



THE DEVELOPMENT AND VALIDATION OF AN INTEGRATED LEARNING METHOD BASED ON PROBLEM-BASED LEARNING IN A PEDAGOGY, TECHNOLOGY AND ASSESSMENT COURSE AT MALAYSIA PUBLIC UNIVERSITIES





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ABSTRACT

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The study aims to develop and test a Problem-Based Learning (PBL) Learning Module the KPD3016- Teaching, Technology and Assessment course as one of the pedagogical strategies that will assist and become a benchmark for lecturers or educators in promoting and strengthening the abilities of students and graduates of the Bachelor of Education degree programmes in soft skills (such as thinking skills, self-learning, group work, communication skills, leadership, entrepreneur, etc). The module produced is current and innovative and it can be used by Universiti Pendidikan Sultan Idris (UPSI) lecturers in empowering the teaching and learning process in the KPD3016 course. The research findings may contribute relevant information and knowledge in implementing the use of PBL approaches in the teaching and learning process in study programmes at Universiti Pendidikan Sultan Idris and other higher education institutions in Malaysia as well as provide a foundation for the construction of other PBL conceptual training modules.

Contribution/ Originality: This study is unique as it is the first focuses on the integration of the PBL method in the development of modules for the Bachelor of Education degree in UPSI. It combines a qualitative and quantitative study by using a validity and reliability questionnaire, interview and observation. This approach is appropriate in the context of this study, as it focused on the construction and development of a PBL-based module for the teaching and learning of the KPD3016 course - Teaching, Technology and Assessment in UPSI.

1. INTRODUCTION

Anderson *et al.* (2000); Birgili (2015) and Wan *et al.* (2013) described the demands of the PBL approach in the classroom to strengthen students' problem solving and critical thinking skills. They suggested that an assignment based on a problem should cover real-world scenarios. Additionally, as the PBL scenario is realistic and based on

the problem's realistic nature, the students' understanding towards the teaching and resources could be improved and maintained. Hardin (2001) and Ma (2001) stated that the employer and the industry should also be involved in the development of the curriculum to ensure that the work skills are included as a set to prepare students to the world of teaching.

However, PBL is still considered as something new in Malaysia. Many studies have stated the effectiveness of the PBL approach on students' soft skills (Chin and Chia, 2000; Neo and Neo, 2001; Ward and Lee, 2002; Kivela and Kivela, 2005; Yuan *et al.*, 2008) but most of the studies are limited to the field of science and technology, especially in medicine, nursing, science, hospitality and engineering. There is a lack of PBL studies focusing on education pedagogy especially in Malaysia. Similarly, there has been no study which focuses on the integration of the PBL approach in the module development. The latest studies on the PBL approach had been conducted by Sulaiman (2011) and Zabit (2013). Sulaiman's study found that PBL increased students' creative and critical skills but this study had been conducted on Physics students at Universiti Malaysia Sabah (UMS).

To increase the graduates' *employability*, the institutions of higher learning (public universities – UA and private universities– US) in Malaysia should take the initiative to strengthen the teaching and learning process (TnL) to enable it to become more focused towards the teaching and facilitating of learning. This includes improving the programme content and syllabus to fulfill the needs and demands of the employer and industry, innovation in pedagogy by relating theory to practice in the real world (like PBL), work-integrated learning as well as using diverse modes of teaching and learning (Boyd, 2010; Hefferan and Ross, 2010; Mak *et al.*, 2010; Yam and Rossini, 2010; 2012; Susilawati and Peach, 2012).

Fukuzawa *et al.* (2017) stressed on the importance to utilise PBL method in introductory courses as an initiative to ward off criticism from professional bodies about the lack of soft skills such as communication skills, IT skills, problem solving skills and ability to work effectively in teams among the accounting graduates. Furthermore, Malaysian public universities which offer the Education programmes are in the process of introducing and strengthening active learning and student-centred approach in all the programmes offered. This is in line with the 10th Malaysia Plan (RMK10, 2011-2015) and Malaysia Education Blueprint (PPPM-PT, 2015-2025), in which the main objective in education is to give priority to education institutions to implement and revive teaching and learning processes which are outcome-based. One of them is the PBL approach which is believed to increase the students' creativity and critical thinking skills as well as innovation.

UPSI's aim to be at Asia's forefront in producing teachers also requires a more innovative and student-centred teaching and learning strategy.

