Pertanika J. Soc. Sci. & Hum. 24 (4): 1849 - 1868 (2016)

PERTANIKA JOURNALS

SOCIAL SCIENCES & HUMANITIES

Journal homepage: http://www.pertanika.upm.edu.my/

The Impact of the Role of Teacher and Balance of Power in Transforming Conventional Teaching to Learner-Centered Teaching in Malaysian Institution of Higher Education

Yap, W. L.[1]*, Neo, M.[2] and Neo, T. K.[2]

[1]INTI International University, Faculty of Science, Technology, Engineering and Mathematics, Persiaran Perdana BBN, Putra Nilai, 71800 Nilai, Negeri Sembilan, Malaysia
[2]Multimedia University, Jalan Multimedia, 63000 Cyberjaya, Selangor, Malaysia

ABSTRACT

There have been many efforts in Malaysian institutions of higher education to move from curriculum-based education to outcome-based education. However, the readiness and acceptance level of teaching with ICT in Malaysian education is also still a challenge, and the confidence in developing effective learning materials and implementing more learner-centred teaching environments is still lacking. Due to this, there is an urge to investigate and propose guidelines for educators teaching in Malaysian institutions of higher education in order to have an easier transition from conventional teaching to a more learner-centred teaching environment. Weimer (2002) proposed five key strategies of learner-centred teaching to be incorporated into the instructional process, four of which were investigated. This research investigates the influence of implementing Weimer's key changes in three learning environments (face-to-face teaching with PowerPoint, learning with multimedia application and online learning with multimedia application) on students' learning outcomes. Data from pre- and post-tests, survey questionnaires and students' comments were triangulated and ANOVA analyses were performed. The results indicate that students showed better appreciation of the balance of power given in the class and they accepted the change of the role of lecturer to a facilitator. The changes have resulted in better learner understanding and learner motivation. The positive results contributed in the form of a framework for tertiary education to implement Learner-Centred Teaching. Future research could be conducted involving different programmes of study.

ARTICLE INFO

Article history:
Received: 12 August 2015
Accepted: 5 February 2016

E-mail addresses:
desiree.yap@newinti.edu.my (Yap, W. L.),
drmaineo@gmail.com (Neo, M.),
tkneo1437b@gmail.com (Neo, T. K.)
* Corresponding author

Keywords: Balance of power, learner-centered teaching, learner motivation, learner understanding, role of teacher, transformation in education, multimedia learning

ISSN: 0128-7702

INTRODUCTION

There was an urge in many Malaysian universities to re-examine courses and programmes to ensure the programme outcomes and students' learning outcomes were aligned with Malaysian Qualification Agency (MQA)'s requirement when there was an alarming increase in the unemployment rate among our graduates from 2006 – 2008 (Kaliannan & Chandran, 2012). The Ministry of Higher Education has been emphasizing the implementation of outcome-based education (OBE) ever since then. In fact, OBE was developed in Malaysia in the 1950s and currently many universities have already started to implement this at all levels (Mohayidin et al., 2008). There have been significant scholarly research projects conducted by a few established Malaysian universities, Universiti Putra Malaysia, Universiti Teknologi MARA and Universiti Pendidikan Sultan Idris which focus on how OBE has contributed in improving students' 21st century skills, and attitudes besides the fundamental knowledge gain from the education system (Karim & Khoo, 2013). However, Malaysian education is still slow to change from the conventional education system to OBE (Malaysian National Education Policy, 2012).

In spite of the rapid progress of technologies for the 21st century classroom, many education systems are still predominantly constrained and limited by conventional teaching and learning methods (Oliver, 2002), where instructors are still teaching their students in the same manner as they were taught and how their own instructors were taught, with little progress in teaching perspectives (Anglin & Anglin, 2008). In the conventional teaching environment, students become passive receivers of information and merely reiterate the information memorized when sitting for exams (McCarthy & Anderson, 2000). Transformation to less conventional methods of teaching results in fear and reluctance from educators, who find the change hard and risky (Chiang et al., 2010). Many educators have realized the limitation of conventional teaching where the students are always not trained to be more mature in their thinking process (Zakaria & Iksan, 2007; Wright, 2011). The learning process is always in one direction: students will just listen to the teachers and no feedback or response is given to the teachers.

The growth of Information and Communication Technology (ICT) has changed the way teachers teach and students learn and it has had a significant influence on education. The use of technology in education has given options for the teachers to introduce innovative teaching to students by facilitating learner-centred teaching. Students who are taught in learner-centred teaching environments will be able to plan and engage more actively in their own learning process and have the opportunity to develop deeper thinking (Hunter, 2012; Weimer, 2013). Use of technology in education is able to further enhance the learning experience. Besides the focus on helping students to learn using technology, teachers can also improve their teaching skills through the

use of technology (Murugaiah et al., 2010). Another encouraging fact is students are ready for the technology uses when they further their studies in colleges, university colleges or universities. In fact they expect to see the use of technology in education (Chen et al., 2010). Through the usage of technology, the students have the chance to improve communication skills, learn to manage data, be creative and be problem solvers. All these skills sets are critical and can lead the students to be successful in their careers (Moeller & Reitzes, 2011). The assistance of technology in teaching and learning promotes active learning where it helps to pass the responsibility of learning to the students. Hence, they become active learners who can enjoy the flexibility in planning the learning progress (Moeller & Reitzes, 2011).

