

# Impact of Visual Learning Environment (VLE): A Case Study on Students' Academic Performance by Subject

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Received Date: 13 January 2018

Accepted Date: 9 April 2018

## ABSTRACT

*Education in the 21st century has created demands for new tools to better accommodate the teaching and learning processes at various levels of education; all with the objective of improving the understanding of students and as such, will be reflected through improved academic performances. This in turn creates opportunity to study the impact of such modern learning platforms on the academic performances of students as a group or as an individual. The magnitude of such impact also varies depending on the types of subjects. In this study, the comparison is done between technical and non-technical based courses. Sampling conditions were also identified so as to ensure a fair treatment of data used in the analysis. Factors such as whether a particular subject is being taught by the same lecturer across a period of three consecutive semesters and the number of activities done in a Visual Learning Environment (VLE) for a particular subject as were taken into consideration. Results of the analysis were presented graphically where trending attributes were highlighted and discussed. Suggestions to improve the study, to increase the positive effects of VLE activities on the overall academic performances of students as well as the proposed initiatives that can be taken to increase the number activities in a subject's VLE were also elaborated in the paper.*

**Keywords:** e-Learning, VLE, Academic performance, Non-technical, Technical.

## **INTRODUCTION**

The correlation between academic performances of students and Teaching and Learning (T&L) techniques and technologies has long been debated and discussed especially within the academia fraternity as students' academic achievements have direct impact to the public image of any learned institutions. Richardson et al. (2012) linked such performance to students' psychological factors, specifically self-efficacy as the main contributor. A study by Rovai (2007) stipulated that students undertaking e-learning course are more intrinsically motivated as compared to their counterparts undertaking the same course conventionally.

The general notion is that there are many contributing factors both tangible and non-tangible that play a role towards the academic achievement of any student of any education level. These factors vary in terms of their impact and can differ from one student to the next. As such, there are hundreds if not thousands of studies being conducted all around the world to define the extent of impact of such factors. Tangible factors include access to and availability of educational resources, physical learning environment and access to ICT have been previously studied. Sivapalan (2005) reported that students who demonstrated an active participation in online activities scored better marks and Alavi (2005) had also suggested that such active participation has positively influence their satisfaction and retention rates. Non-tangible factors especially the psychological factors such as personality traits, self-efficacy and even psychosocial contexts were also previously researched. Chamorro (2003) concluded that students exhibiting significant conscientiousness attribute in their personality traits performed better academically and those showing significant neuroticism fared less.

Towards contributing to the past and existing researches done on such topic that has been linked to such a wide spectrum of contributing factors, this study aims to methodically link the tangible factor i.e. the learning environment to students' academic performance. This paper highlights the impacts of Virtual Learning Environment (VLE) on students' academic performance based on two (2) subject categories, technical and non-technical. This is deliberated and discussed based on data accumulated for three (3) consecutive academic semesters commencing January 2016 up to January 2017. Specific sampling conditions were identified to ensure data

consistency and this was highlighted in the research methodology section of this paper. Analysis were presented graphically where trending attributes were highlighted and discussed. Suggestions to improve the study as well as ways to increase the positive impacts that VLE activities have on overall academic performances of students aswell as the proposed initiatives that can be taken to increase the number activities in asubject’s VLE were also elaborated in the discussion section of this paper.

## METHODOLOGY

The aim of this study is to determine the change in students’ performance in selected subjects under the categories of technical and non-technical after the implementation of VLE as part of the teaching and learning environment from January 2016 at UniKL MIMET. In order to carry out the analysis, relevant data and records were sourced from UniKL e-CITIEsystem, UniKL VLE Management Systems and UniKL Learning Outcome and AttainmentManagement System (LOAMS) for the said period. The determined subjects for each category are as follows:

**Table 1: Subjects under Technical and Non-Technical Categories**

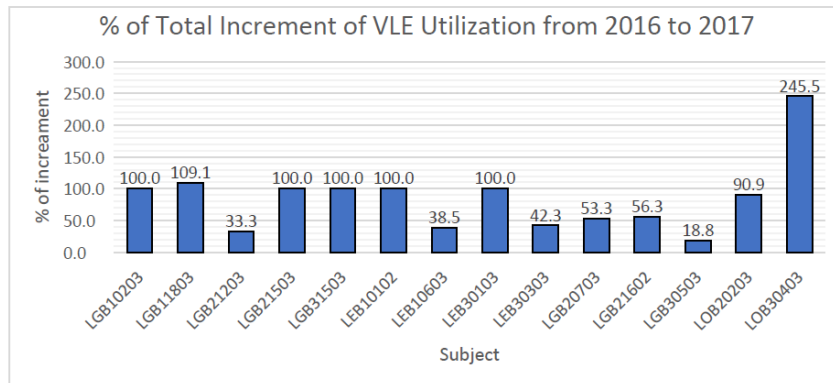
LGB10203	ENGINEERING SCIENCE	Technical Foundation Subjects	Technical Subjects
LGB11803	THERMODYNAMICS 1		
LGB21203	SHIP MATERIALS		
LGB21503	APPLIED DYNAMICS		
LGB31503	THERMODYNAMICS	Discipline Core Subjects	
LEB10102	MARINE ELECTRO-TECHNOLOGY		
LEB10603	ANALOGUE ELECTRONICS		
LEB30103	POWER ELECTRONICS		
LEB30303	ELECTRO-TECHNIQUE 2	Non-Technical Subjects	
LGB20703	E-COMMERCE & INFORMATION SYSTEMS		
LGB21602	INTRODUCTION TO PROGRAMMING		
LGB30503	MARKETING		
LOB20203	MARITIME & ADMIRALTY LAW		
LOB30403	MARITIME TRANSPORT OPERATIONS		

The study involves the extraction of data of students’ performance for three (3) consecutive semesters specifically January 2016, September 2016 and January 2017. The courses for each of the category were selected based

on the present of VLE activities as monitored by UniKL VLE Management Systems. For 2016 semesters, as the system was at an early stage then, the data on VLE activities recorded were simplistic and were merely recorded as present or not present. Therefore the determination of number and types of activities would have to be done manually through consultation with the concerned lecturers themselves. The determining criteria in such cases would be to ensure that such VLE activities were constantly conducted throughout the three (3) semesters. Data for January 2017 semester were sourced directly from the system as the VLE management system was updated that year. The number and types of VLE activities were obtained directly from the system.

The other aspect of data compilation involves the grouping of academic grades to summarize the band of students' academic performance. The academic grades were divided into two (2) bands. Band 1 is designated as Good to Excellent performing students who scored grade A, A-, B+, B, or B- for each of the determined subjects. Meanwhile Band 2 is designated as Marginal to Satisfactory performing students who scored grade C+, C, C- or D for each subject. The improvement of students' performance for three (3) consecutive semesters were analyzed and its correlation with VLE approach were highlighted and discussed. Note that data were only analyzed for students passing the concerned subjects as those who did not were considered to have not been utilizing the VLE thus its effectiveness can't be intrinsically determined.