The proposed study will be the first that focuses on the integration of the PBL method in the development of modules for the Bachelor of Education in UPSI. It comprises a qualitative and quantitative study by using a validity and reliability questionnaire, interview and observation. This approach is appropriate in the context of this study, which will focus on the construction and development of a PBL-based module for the teaching and learning of the KPD3016 course - Teaching, Technology and Assessment in UPSI.

1.1. Research Objectives

1. To ascertain the type of teaching, learning and facilitating module for the KPD 3016 course developed using the PBL approach.
2. To assess the validity of the teaching, learning and facilitating module for the KPD 3016 course developed using the PBL approach.
3. To identify the reliability value of the teaching, learning and facilitating module for the KPD 3016 module developed using the PBL approach.
4. To review the benefits and advantages derived from the KPD 3016 module developed using the PBL approach.

2. RESEARCH METHOD

This focuses on the integration of the PBL method in the development of modules for the KPD 3016 course for the Bachelor of Education in UPSI. It comprises a qualitative and quantitative study by using a validity and reliability questionnaire, interview and observation.

2.1. Population and Sample

This study involved 58 students of the Bachelor of Education (Accountancy) in UPSI who sat for the KPD3016 in the semester of the implementation of the intervention.

2.2. Data Collection Procedure

This was done via a validity and reliability questionnaire given to the experts and a pilot study on the students. Questionnaires were given to a focus group of 3 lecturers teaching KPD 3016. Next, a structured interview was conducted with 20 selected students in the relevant course focusing on the benefits and challenges of implementing PBL teaching, learning and facilitating modules, as well as the students' reflection of their experiences during the module implementation.

The PBL scenario for the module developed in this study focused on the following topics :

- Learning theories – Cognitive, Constructivism, Behaviourism, Humanism.
- Compilation and Preparation of teaching content – the Tyler Model; the ASSURE model; The Mastery Model.
- Daily Teaching Plan (RPH) – The writing of teaching objectives; Cognitive Taxonomy; Psychomotor Taxonomy; Affective Taxonomy.
- The usage of various media and technology as well as ICT in teaching and learning.
- The testing and evaluation of learning outcomes – School-based assessment (SBA).
- Communication in the Evaluation Process – using questions, listening and giving response, giving feedback before, during and after the evaluation.

This approach was in line with the context of this study which focused on the building and development of teaching and learning module based on PBL in UPSI. The phases covered were : Phase 1 : The development of the PBL Teaching, learning and facilitating Module, Phase 2 : The Strategy for PBL Module Development and Validity and Phase 3 : The Validity of the PBL Teaching, learning and facilitating Module.

Phase 1 : The development of the PBL Teaching, learning and facilitating Module

The literature review and focused group discussions were conducted with a few lecturers and students and academic officers from UPSI to determine the direction for KPD3016 course in accordance with the vision and mission of the program as well as UPSI's direction.

The literature review covers the teaching, learning and facilitating theories, theories on KPD 3016, PBL theory, model and implementation as well as relevant research. The response from students and graduates of the field and the employer/industry would also be obtained regarding the curriculum, content and Tn L processes related to the KPD 3016 course.

Phase 2 : The Strategy for PBL Module Development and Validity

Before the intervention was implemented, a Problem Scenario was prepared for the selected lecturers of KPD3016 course. This workshop was handled by the PBL expert and the lecturers involved would assist in preparing the materials for the Problem Scenario to be used during the intervention. The problems used in this activity were based on the topics in the selected topics related to the KPD 3016 course, and comprised a part of the higher learning curriculum in Malaysia.

The construction of the module's framework focused on the use of problem solving tasks to strengthen the learning content of the course, problem solving skills, thinking skills including critical thinking for the Bachelor of Accountancy programme in UPSI. The problem-solving assignments developed will now be referred to as PBL. The following are a number of assumptions that are identified through the conceptual framework:

- i. Effective problem solving in the learning process of the KPD3016 course will involve problem-solving skills, critical thinking skills as well as declarative knowledge.
- ii. The problem solving process in the learning of the KPD3016 course involves activities in which knowledge will be applied to new learning situations.
- iii. The student would experience more problem-solving and this would stimulate and increase the problem-solving skills and thinking skills.

This PdPc PBL module would be designed to be valid, based on the real-life problem situations but in accordance with the syllabus of KPD3016 course for students at the public universities. Question and answer techniques, small group discussions, PBL, questions and explanations, experiments, brainstorming, problem-solving scenarios are the main learning activities in this module. The main aim for the module that will be developed is to enable students to understand the problem : problem solving skills and thinking critically at the same time. Students will be informed of the learning outcomes in advance. The researchers will use the method of 'post-hole' (Savery and Duffy, 1995) in which the model that will be developed will be integrated into the existing method of PdPc.