There have been on-going studies conducted in Malaysian universities to assess if students are ready and could accept e-learning or technology in their education. These studies have given positive feedback that students are ready to be taught in technology driven environments (Hong et al., 2003; Lim et al., 2008; Hong & Tan, 2011) However, teachers face challenges in using the technology in teaching because there is a lack of ICT training on the tools and an absence of suitable understanding of the advantages of ICT-based classrooms, resulting in slow progress or change towards leaner-centred teaching and teacher reluctance and resistance (Wong, 2009). Thus, students in colleges and universities in Malaysia are still taught in curriculum-based teaching environments (Malaysian National Education Policy, 2012).

In order to bridge the gap in the transition from curriculum-based teaching to OBE for teachers who have challenges in implementing OBE, a learner-centred teaching model is recommended. Learner-centred learning is where the learning process makes students the focus because the students have the right to arrange the content for learning: they can plan when they want to learn and also the methods they want to adopt for learning (Baeten et al., 2010). When students are allowed to have control over their own learning materials and learning pace at the same time, they experience a change in the learning process (Hunter, 2012). In student-centred learning, the emphasis is on empowering students and placing the student in the centre of the learning process (Blumberg, 2004). Teacher-centred teaching also focuses on engaging students in their learning, but places the critical role on the teacher (Blumberg, 2004) as the "engine of innovators" – designing, testing, and sharing their best pedagogical ideas (Laurillard, 2013). In order to improve students' learning process, Weimer (2002) proposed to the academics and educators to consider five key changes to take place which can promote learner-centred teaching at the same time where the focus or responsibility is on the students. Educators can consider incorporating the following five key changes (Yap, 2016) into their instructional practices, which are:

i. The role of the teacher
Instead of having the teacher covering the syllabus from a-z in the classroom, the teacher should encourage students to become active learners so their role changes from "teacher" to "facilitator".

ii. The balance of power
In learner-centred teaching, teachers can share the decision making with the students. In such situations, students are involved more in the learning process rather than having teachers decide everything for them.

iii. The function of content
The content used in the classroom delivery should be able to promote critical thinking skills, problem solving skills, develop their learning skills and increase self-learning awareness besides the ordinary function which is to deliver knowledge to students.

iv. The responsibility for learning
In learner-centred teaching environments, students are encouraged to play an active role in learning where they will be aware of their learning responsibility. Students do not feel "forced" to look at the study materials and in fact they will be motivated to be more independent and have control on how they want to study. As such, students will take the initiative to explore the subjects' contents without waiting for the teachers' instructions. Hence, this would reduce the "spoon-feeding" situation in the teaching process.

v. The process and purpose of evaluation
The evaluation adopted in coursework should be able to promote learning and help students to develop their learning skills. Learner-centred teaching promotes the use of self-assessment or peer assessment because this can prevent the courses from being grade-oriented and evaluated by teachers only. (Yap, 2016)

In this paper, findings on the impact of the role of the teacher on learner understanding and the balance of power on learner motivation are reported.

The implementation of the above learner-centred teaching strategies could be assisted with the use of multimedia technology. Multimedia technology has had an impact on learning and teaching, with research showing that multimedia has been effective in education (Wang, 2010; Smith et al., 2011). The importance of multimedia technology in education cannot be denied as it plays an important role in transforming the traditional chalk and talk environment into a blended learning environment or student centered learning environment (Demirer & Sahin, 2012). Multimedia learning is reported in many research studies which suggest that it is significant in improving learning and somewhat aids in forming learner-centred teaching. The use of multimedia learning modules would provide a platform for independent learning. Besides that, the careful combination of multimedia elements in the multimedia learning modules would create a better

learning experience. Multimedia technology is seen to be one of the significant factors driving the creation of the current education framework. Smith et al. (2011) posited the following:

> *Advantages of instructional multimedia include increased availability and repetition of instructional content, improved ability of students to learn at their own pace, increased student control of material, less demand on instructor time, and the provision of an alternative approach to describe complex topics or three-dimensional relationships* (p. 1).

The involvement of multimedia in education is getting more important as it is able to improve the students' learning outcome. Much research has been done on the impact of multimedia learning and also online learning applications on the student learning process (Oncu & Cakir, 2009; Yerby & Floyd, 2013). According to Mukti and Siew (2004), interactive multimedia application was found to be an interesting and exciting tool in teaching children moral values. Similar positive results were found in another research project where road safety education was delivered to children using multimedia technology (Rawi et al., 2015). Malaysian university students were motivated and able to gain better understanding while at the same time improve their problem-solving and collaboration skills through the use of interactive multimedia applications in the web environment (Neo et al., 2016) or virtual simulation applications (Ziden & Rahman, 2013).

Statement of Problem

The above discussion leads to the following research issues: Malaysian institutions still practice curriculum based teaching, and therefore, the change has been slow. As such, the Malaysian Education Policy 2012 has called for institutions of higher education to step forward and introduce learner-centred teaching in order to increase students' creativity and thinking skills. However, in order for educators to accept and move towards such change, these learner-centred teaching methods have to be investigated and tested (Blumberg, 2004; Weimer, 2013). For Malaysian universities which are still at the beginning stages in moving towards learner-centred learning, there may not be clear proposed guidelines for reference. Therefore, there is a need to develop a proper learner-centred teaching framework to help Malaysian educators transition from conventional teaching to learner-centred teaching (Weimer, 2013).

