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Effectiveness of Using Appropriate Blended Learning Tools for Teaching and Learning Computer Programming Related Courses

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Abstract

With the advent of technology there are plenty of blended learning tools available for us to use in teaching and training activity. Selecting appropriate tools for a particular category of students and the nature of the subject being taught is important to achieve better academic results. Hence, the objective of this research is to assess effectiveness of various blended learning tools and to find the appropriate tool for teaching a computer programming related subject. The subject considered in this research is “Knowledge-based systems (ECP3126)” offered for electronics engineering students at Multimedia University of Melaka campus in Malaysia. This subject was delivered using four selected blended learning digital tools; ED puzzle virtual classroom videos, Home works on MMLS, MMLS online Quiz and MMLS discussion board, at the beginning of Trimester 2, 2018/2019. They were asked in the middle of the trimester to rate the usefulness of the four selected blended learning digital tools in a 5-point scale using an online survey. The analysis made in the form of a bar graph of the students’ feedback shows that out of the four tools “ED puzzle virtual classroom videos” is the most useful one with a score of 65, that is followed by “MMLS discussion board” with a score of 59. Hence more number of “virtual classroom videos” was used during the second half of the trimester. The effectiveness of using “virtual classroom videos” compared to other tools was revealed when the achievements of the students in terms of their academic performance were compared with previous year. It clearly shows that the academic performance of the students of year 2019 is better than of students of 2018. Hence it is recommended to choose appropriate tools based on students’ interest as we are moving towards student centred learning.

Keywords Blended learning tools; Virtual classroom videos; Computer programming subject and student’s academic performance

Introduction

In simple terms, blended learning is the combination of asynchronous and synchronous learning activities in one course. Blended learning offers numerous benefits, including; flexibility, independence, diversification, support etc. There is no doubt, that it provides richer, more interactive learning experiences to the students of higher learning institutions (Priyanka Gupta, 2016). Integration of videos, podcast and other multimedia makes learning richer and fun. With the advent of technology there are plenty of blended learning tools available for us to use in teaching and training activity. Selecting appropriate tools for a particular category of students and the nature of the subject being taught is important to achieve better academic results (Chew, 2008). That is why the primary aim of this research is to assess the effectiveness of using appropriate blended learning tools for teaching and learning computer programming related courses. The secondary aim is to find the appropriate blended learning tools for teaching the computer programming related subject, Knowledge-based systems (ECP3126), offered for electronics engineering students at Multimedia University of Melaka campus in Malaysia.

Literature Review

Blended learning is the combination of digital tools, techniques and materials with the physical traditional learning classroom (José et al., 2007). It is a hybrid teaching methodology or a style of education in which students learn through online electronic media and the face-to-face style of traditional teaching (Curtis et al., 2005). The pedagogical and socio-economic forces that have pushed Institutions of Higher Learning (IHL) to embrace and integrate ICTs in teaching and learning include “greater information access; greater communication; synchronous and asynchronous learning; increased cooperation and collaboration, cost-effectiveness and pedagogical improvement” (Sife et al., 2007). Even though the method which has evolved from distance education called “e-learning” has received great attraction from public universities, it should be combined with the face-to-face learning in order to be more effective. This blending leads to a new methodology called “blended learning”. This blended learning has proven to be the most effective learning system in Higher Educational Institution (HEI) in Malaysia (Azizan, 2010). There are many tools available for the implementation of blended learning in classroom teaching (Khandve & Shelke, 2016). However, selecting appropriate tools for a specific subject and the particular group of students being taught is important to achieve better academic results (Chew, 2008). Specific blended learning models are required to teach computer programming in higher education (Mohorovicic & Tijan, 2011). The nature of students and the type of course are to be considered while preparing for blended e-Learning (Littlejohn & Pegler, 2017). Research shows that the instructors involved in implementing blended learning in classroom teaching are also benefited in various ways (Nihuka et al., 2012).

Methodology

Selection of appropriate digital tools for blended learning is very important for the successful implementation of it. Hence it was decided to choose the tools based on the feedback received from the students of the class and to use the selected tools for teaching the subject. Finally, an analysis was made on the academic performance of these students by comparing the results of the current year (2019) students and the results of previous year (2018) students of the same subject (Asarta & Schmidt, 2017). The lecturer teaching the subject last year should be same for consistency. Number of students participated in the online teaching evaluation at the end of the trimester this year (2019) and last year was also compared and the result was considered as one of the indicators.

At the beginning of the trimester (Trimester 2, 2018/2019), lessons of the subject (ECP3126: Knowledge-based systems) were delivered using four selected blended learning digital tools; ED puzzle virtual classroom videos, Home works on MMLS, MMLS online Quiz and MMLS discussion board. At the middle of the trimester feedback on the effectiveness /usefulness of using these blended learning digital tools was taken. All of the students were requested to complete the online survey carefully designed using google form. A graphical analysis was made on their responses obtained through the survey. Subsequently, it was decided to implement the most useful and beneficial blended learning tool during the second half of the trimester.