2.3. Development and Construction of the Module

This module has been developed using the McMaster (Barrows and Tamblyn, 1980) model with the 3 basic PBL concepts involving three phases:

- a) Overview of the problem scenario.
- b) Information search.
- c) Discussion and presentation of new information to the problem.

Validation from experts in the field of Pedagogy, Instructional Technology and Assessment as well as PBL. The next step would be assessing the validity of the module. There would be improvement made to the module following the suggestions and comments made by the experts. outcome of the module.

Phase III: Validity of the PBL Module

This step would involve assessing the module validity via a pilot study on the Bachelor of Education students of the KPD3016 course. After that, there would be a structured interview conducted on the students in order to find out aspects such as advantages and challenges of the module implementation. The students would be required to reflect on the experience and challenges that they face. Suggestions from the graduates and the employers would be considered.

2.4. Data Analysis

This study would adapt the descriptive analysis in assessing the validity and reliability of the module. The views from the focus group as well as the structured interview and students' reflection would be utilised to ascertain the ability, validity and reliability of the module.

3. LITERATURE REVIEW

The development of the PBL approach has been discussed in detail since the 1970s (Savin-Baden, 2000). PBL has been identified as a learning strategy and theoretical transfer of practice to students with critical thinking skills (Chikotas, 2009; Sangestani and Khatiban, 2013). The PBL was developed by the medical staff at McMaster University, Canada in the late 1960s, and subsequently expanded in various fields of study based on the introduced

PBL model (Karakas, 2008). According to Dochy *et al.* (2005) PBL has been developed in the hope that it will assist students in developing their professional skills such as problem solving skills, analysis, synthesis and assessment, and even the ability to solve problems in real-world scenarios.

The PBL method emphasizes that problem solving activity is a style to acquire and apply knowledge (Barrows and Tamblyn, 1980). The term PBL is increasingly popular in higher education and was first used in business schools (Kwan, 2000) It subsequently attracted other educational disciplines implementing teaching and learning related to this term, which was previously believed to be monopolized by medical education. This approach is widely used for learning in the most professional disciplines and disciplines. In fact, some argue that it is the most important innovation since the transfer of professional training into educational institutions (Boud and Feletti, 1997).

PBL also has its share of benefits and drawbacks in its implementation. Strohfeltd and Grant (2010) identified a few of its advantages.

- The students will learn naturally.
- Critical thinking will be developed.
- A good relationship between students and facilitator would be developed.
- The students would be in ready mode for 5-8 hours for every PBL session and this may not be evident in traditional learning.

3.1. The Effectiveness of PBL in Teaching and Learning

In recent years, there has been a controversy over the effectiveness of PBL as a TnL method (Albanese, 2000; Dolmans, 2003; Farrow and Norman, 2003). According to Hmelo-Silver (2009) PBL's goals include helping students develop flexible knowledge; effective problem-solving skills; self-learning skills (SDL); effective collaboration skills and; intrinsic motivation. This shows that PBL is an effective T&L method and has a lot of positive effects on students. Many research findings support the benefits of PBL, although studies on PBLs in accounting are limited. The advantages of this approach are widely documented mainly in medical education, engineering and science, but there is a lack of research in its use in accounting. Most research findings were made for the achievement of PBL only based on anecdotal evidence or small-scale evaluation studies and not generalized.

Through the PBL approach, students are more motivated (Chan, 2000) and their findings are more meaningful and focused. This opinion is supported by Chin and Chia (2000) and Syed (2002) where the PBL approach enables students to identify problems effectively. Students become more motivated because they consider these problems as their own problems. Students are also involved in the learning process and become more creative and critical (Morales-Mann and Kaitell, 2001; Neo and Neo, 2001; Frenay *et al.*, 2007). According to De Graaff and Kolmos, they believe that PBL also helps to raise the knowledge and skills of interdisciplinary skills. Additionally, PBL also has the potential to enhance individual cognitive competitiveness by eliminating obstacles that can prevent work processes (Yeo, 2007) and encourage students to apply relevant and meaningful information in real situations (Tiwari, 2009).

3.2. Thinking Skills in Education

The purpose of the National Education Philosophy (FPN) as introduced by the Ministry of Education Malaysia (1996) is to provide individuals who are physically, emotionally, spiritually and intellectually balanced, based on obedience and trust in God. In this context, educators need to understand and have deeper awareness of FPN as the basis for the development of thinking skills. The implementation of thinking skills in this study means that lecturers need to apply and integrate the content of the Accountancy syllabus in a systematic and organized way.