Research Questions

There were two research questions formulated to help in conducting this research.

RQ_1: What is the impact of the role of teacher on learner understanding?

RQ_2: What is the impact of the balance of power on learner motivation?

METHODS

This study followed the experimental research methodology where there was a need to study the "cause-and-effect" relationships between the learning environments and students' learning outcomes. There was an independent variable to be manipulated in this study, which was the learning environments: students underwent their lessons in different learning environments. The implementation of each learning environment was monitored for its effect on the dependent variables, which were students' motivation, understanding and content. The quasi-experimental design for this research consisted of one control group (C) and two treatment groups (X). The control group was where students were taught using a face-to-face teaching approach and PowerPoint was used as the presentation slides. In one of the treatment groups the lecturer conducted the lecture face-to-face via the interactive multimedia learning module, and at the same time students were allowed to access the same copy of the learning module from the computers. The other treatment group was allowed the students to have their own independent learning by accessing the web-based interactive multimedia learning module. Observation (O) through measurement was conducted through a pretest before and post test after the learning for the three groups. These three learning environments would be able to show how the impact of role of teacher and balance of power may change gradually in the learning environment.

The study adopts mixed-methods approach which uses both quantitative and qualitative methods (Fraenkel et al., 2012). In this study, the results from the survey were considered as quantitative approach, the comments received from the students were the qualitative approach. This research adopts triangulation as the strategy to conduct the study (Mathison, 1988).

This research had considered internal validity in the relationship formed among the variables from the quasi-experimental design which was unambiguous. The effect on the dependent variables should be due to the intervention of the treatment and there are no other unrelated variables. Therefore, it is important to control the threats to internal validity for the quasi-experimental design adopted (Fraenkel et al., 2012). The process of implementing each learning environment was the same, including the instruments and the same syllabus. The study was conducted at the same place and by the same researcher. Other than that, all the participants in the research had similar education backgrounds. The students in this class were divided into the three learning environments through convenience sampling after they formed their own groups. The lecturer who was the researcher could not choose which class to teach as the assignment of the teaching workload was administered in the faculty by the Dean and the Head of Programme.

There was a total of 76 students enrolled in the subject "CSC1170 Principles of Information Technology" and 68 of them participated in this study. These students

were studying in the Diploma of Business Administration course, semester one, under the Faculty of Business, Communication, Accountancy and Law (FOBCAL), at INTI International University. They were computer literate where they had some basic knowledge in computing or had experience in using computer. All of them had met the entry requirements of this course and also had passed the English test upon entry.

This research involved three instruments: (i) a pre-test and post-test with 20 multiple choice questions, (ii) a learning environment survey with a five-point Likert type scale where five constructs were identified from the survey: motivation, understanding, content, role of the teacher and web features (this category was only available for the survey used in the web learning environment), (iii) the students' comments where the students were required to answer five open ended questions regarding the learning environment. The flow of study is presented in Figure 1.

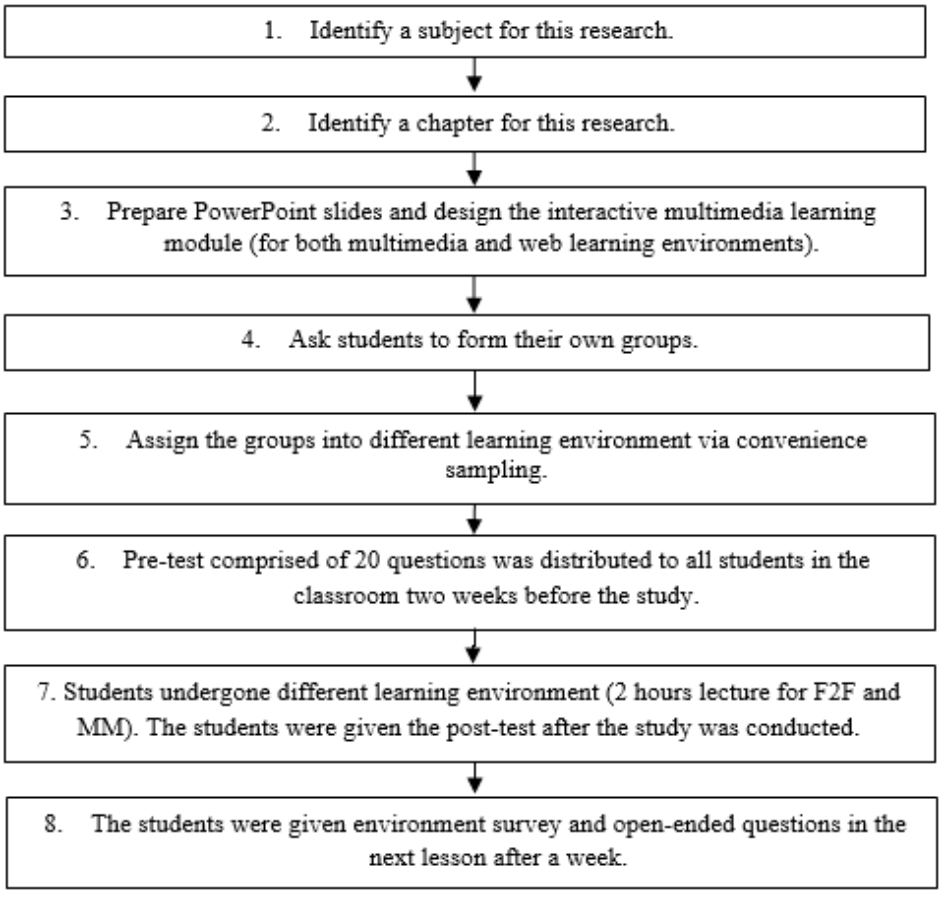

Figure 1. Flow of Study

DATA ANALYSIS

This section presents the results of students' performances (learning scores), students' perceptions of the learning environments in which they participated and students' comments, using the triangulation method from three different learning environments.