Results

All of the sixteen students in the class took part in the online survey designed using the google form. They were asked to rate the usefulness and effectiveness of the four selected blended learning digital tools in a 5 point scale. Their comments and suggestions were also obtained through the same form. The analysis of the students' feedback is shown in the form of a bar graph in Figure 1. Out of the four tools "ED puzzle virtual classroom videos" is the most useful one with a score of 65, which is followed by "MMLS discussion board" with a score of 59 (Appendix A). According to their feedback, "MMLS Online Quiz" is not very useful (scored only 40). It showed that the students were interested in practical type of assessment as the subject is computer programming based. The tool "Home works on MMLS" was in the third position scoring 57, close to MMLS discussion board, which showed that they were still interested in doing homework but at their own pace and time.

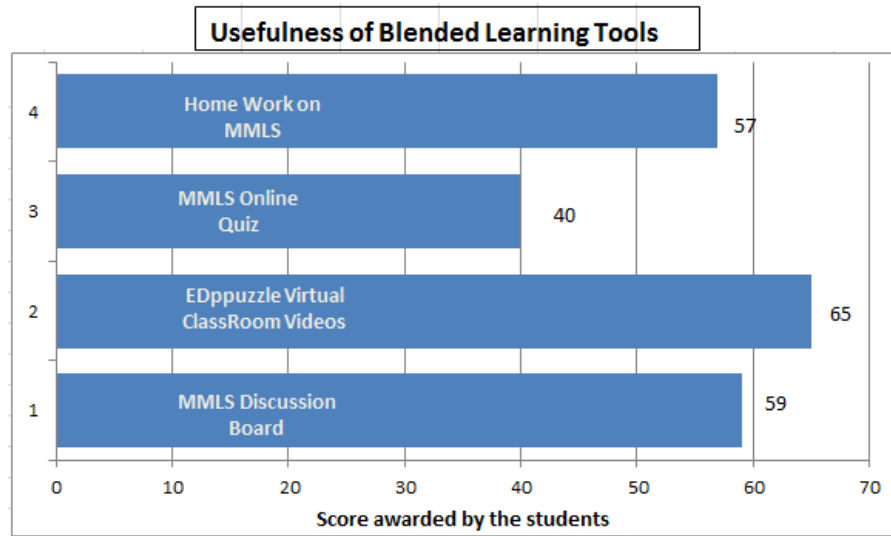


Figure 1 Analysis of Students’ Feedback.

The same analysis in the form of pie chart is shown in Figure 2 for better clarity and understanding. It is clear from the pie chart that the most useful tool is the “ED puzzle virtual classroom videos” because of its multimedia content. The least useful tool was found to be the “MMLS online Quiz”.

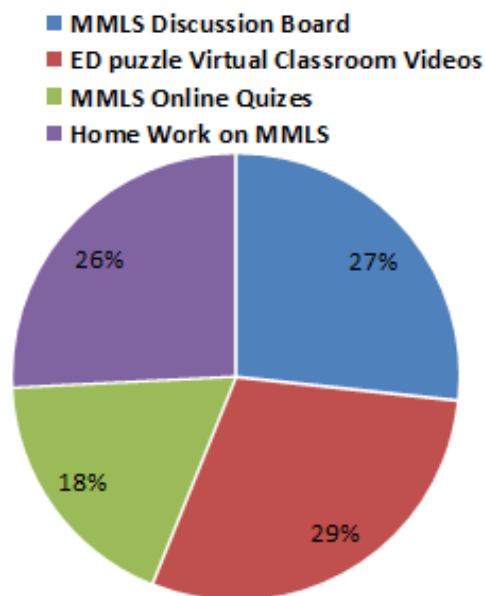


Figure 2 Pie Chart of Students’ Feedback Analysis

The comparison of achievements of the students in terms of their academic performance during 2019 and 2018 is listed in Table 1. It is also graphically shown in the form of column graph in Figure 3.

Table 1 Academic Results in 2018 and 2019

Trimester 2	Class Average Mark	Grade A Percentage	Teaching Evaluation Participation
2017/18	71.76	43.75	81.25
2018/19	73.96	47.06	94.12