The literature review assumes that the PBL method stimulates teaching and learning. Problems are a major focus in the teaching and learning process and students need to carry out problem solving activities. PBL is an

innovative teaching method by using problems in stimulating students to learn (Wan Muhd Zin *et al.*, 2015). Declarative knowledge and skills acquired through critical thinking skills will be used to solve the problems. This process is a repetitive process and therefore knowledge and skills will be easier to remember and it will be stored in the long-term memory. The knowledge becomes easier to remember when needed via this automated process.

4. FINDING AND DISCUSSION

The findings showed that this module was developed using the McMaster PBL Model (Barrows and Tamblyn, 1980). The module comprised 12 topics, with each topic consisting of two PBL Scenarios to assist lecturers and students in conducting the KPD3016 course - Teaching, Technology and Assessment in UPSI.

The assessment from the panel of experts showed that this PBL as a teaching and learning strategy module had the ability and continuity to assist the UPSI Bachelor of Education undergraduates to learn and understand the pedagogical, educational technology and education appraisal better. Russel (1974) stated that a module is considered to have a good and high quality content when it takes into account the target audience, there is satisfactory implementation of modules, time sufficiency and usability in solving modules and it raises the level of achievement and creates more positive student interest.

This clearly showed that this PBL teaching and learning module had gone through these processes and fulfilled the conditions expressed by Russel (1974). Furthermore, the PBL teaching and learning module recorded a high coefficient value of 0.833 (based on Russel (1974)). It can be concluded that this PBL Teaching and Learning Module had a high validity content value.

The research also took into account the views of the panel of experts that the PBL scenarios built into this module were easy to understand, not too difficult, appropriate and included topics in line with the KPD3016 course. The module also proved to be a consistent and effective measuring tool in the development of skilful and competent skills that incorporate thinking skills, self-learning, teamwork, communication skills, leadership and so on in line with today's market needs as well as meeting the requirements of becoming a teacher under the Malaysian Ministry of Education.

The coefficient value for the suitability and activity according to the experts' views regarding the PBL Module also recorded a high value of 0.889. Based on the pilot test activities for 58 students enrolling in the KPD3016 course to obtain the reliability value for the PBL teaching and learning module, this showed a reliability coefficient value of 0.923. This value was in line with the recommendations of Edward and Richard (1979); Frankael and Wallen (1996); Mohd (1998) and Vallete (1977). The conclusion was that the reliability of the PBL (TnFL) Module also recorded high coefficient values and fulfilled the criteria set by experts and researchers in Malaysia and overseas related to the development of the module.

As such, we conclude that the study of the effectiveness of the PBL (TnFL) Module for KPD3016 course - Teaching, Technology and Assessment can be implemented.

5. CONCLUSION

Overall, the study findings of the KPD3016 - Teaching, Technology and Assessment Modules showed good validity and reliability using the IBM SPSS Cronbach Alpha. This indicated that the KPD3016 - Teaching, Technology and Assessment modules of the KPD3016 course can be further utilised to see the effectiveness of the PBL Scenarios developed among students and lecturers involved in the KPD3016 course at UPSI or in any Education Pedagogy, Education Technology or Educational Assessment courses at other public universities. In addition, this module is also helpful for the development of innovative and effective teaching aids for other courses in strengthening the teaching and learning strategy of Bachelor degree programs at UPSI and other higher education institutions.