I. Pre-test/ Post-test

The breakdown of the number of students involved in each learning environment (Face-to-face teaching with PowerPoint – F2F, Learning with multimedia – MM, Web learning with multimedia – Web) is shown in Table 1. All the Tables are located in the Appendix. The mean scores for pre-test/ post-test results were found to be higher for students who went through the learning with the multimedia module and also the web learning with multimedia module compared to the students who went through the conventional teaching environment (see Table 2). Students who had their independent learning on the web actually achieved the highest mean scores in the post-test. This appears to indicate that when the role of teacher changed from "teacher" to "facilitator", students could actually learn better. The score difference of the pre-test and post-test results was found to be normally distributed where each was greater than 0.05 in the Shapiro-Wilk test (see Table 3). Next, the pre-test and post-test mean scores were compared using the paired-samples t-test. In Table 4, the p-value obtained in all three learning environments does not fall outside of the 95% confidence level (sig value is not greater than 0.05), therefore it tells that the differences of the mean scores for the pre-test and post-test results were significant. Each learning environment managed to help in achieving the students' learning outcomes.

II. Learning Environment Survey

Teaching with PowerPoint (F2F). Students in this conventional teaching environment were able to gain understanding after the class was conducted. However, the gain was not as great as the other two learning environments. Though different students were involved in each learning environment, from the background profile survey, it was found that they had similar educational backgrounds and computing knowledge, and that this was their first computing subject as well. The use of same chapter in the study for all three learning environments would contribute to the reliability of the results. When the teacher played the role of the authority, students were not able to be involved actively in the learning process (Yap, 2016). Therefore, the results of the survey supporting this "understanding" aspect were lower in this learning environment (refer to Table 5) (Yap, 2016). Besides investigating learner understanding in this learning environment, there were items which investigated students' perceptions of the role of the lecturer in the class (see Table 6). Another construct, "motivation," was identified from the survey questions (see Table 7).

Learning with Multimedia (MM). When students started to be involved in the

learning process, they became aware of the topics they were learning and they could understand the information presented in the multimedia module (Yap, 2016). This appeared to assist students to successfully achieve the learning outcomes. In this study, there were seven survey items being extracted for the "Understanding" category (see Table 8). The presence of teachers in this learning environment appeared to help to guide the learning process but more at a scaffolding level (See Table 9 for the "Role of Teacher" category). When students found the lectures interesting, they were engaged throughout the learning process. When students were motivated during the learning process, students were encouraged to find more information regarding the topic they learn in the class (see Table 10).

Web learning with multimedia (Web). In this web learning with multimedia module environment, students went through a self-learning process. Since there was no face-to-face teaching done by the lecturer, it was necessary to investigate if students had gained any knowledge or understanding from their independent learning. For the "Understanding" category, there were nine survey items that were extracted (refer to Table 11). The presence of the lecturer in the web learning environment was to facilitate the learning process. If students were to have any problems in learning, the lecturer would be able to help the students by answering their questions. There was only one survey item extracted for the "Role of Teacher" category (see Table 12), and this item showed that students were concerned about the support given by the teacher where they appreciated the teacher's presence who acted as a facilitator in the class. There were 11 items extracted which were related to "motivation" (see Table 13).

One-way ANOVA Analysis

Table 14 shows the results of the ANOVA analysis for the factor on learner understanding. It is noted that the difference between the mean scores for understanding is significant among the three learning environments where $p < 0.05$. For the effect on achieving understanding among the three learning environments, it differed significantly across all three, F (2, 65) = 7.680, p = .001. In terms of the effect on understanding, the web learning with multimedia module was significantly different from teaching with PowerPoint and teaching with multimedia modules. Tukey post-hoc comparisons for effect on understanding of these three learning environments indicated that the web learning with multimedia module (M = 3.87, 95% CI [3.71, 4.03]) again had higher ratings than teaching with PowerPoint (M = 3.52, 95% CI [3.24, 3.80]), p = .049, and also teaching with multimedia module (M = 3.41, 95% CI [3.22, 3.60]), p = .001 (see Table 15).

III. Students' Comments

In this study, students were asked for their written feedback regarding the learning environments which they went through. The comments were able to support the results obtained in the Pre-test/ Post-test as well as the survey results. Students expressed

that they could enjoy learning when they were given more responsibility and control on how they would want to learn. They also conveyed their appreciation of the multimedia module which made the learning easier and more interesting. Some common phrases for face-to-face teaching were *"boring", "sleepy", "couldn't catch up", "teach too fast",* and *"less interaction"* (see Table 18). For the learning with multimedia module environment, some of the students' comments were *"easy to understand", "easy to memorise", "teacher guide me", and "pictures and animation"*. This supported the pre-test/ post-test and survey results, where when the role of teacher changed, and the learners' understanding improved (see Table 19). Students who studied in the web learning environment commented *"lecturer can explain", "easy to learn", "easy to understand", "can focus more", "quiz help to memorize",* and *"learn with fun and peace mind"* (see Table 20).

