medicine examination. *Academic Emergency Medicine, 18*, 559–562. Retrieved from https://doi.org/10.1111/j.1553-2712.2011.01064.x

Sunguya, B. F., Hinthong, W., Jimba, M., & Yasuoka, J. (2014). Interprofessional education for whom? - Challenges and lessons learned from its implementation in developed countries and their application to developing countries: A systematic review. *PLoS ONE*. Retrieved from https://doi.org/10.1371/journal.pone.0096724

Taylor, M., Taylor, D., Kulendran, M., Gately, P., Darzi, A. (2013). Virtual worlds as a tool to facilitate weight management for young people. *J Virtual Worlds Res*, *6*(1).

Tong, S. F., Mohamad, N., Tan, C. E., Efendie, B., Chelliah, K. K., & Gilbert, J. H. (2016). Transition from uniprofessional towards interprofessional education: The Malaysian experience of a pragmatic model. *In Leading Research and Evaluation in Interprofessional Education and Collaborative Practice,* (pp. 169–192). London: Palgrave Macmillan UK. Retrieved from https://doi.org/10.1057/978-1-137-53744-7_9

WHO. (2013). Transforming and scaling up health professionals' education and training. *World Health Organization Guidelines*. Retrieved from https://doi.org/10.1017/CBO9781107415324.004

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This e-book is intended for individuals with vested interests in the scholarship of teaching and learning (SoTL). The 13 chapters presented showcase the vibrant SoTL culture within UPM's teaching-learning landscape. Drawing from the contributions of SoTL practitioners among academics from various disciplines, this book presents in-class and out-of-class evidences that reflect SoTL's value as a vehicle to advance student learning. It is the goal of this book to provide a resource to enable readers to understand SoTL better and thereby contribute to its promotion and growth.

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