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REFERENCES

- Albanese, M., 2000. Problem-based learning: Why curricula are likely to show little effect on knowledge and clinical skills. *Medical Education*, 34(9): 729-738. Available at: <https://doi.org/10.1046/j.1365-2923.2000.00753.x>.
- Anderson, R.I., A.L. Loviscek and J.R. Webb, 2000. Problem-based learning in real estate education. *Journal of Real Estate Practice and Education*, 3(1): 36-41.
- Barrows, H.S. and R.M. Tamblyn, 1980. *Problem-based learning: An approach to medical education*. New York: Springer.
- Birgili, B., 2015. Creative and critical thinking skills in problem-based learning environments. *Journal of Gifted Education and Creativity*, 2(2): 71-80.
- Boud, D. and G. Feletti, 1997. Changing problem-based learning [Introduction]. In D. Boud & G. Feletti (Eds.). *The challenge of problem-based learning*. 2nd Edn., London: Kogan Page. pp: 1-14.
- Boyd, T., 2010. Are we exemplars for the property profession? *Pacific Rim Property Research Journal*, 16(2): 124-150. Available at: <https://doi.org/10.1080/14445921.2010.11104298>.
- Chan, K.G., 2000. PBL@Anderson. *Problem-based learning: Educational innovation across disciplines*. The 2nd Asia Pacific Conference on PBL, Temasek Polytechnic, Singapore.
- Chikotas, N.E., 2009. Problem-based learning and clinical practice: The nurse practitioners' perspective. *Nurse Education in Practice*, 9(6): 393-397. Available at: <https://doi.org/10.1016/j.nepr.2009.01.010>.
- Chin, C. and L.G. Chia, 2000. Implementing PBL in biology. *Problem-based learning: Educational innovation across disciplines*. The 2nd Asia Pacific Conference on PBL, Temasek Polytechnic, Singapore.
- Dochy, F., M. Segers, P. Van den Bossche and D. Gijbels, 2005. Effects of problem-based learning: A meta-analysis. *Learning and Instruction*, 13(5): 533-568.
- Dolmans, D., 2003. The effectiveness of PBL: The debate continues. Some concerns about the BEME movement. *Medical Education*, 37(12): 1129-1130. Available at: <https://doi.org/10.1046/j.1365-2923.2003.01724.x>.
- Edward, G.C. and A.Z. Richard, 1979. *Reliability and validity assessment*. United States of America: Sage Publication.
- Farrow, R. and G. Norman, 2003. The effectiveness of PBL: The debate continues. Is meta-analysis helpful? *Medical Education*, 37(12): 1131-1132. Available at: <https://doi.org/10.1046/j.1365-2923.2003.01725.x>.
- Frankael, J.R. and N.E. Wallen, 1996. *How to design research in education*. 3rd Edn., New York: McGraw-Hill, Inc.
- Frenay, M., B. Galand, E. Milgrom and B. Raucant, 2007. Project and problem based learning in the first two years of the engineering curriculum at UCLouvain. In: A. Kolmos & E. De Graaff (Eds.), *Management of change: Implementation of problem-based and project-based learning in engineering*. Rotterdam: Sense Publisher. pp: 93-108.
- Fukuzawa, S., C. Boyd and J. Cahn, 2017. Student motivation in response to problem-based learning. *Collected Essays on Learning and Teaching*, 10: 175-188. Available at: <https://doi.org/10.22329/celt.v10i0.4748>.
- Hardin, W.G., 2001. Practical experience, expectations, hiring, promotion and tenure: A real estate perspective. *Journal of Real Estate Practice and Education*, 30(2): 17- 34.
- Hefferan, M. and S. Ross, 2010. Forces for change in property education and research in Australia. in *Proceedings of the 16th Annual Conference of the Pacific Rim Real Estate Society*, Wellington, New Zealand.
- Hmelo-Silver, C., 2009. What do we know about problem-based learning? Current status and future prospects. Keynotes Speaker will Present in 2nd International PBL Symposium. Singapore: Republic Polytechnic, 10-12 June.
- Karakas, M., 2008. Graduating reflective science teachers through problem based learning instruction. *Bulgarian Journal of Science and Education Policy*, 2(1): 59-71.