DISCUSSION

The results obtained above had given an insight about the difference in the impact of the role of the teacher and the balance of power in learner understanding and learner motivation when these two factors change gradually from conventional teaching to learner-centred teaching. This study did not recommend replacing conventional teaching but recommends providing teachers with other learning environment options to consider if they would want students to achieve all learning outcomes and help them gain 21st century skills.

A. **Role of the Teacher**

The face-to-face teaching with PowerPoint was very much teacher-centred learning or known as conventional teaching approach. Students did show their appreciation towards presence of lecturer in the classroom. The teaching with multimedia module learning environment received positive ratings on the presence of lecturer. Due to the introduction of the multimedia module, the frequency of students asking questions was slightly reduced because they could find the answers easily from the multimedia module and they could understand the lecture easily. Therefore, the role of lecturer became a scaffold for the learner-centred teaching approach. In the web learning environment, a high level of learner-centred teaching was formed where the role of the teacher changed from authority to facilitator and students were encouraged to be active learners and were given more time to understand the contents. Hence, learner understanding improved.

A. **Balance of Power**

This "motivation" construct received the most outstanding ratings from the students when they were given the opportunity to access the multimedia module either in the case while the lecturer was teaching in the class using the multimedia module or in the web learning environment. The majority of the students felt they were motivated in learning when the balance of power shifted from the teacher to the students: learner motivation increased. The results from the survey and comments supported

the literature where multimedia could motivate students in learning and created an interesting atmosphere for students. This has supported the effectiveness of multimedia technology in enhancing the learning experience.

CONCLUSION

This study has indicated that learner understanding and learner motivation would be affected when the role of the teacher/lecturer changes from "teacher" to "facilitator" and also when the balance of power moves from the teacher to the students. Students were given more control over their learning pace and they decided on the sequence of topics to study. They also decided how much time was to be spent on each topic as the learning environment gradually changed to become more learner-centred as compared to the conventional teaching environment. Students' comments revealed that they enjoyed the web learning environment. The learner understanding and learner motivation were statistically found to be significant in the ANOVA analysis comparing the conventional teaching environment with the independent learning environment. Last but not least, the use of the multimedia learning module in both the more learner-centred teaching environment and web learning environment also contributed in helping the students to learn successfully. The triangulated findings supported a framework which presents that there will be different level of impact on students' learning outcomes – greater learner understanding and learner motivation when teachers play different roles and also when the balance of power shifts gradually from one learning environment to another. In future, the research could be expanded by involving more students from different faculties, and different levels of programmes as well as courses. This research has only investigated the positive outcomes of implementing a learner-centred teaching environment in tertiary education which has just started taking the steps to move towards OBE before they concentrated on the student-centred learning approaches to be incorporated. It would be interesting to find out how a student-centred learning approach which involves the use of various technology-enabled learning tools in an online learning environment can enhance students' learning experience. This future research would echo the recommendation from Malaysian Ministry of Education to increase awareness in all education institutions to ensure students acquire the necessary 21st century skills (Malaysian Education Blueprint 2013 – 2025, 2012).

ACKNOWLEDGEMENTS

I would like to thank my supervisors, Prof. Dr. Neo Mai and Prof. Dr. Neo Tse-Kian who had given me their guidance, advice and support along the research process. Their patience and motivation helped me complete this research. Besides my supervisors, I would also like to thank INTI International University for the financial support for my study and also the opportunity to conduct this research on campus. I also appreciate the participation of the subjects from Faculty

of Business, Accountancy and Law. Their invaluable responses and comments had contributed greatly to the success of this research.

REFERENCES

Anglin, L., & K. Anglin. (2008). *Business Education, Teaching, and the Millennials.* Proceedings of the Academy of Business Disciplines.

Baeten, M., Kyndt, E., Struyven, K., & Dochy, F. (2010). Using student-centred learning environments to stimulate deep approaches to learning: Factors encouraging or discouraging their effectiveness. *Educational Research Review, 5*(3), 243 – 260.

Blumberg, P. (2004). Beginning journey toward a culture of learning centered teaching. *Journal of Student Centered Learning, 2*(1), 68-80.

Chen, P. D., Lambert, A. D., & Guidry, K. R. (2010). Engaging online learners: The impact of Web-based learning technology on college student engagement. *Computers and Education, 54*(4), 1222 – 1232.

Chiang, C. K., Chapman, H., & Elder, R. (2010). Changing to learner-centred education: Challenges experienced by nurse educators in Taiwan. *Nurse Education Today*, *30*(8), 816 – 820.

Demirer, V., & Sahin, I. (2012). Development, implementation and evaluation of an online multimedia learning environment for blended learning. *AWERProcedia Information Technology and Computer Science, 1*, 980-985.

Fraenkel, J., Wallen, N., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th ed.). Boston: McGraw Hill.

Hong, K. S., Ridzuan, A. A., & Kuek, M. K. (2003). Students' attitudes toward the use of the Internet for learning: A study at a university in Malaysia. *Journal of Educational Technology and Society, 6*(2), 45 – 49.

Hong, K. S., & Tan, G. G. S. (2011). The Effectiveness of collaborative learning in the teaching of Form Four mathematical reasoning. *Jurnal Teknologi, 55*(1), 55 – 73.