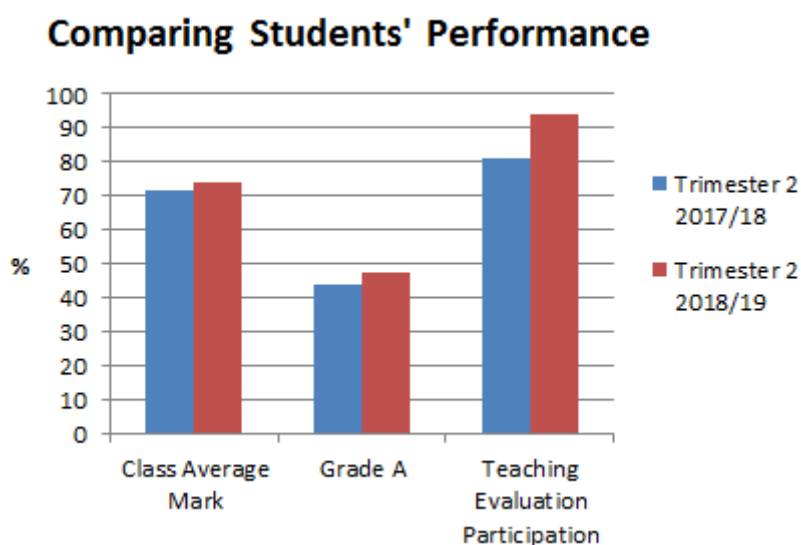


Figure 3 Comparing Students' Performance in 2018 and 2019

Discussion and Conclusion

From the analysis it is clear that the academic performance of the students in the current year 2019 is better than the students of 2018 in terms of their class average score and the percentage of students who obtained "A Grade". The reason for the improvement is because of the course taught used tools more likable to the students. It is also reflected in the percentage of students taking part in the online teaching evaluation at the end of each trimester, whereby the lecturer is also benefited.

From the results, it can be concluded easily that the selection of appropriate blended learning tools for teaching and learning computer programming related courses such as Knowledge-based Systems can improve students' academic performance. Hence it is recommended to choose appropriate tools based on students' interests as we are moving towards "student centred learning".

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Authors' Bio

Dr. Joseph Emerson Raja, is currently lecturing in the Faculty of Engineering and Technology at Multimedia University, Malaysia. He has received the Notable Commendation Award [Distinguished Alumni] from SRM University, India, on 12th March 2017. He has been honored with the best executive award and group CEO merit award in the year 2015 from TM, the leading integrated telecommunications company in Malaysia. He has authored a chapter titled "Blended Learning Classroom: Who is important, Lecturer or Student?" in the e-Book of "Blended learning strategies in Technology supported classrooms", published by MMU in August 2018. He has also co-authored a book, "C Programming for beginners", published by Pearson, Malaysia, 2009. He has received the excellent teaching award three times (2016, 2013 and 2012) from the president of Multimedia University, Malaysia. He has been awarded the silver medal by the Ministry of Higher Education, Malaysia, for his poster in the Innovative Practices in Higher Education Expo 2014 (I-PHEX 2014).

Dr. Jakir Hossen graduated in Mechanical Engineering from the Dhaka University of Engineering and Technology (1997), Higher Diploma in Computer Science and Engineering (1999), Masters in Communication and Network Engineering from Universiti Putra Malaysia (2003) and PhD in Smart Technology and Robotic Engineering at Universiti Putra Malaysia (2012). He is currently a Senior Lecturer at the Faculty of Engineering and Technology, Multimedia University, Melaka, Malaysia. His research interests are in the area of Artificial intelligence (fuzzy logic, neural network), Robotics, Data Mining and Processing tool, Pattern classification, Mobile robot navigation and Intelligent control systems.

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Dr. Way-Soong Lim received his Ph.D. degree (Engineering) from Multimedia University of Malaysia, in 2007. He joined the university in 1999 as a lecturer in the Faculty of Engineering & Technology. Since 2008, he served the faculty as Deputy Dean and later promoted to Associate Professor in 2010. He is currently holding the portfolio of student affair, engineering laboratory management, industrial training

program and overall faculty operation. His research interest covers areas in artificial intelligence, neural network, pattern recognition, road traffic monitoring, machining-tools condition monitoring and robotics navigation. Along his career path, he has published numerous numbers of international journals and conference papers, book chapters and engineering text books. Dr. Lim also maintains strong industrial and international university collaborations such as, with Infineon Technologies and Chiba University.

Appendices

Appendix A Online Survey Data Obtained from Students' Feedback

Timestamp	MMLS Discussion Board	ED puzzle Virtual Classroom Videos	MMLS Online Quizzes	Home Work on MMLS
2019/01/30 4:18:56 PM GMT+8	5	4	3	4
2019/01/31 12:48:21 PM GMT+8	3	3	2	3
2019/02/08 5:07:57 PM GMT+8	3	5	2	3
2019/02/11 10:12:19 AM GMT+8	5	4	2	3
2019/02/11 5:03:11 PM GMT+8	3	4	3	4
2019/02/12 12:18:01 PM GMT+8	4	5	3	4
2019/02/12 1:38:12 PM GMT+8	2	4	2	3
2019/02/12 7:27:27 PM GMT+8	3	4	2	3
2019/02/14 4:19:50 PM GMT+8	3	4	3	3
2019/02/14 5:57:22 PM GMT+8	5	5	3	5
2019/02/15 10:09:36 AM GMT+8	4	2	2	4
2019/02/15 10:28:48 AM GMT+8	4	4	1	2
2019/02/15 12:52:55 PM GMT+8	4	2	3	4
2019/02/15 12:53:58 PM GMT+8	4	5	3	4
2019/02/15 12:54:19 PM GMT+8	5	5	3	5
2019/02/22 4:13:08 PM GMT+8	2	5	3	3
Total Score	59	65	40	57