- Kivela, J. and R.J. Kivela, 2005. Student perceptions of an embedded problem-based learning instructional approach in a hospitality undergraduate programme. *International Journal of Hospitality Management*, 24(3): 437-464. Available at: <https://doi.org/10.1016/j.ijhm.2004.09.007>.
- Kwan, C.Y., 2000. What the problem-based learning (PBL): It is magic, myth and mindset. National University of Singapore Centre for Development of Teaching and Learning Brief, 3(3): 1-2.
- Ma, Y., 2001. Engaging employers in curriculum development through collaboration: A case study of an executive MBA programme. Master Thesis, Institute for Educational Research, Faculty of Education Universitetet I Oslo, Norway.
- Mak, M.Y., W.D. Sher and A.P. Williams, 2010. Students' evaluation of an online postgraduate property program. Proceedings of the 16th Annual Conference of the Pacific Rim Real Estate Society, Wellington, New Zealand.
- Ministry of Education Malaysia, 1996. National education philosophy: Goal and mission. Putrajaya, Malaysia: Curriculum Development Center.
- Mohd, M.K., 1998. Educational research methods. Kuala Lumpur: Language and Library Council.
- Morales-Mann, E.T. and C.A. Kaitell, 2001. Problem-based learning in a New Canadian curriculum. *Journal of Advanced Nursing*, 33(1): 13-19. Available at: <https://doi.org/10.1046/j.1365-2648.2001.01633.x>.
- Neo, T.K. and M. Neo, 2001. Problem-based learning: Reconstructing a website using multimedia authoring tools. Available from <http://www.tp.edu.sg/pblconference/full/Neo%20T.%20K%20and%20Neo%20M.pdf> [Accessed November 13, 2018].
- Russel, J.D., 1974. Modular instruction: A guide to the design, selection, utilization and evaluation of modular materials. Minneapolis, Minnesota: Burgess Publishing Company.
- Sangestani, G. and M. Khatiban, 2013. Comparison of problem-based learning and lecture-based learning in midwifery. *Nurse Education Today*, 33(8): 791-795. Available at: <https://doi.org/10.1016/j.nedt.2012.03.010>.
- Savery, J.R. and T.M. Duffy, 1995. Problem based learning: An instructional model and its constructivist framework. *Educational Technology*, 35(5): 31-38.
- Savin-Baden, M., 2000. Problem-based learning in higher education: Untold stories. Society for research into higher education. Open University Press.
- Strohfeltd, K. and D.T. Grant, 2010. A model for self-directed problem-based learning for renal therapeutics. *American Journal of Pharmaceutical Education*, 74(9): 173. Available at: <https://doi.org/10.5688/aj7409173>.
- Sulaiman, F., 2011. The effectiveness of problem-based learning (PBL) online on students' creative and critical thinking in Physics at tertiary level in Malaysia. Published PhD Dissertation, Centre for Science and Technology Education Research, University of Waikato Hamilton, New Zealand.
- Susilawati, C. and D. Peach, 2012. Challenges of measuring learning outcomes for property students engaged in work integrated learning. The 18th Pacific Rim Real Estate Society Conference, Adelaide, 15-18 January.
- Syed, A.A., 2002. The effect of problem-based learning with structured scaffolding on knowledge performance, reasoning performance and constructive learning dynamism in matriculation chemistry. Matriculation). Unpublished PhD Dissertation, Penang: University of Science Malaysia.
- Tiwari, A., 2009. Facilitating student learning during problem-based learning tutorials. Invited Speaker will Present in 2nd International PBL Symposium. Singapore: Republic Polytechnic, 10-12 June.
- Vallete, R.M., 1977. Modern language testing. 2nd Edn., New York: Harcourt Jovanovich Brace.
- Wan Muhd Zin, W., W. Sher and A. Williams, 2015. Crafting challenging PBL problems in engineering curricula. Paper Presented at the Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors (COBRA) and The Australasian Universities' Building Educators Association Conference (AUBEA), Sydney, Australia.
- Wan, M.Z.W.H., A. Williams and W. Sher, 2013. Crafting challenging PBL problems in engineering curricula. In The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors, Sydney,

- Australia in Association with AUBEA, the University of Technology Sydney and University of Western Sydney, 8 -10 July.
- Ward, J.D. and C.L. Lee, 2002. A review of problem-based learning. *Journal of Family and Consumer Sciences Education*, 20(1): 16-26.
- Yam, S. and P. Rossini, 2010. Effectiveness of project-based learning as a strategy for property education. *Pacific Rim Property Research Journal*, 16(3): 291-313. Available at: <https://doi.org/10.1080/14445921.2010.11104306>.
- Yam, S. and R. Peter, 2012. Online learning and blended learning: Experience from a first-year undergraduate property valuation course. *Pacific Rim Property Research Journal*, 18(2): 129-148. Available at: <https://doi.org/10.1080/14445921.2012.11104355>.
- Yeo, R.K., 2007. (Re) viewing problem-based learning: An exploratory study on the perceptions of its applicability to the workplace. *Journal of Managerial Psychology*, 22(4): 369-391. Available at: <https://doi.org/10.1108/02683940710745941>.
- Yuan, H., W. Kunaviktikul, A. Klunklin and B.A. Williams, 2008. Improvement of nursing students' critical thinking skills through problem-based learning in the People's Republic of China: A quasi-experimental study. *Nursing & Health Sciences*, 10(1): 70-76. Available at: <https://doi.org/10.1111/j.1442-2018.2007.00373.x>.
- Zabit, M.M.N., 2013. The Implementation and impact of problem-based learning on students' critical thinking skills in teaching business education in Malaysia. Ed.D Dissertation, University of Strathclyde, UK.

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