Hunter, M. S. (2012). *Creating and eveloping learner-centered classrooms*. In 31st Annual National Conference on The First -Year Experience, National Resources Centre, San Antonio, Texas, USA. February 20, 2012, 53-60.

Kaliannan, D. M., & Chandran, S. D. (2012). Empowering students through outcome-based education (OBE). *Research in Education*, *87*(1), 50-63.

Karim, N. A. H. A., & Khoo, Y. Y. (2013). Outcome-Based Education: An approach for teaching and learning development. *Teacher Education*, *3*(1), 26-35.

Laurillard, D. (2013). *Keynote: Designing the pedagogies for student guidance on the larger scale.* In 63rd Annual Conference International Council for Educational Media 2013, Oct 1-4 2013, Singapore.

Lim, B. C. Y., Hong, K. S., & Tan K. W. (2008). *Acceptance of e-learning among distance learners: A Malaysian perspective*. Proceedings ascilite Melbourne 2008.

Ministry of Education Malaysia. (2012). *Malaysian Education Blueprint 2013 – 2025 (2012)*. Retrieved August 20, 2013, from www.moe.gov.my/userfiles/file/PPP/Preliminary-Blueprint-Eng.pdf

Ministry of Education Malaysia. (2012). *Malaysian National Education Policy, (2012)*. Retrieved August 20, 2013, from http://www.moe.gov.my/v/dasar-pendidikan-kebangsaan

Mathison, S. (1988). *Why Triangulate?* [Online]. Retrieved 30 May 2012 from

http://www.eric.ed.gov/ERICWebPortal/recordDetail?accno=EJ371464.

McCarthy, J. P., & Anderson, L. (2000). Active learning techniques versus traditional teaching styles: Two experiments from History and Political Science. *Innovative Higher Education*, *24*(4), 279-94.

Moeller, B., & Reitzes, T. (2011). *Integrating Technology with Student-Centered Learning*. Quincy, MA: Education Development Center, Inc. (EDC).Nellie Mae Education Foundation.

Mohayidin, M. G., Suandi, T., Mustapha, G., Konting, M. M., Kamaruddin, N., Man, N. A., ... Abdullah, S. N. (2008). Implementation of Outcome-Based Education in Universiti Putra Malaysia: A focus on students' learning outcomes. *Journal of International Education Studies, 1*(4), 147 - 163.

Mukti, N. A., & Siew, P. H. (2004). Malaysian perspective: Designing interactive multimedia learning environment for moral values education. *Educational Technology and Society*, *7*(4), 143-152.

Murugaiah, P., Azman, H., Ya'acob, A., & Thang, S. (2010). Blogging in teacher professional development: Its role in building computer-assisted language teaching skills. *International Journal of Education and Development using ICT*, *6*(3), 73-87.

Neo, M., Tan, Y. J. H., & Ludin, N. (2016). *Enhancing Malaysian students' learning with interactive multimedia and the Web: The MILE project.* In 7th International Conference on University Learning and Teaching (InCULT 2014) Proceedings (pp. 361-373). Singapore: Springer.

Oliver, R. (2002). *The role of ICT in higher education for the 21st century: ICT as a change agent for education.* Proceedings of the Higher Education for the 21st Century Conference, Curtin: Curtin University.

Oncu, S., & Cakir, H. (2011). Research in online learning environments: Priorities and methodologies. *Computers and Education, 57*(1), 1098 – 1108.

Rawi, N. A., Mamat, A. R., Deris, M. S. M., Amin, M. M., & Rahim, N. (2015). A Novel multimedia interactive application to support road safety education among Primary School children in Malaysia. *Jurnal Teknologi*, *77*(19), 75 - 81.

Smith, A. R. Jr., Cavanaugh C., & Moore, W. A. (2011). Instructional multimedia: An investigation of student and instructor attitudes and student study behavior. *BMC Medical Education, 11*(38). Retrieved November 28, 2011, from http://www.biomedcentral.com/1472-6920/11/38

Wang, T. J. (2010). Educational benefits of multimedia skills training. *Tech Trends, 54*(1), 47-57. Retrieved November 28, 2011, from http://www.cc.ntut.edu.tw/~tjwang/tt-54-1.pdf

Weimer, M. (2002). *Learner-centered teaching: Five key changes to practice.* San Francisco, CA: Jossey-Bass.

Weimer, M. (2013). *Learner-centred teaching: Five key changes to practice* (2nd ed.). San Francisco, CA: Jossey-Bass.

Wong, L. S. (2009). Investigating the technology acceptance among student teachers in Malaysia: An application of the Technology Acceptance Model (TAM). *The Asia-Pacific Education Researcher 18*(2), 261-272.

Wright, G. B. (2011). Student-centered learning in higher education. *International Journal of Teaching and Learning in Higher Education, 23*(3), 92-97. Retrieved November 10, 2011, from http://www.isetl.org/ijtlhe/

Yap, W. L. (2016). Transforming conventional teaching classroom to learner-centred teaching classroom using multimedia-mediated learning module. *International Journal of Information and Education Technology, 6*(2), 105-112.

Yerby, J., & Floyd, K. (2013). *An investigation of traditional education vs. fully-online education in information technology*. Retrieved July 19, 2013, from http://sais.aisnet.org/2013/YerbyFloyd.pdf

Zakaria, E., & Iksan, Z. (2007). Promoting cooperative learning in Science and Mathematics education: A Malaysian perspective. *Eurasia Journal of Mathematics, Science and Technology Education*, *3*(1), 35-39. Retrieved November 21, 2011, from http://www.ejmste.com/v3n1/EJMSTEv3n1_Zakaria&Iksan.pdf

Ziden, A. A., & Rahman, M. F. A. (2013). The effectiveness of Web-based multimedia applications simulation in teaching and learning. *Online Submission*, *6*(2), 211-222.

APPENDIX

Table 1
Number of participants in the three learning environments

	Number of participants (N)
Face-to-face Teaching with PowerPoint (F2F)	14
Learning with Multimedia (MM)	24
Web Learning with Multimedia (Web)	30

Table 2
Mean scores for pre-test/ post-test in all three learning environments

	N	Mean	STD
F2F: Pre-test	14	7.64	2.061
F2F: Post-test	14	11.64	2.205
MM: Pre-test	24	8.46	2.813
MM: Post-test	24	11.92	3.006
Web: Pre-test	30	8.10	2.496
Web: Post-test	30	12.80	3.253

Table 3
Normality Test for Pre-Test/ Post-Test

Test of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Difference (F2F)	.143	14	.200*	.971	14	.885
Difference (MM)	.144	21	.200*	.968	21	.606
Difference (Web)	.124	30	.200*	.938	30	.080
a. Lilliefors Significance Correction						
*. This is a lower bound of the true significance.						

Table 4
Paired Sample Test for all three learning environments

Pre-test – Post-test	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
F2F	-4.000	2.075	.555	-5.198	-2.802	-7.211	13	.000
MM	-3.458	3.538	.722	-4.952	-1.964	-4.788	23	.000
Web	-4.700	3.303	.603	-5.933	-3.467	-7.795	29	.000

Table 5
Survey items for "Understanding" (F2F)

No.	Survey Items	Mean (M)	STD	%
7	The content presented in the lecture was relevant to my learning	3.64	.497	64.3
10	I was clear about the objectives of the lecture	3.57	.646	64.3
11	The content was easy to understand	3.50	.760	50.0
14	I know better about the subject after the lecture	3.50	.760	50.0
13	I was able to learn better with the conventional method of teaching	3.50	.760	35.7
16	I understood the course content after the lecture	3.43	.756	57.1

Table 6
Survey items for "Role of Teacher" (F2F)

No.	Survey Items	Mean (M)	STD	%
3	The lecturer helped me understand the concepts in the lecture better.	3.86	.663	71.4
1	The presence of the lecturer during this lecture was helpful	4.21	.802	78.6
8	I was able to maintain contact with the lecturer at all times	3.57	.852	50.0
4	I enjoyed having the lecturer present to answer any of my questions	3.86	.663	71.4

Table 7
Survey items for "Motivation" (F2F)

No.	Survey Items	Mean (M)	STD	%
15	I enjoyed learning with the conventional method of teaching	3.50	.855	42.9
17	I found the lecture interesting and engaging	3.43	.852	50.0
18	I liked the conventional method of teaching.	3.29	.914	42.8
19	I was interested to learn more about the topic after the lecture	3.14	.663	28.6
20	I was motivated learning with the conventional method of teaching	3.07	1.072	28.6

Table 8
Survey items for "Understanding" (MM)

No.	Survey Items	Mean (M)	STD	%
6	Multimedia made understanding the content better	3.79	.658	66.7
18	The content presented in the module was relevant to my learning	3.71	.550	66.7
30	I understood the course content in the multimedia learning module	3.71	.784	61.9
16	The content was easy to understand	3.50	.834	58.4
27	I was able to learn better with multimedia content	3.33	.761	41.7
29	I was clear about the objectives of the multimedia learning module	3.33	.761	41.7
28	I knew better about the subject with the multimedia learning module	3.33	.761	41.7

Table 9
Survey items for "Role of Teacher" (MM)

No.	Survey Items	Mean (M)	STD	%
1	The presence of the lecturer during this module was helpful	3.96	.624	79.2
2	The lecturer helped me understand the concepts in the module better	3.83	.702	66.7
12	I enjoyed having the lecturer present to answer any of my questions during the module presentation	3.71	.690	66.6
25	I was able to maintain contact with the lecturer at all times	3.42	.584	45.8

Table 10
Survey items for "Motivation" (MM)

No.	Survey Items	Mean (M)	STD	%
5	I liked the multimedia learning module	3.79	.779	66.7
7	I enjoyed learning with the multimedia learning module	3.79	.833	70.9
8	I liked learning with this method than in the traditional classroom	3.75	.676	62.5
11	Multimedia made learning fun and motivating	3.75	.676	70.8
15	I liked being able to learn with multimedia-oriented modules	3.54	.588	58.3
18	I liked the multimedia content in the module	3.50	.659	50.0
19	I was motivated learning with the module	3.50	.590	54.2
20	I found learning with the module interesting and engaging	3.50	.834	54.1
21	I was interested to learn more about the topic after going through the multimedia learning module	3.50	.722	54.2
22	The interactive features in the module made learning fun and engaging	3.46	.721	50.0
23	The interactive features in the module motivated me to learn the content	3.46	.721	41.6

Table 11
Survey items for "Understanding" (Web)

No.	Survey Items	Mean (M)	STD	%
2	The content was easy to understand	4.10	.548	90.0
5	I understood the course content in the web-based module	4.00	.587	83.3
10	I was able to learn better with multimedia content	3.97	.718	73.3
17	The content presented in the module was relevant to my learning	3.87	.571	83.3
19	The content in the application relevant to the chapter objectives	3.87	.629	73.3
21	Multimedia made understanding the content better	3.83	.699	73.3
24	The instructions in the application was easy to understand	3.80	.551	80.0
33	I was clear about the objectives of the multimedia learning module	3.70	.702	70.0
35	I know better about the subject after using the web module	3.60	.675	63.3

Table 12
Survey items for "Role of Teacher" (Web)

No.	Survey Items	Mean (M)	STD	%
1	The presence of the lecturer helped me in the learning process	4.23	.626	90.0

Table 13
Survey items for "Motivation" (Web)

No.	Survey Items	Mean (M)	STD	%
7	I find learning with the web interesting and engaging	4.00	.643	86.7
8	I enjoyed learning in the web environment	4.10	.548	90.0
13	Multimedia made learning fun and motivating	3.97	.669	83.3
16	I liked being able to learn at my own pace and time	3.90	.885	70.0
18	The interactive features in the module made learning was fun and engaging	3.87	.730	73.3
22	I liked the multimedia content in the web module	3.83	.874	73.3
23	I was motivated learning on the web	3.80	.805	80.0
25	I was interested to learn more about the topics in the web module	3.77	.898	73.3
27	I prefer this teaching / learning method in my learning process	3.77	.774	70.0
29	Interacting with the module motivated me to learn the content	3.73	.740	63.3
34	I liked learning on with this application rather than the traditional classroom	3.63	.928	60.0

Table 14
One-way ANOVA analysis on "Understanding"

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.079	2	1.539	7.680	.001
Within Groups	13.029	65	.200		
Total	16.108	67			

Table 15
Multiple comparison for "Understanding"

Tukey HSD						
(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
F2F	MM	.11409	.15056	.730	-.2470	.4752
	Web	-.34841*	.14491	.049	-.6960	-.0008
MM	F2F	-.11409	.15056	.730	-.4752	.2470
	Web	-.46250*	.12261	.001	-.7566	-.1684
Web	F2F	.34841*	.14491	.049	.0008	.6960
	MM	.46250*	.12261	.001	.1684	.7566

*. The mean difference is significant at the 0.05 level.

Table 16
ANOVA analysis on "Motivation"

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.288	2	1.644	5.079	.009
Within Groups	21.037	65	.324		
Total	24.325	67			

Table 17
Multiple comparison for "Motivation"

Tukey HSD						
(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
F2F	MM	-.33095	.19132	.202	-.7898	.1279
	Web	-.58095*	.18414	.007	-1.0226	-.1393
MM	F2F	.33095	.19132	.202	-.1279	.7898
	Web	-.25000	.15580	.251	-.6237	.1237
Web	F2F	.58095*	.18414	.007	.1393	1.0226
	MM	.25000	.15580	.251	-.1237	.6237

Table 18
Students' comments (F2F)

"I don't like the conventional method of teaching."
"The class is boring because sometime will feel sleepy."
"Because if the long hour of classes is taken, will feel bore and sleepy."
"Some lecturer were less interect with the students. *The slide were too boring, it should add more picture and even more in order to make the students more understand about what the lecturer were teaching."*
"Boring."
"Difficult to follow."
"I don like this because there is not enough to splain."
"Because don't have tell any important thing."
"I will feeling sleepy after an hour in the class, and its tiring after all the classes."
"Sometimes will feel boring if lecturer present by a boring way."
"The lecturer teach too fast then student can't absorb fully information."
"Some lecturer might having less interaction with the students. *Some lecturer might teaching too fast, the students might find hard to absord the knowledge. Students might not concentrated during the class."*
"Difficult to follow."

Table 19
Students' comments (MM)

"I still can remember what I see in the module."
"Understanding the module easy bcos got pictures and animation."
"Make learning fun and motivating."
"Very interesting and fun."
"It is well-prepared and systematic."
"The graphic is nice and explains clear to me."
"I like the note."
"Animation, pictures are clear."
"Within animation more helpful."
"Colour, pictures and sound are used nicely in the module."
"What I like about the interactive multimedia learning module is, the module have all the pictures and videos to make the student more understand about the topic."
"Like teacher explain to me."
"Teacher guides me in the class."
"I like that teacher still explains the chapter to me."
"My lecturer is there to explain some points."
"I like my lecturer give me time to see the module after she teach me."

Table 20
Students' comments (Web)

"It has extra explanation."
"Easy to learning."
"Easy to understand."
"All the colourful pictures are provided, sound effect makes less boring."
"It is more easily to learn and it is interesting."
"Very easy to access and can interact with the teachers. Can learn in our own place at any time."
"The things that I like about the web module is that it is very interesting and fun. With it, I have learnt a lot of things."
"It is interesting, and it far more better than looking at those boring books."
"After reading all the information have a quiz. The quiz can help me faster to memorize the keyword and quick review."
"Many animation for more interesting to learn."
"The graphics and multimedia application make me interest."
"The animations and pictures help me to learn."
"Very easy to access and can interact with the teachers. Can learn in our own place at any time."
"Lecturer is here with us when we learn on our own."
"I am happy that I can learn on my own."
"I don't have to worry if I am slow in learning."
"Can learn in our own place at any time."