## RESULTS AND ANALYSIS

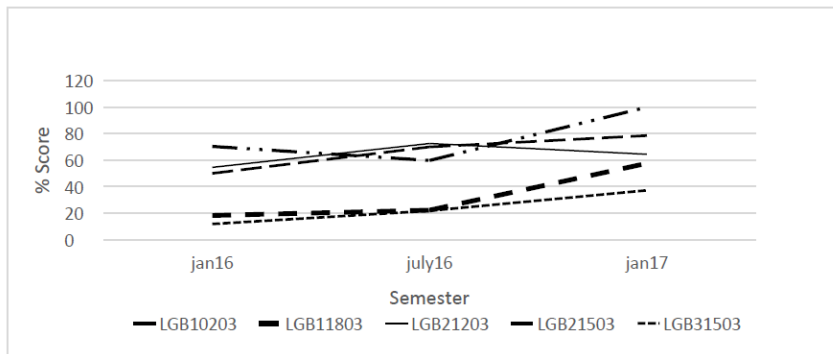


**Figure 1: Percentage of Total Increment of VLE Utilization**

Figure 1 shows the percentage of total increment of VLE utilization of January 2016, September 2016 and January 2017 semesters. The increment percentage was measured on selected technical and non-technical subjects specifically by considering the number of resources and teaching materials used. One of the compulsory criteria in selecting these subjects is that they are being taught by the same lecturer throughout the three (3) consecutive semesters. The name of the subjects is listed in Table 1. The percentage indicates the increment of VLE utilisation by the lecturers of the concerned subjects in their teaching and learning (T&L) activities across the three (3) semesters. In other words, the percentage indicates the increase in the amount of teaching materials uploaded (includes conventional notes, presentation slides and videos) and the number forums/chats as well as online assessments conducted. The trend shows increment ranging from 19% to a massive 245% on the VLE utilization from 2016 to 2017. To highlight, more VLE activities were recorded in January 2017 semester as lecturers are made compulsory to utilize VLE through activities such as forums, tutorials, discussions as well as their own video contents as additional learning resources for the students as part of their key performance index (KPI) under the University blended learning requirement. Such trend gives a good indicator in supporting the increase in student performance in the listed subjects, as shown in Figure 2 to Figure 7. For this study, the measurement of student performance was clustered into two (2) categories; Band 1 and

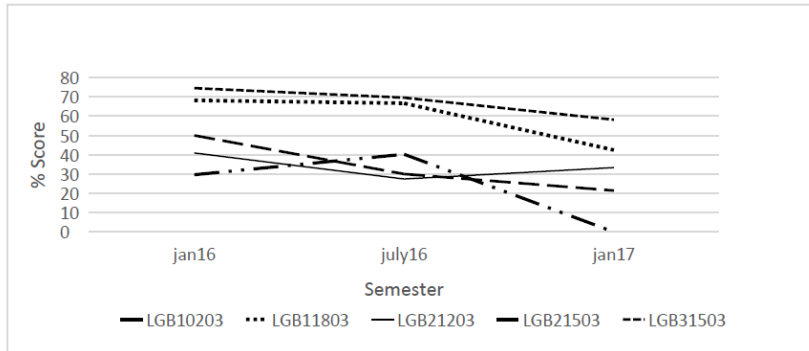
Band 2. Band 1 gives an indication from good to excellent grades, ranging from B-, B, B+, A- to A. Band 2 represents marginal to satisfactory grades, ranging from D, C-, C to C+.

Figure 2 illustrates the Band 1 percentage score for three (3) consecutive semesters for Technical Foundation subjects from January 2016 to January 2017. It can clearly be seen that there has been a large increase of students attaining Band 1 performance in several subjects specifically Thermo dynamics 1, Engineering Science and Applied Dynamics with approximately 40%, 30% and 29% respectively. The other two (2) subjects only show a slight growth of under 20%.



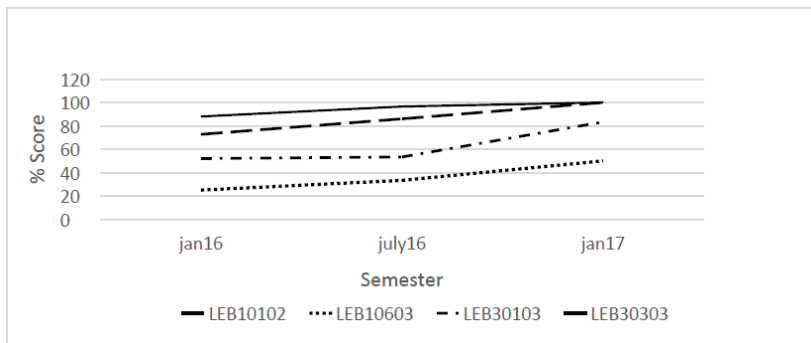
**Figure 2: Band 1 Percentage Score in Three (3) Consecutive Semesters for Technical Foundation Subjects**

Figure 3 shows the Band 2 percentage score in three consecutive semesters for technical foundation subject for semesters January 2016 to January 2017. The percentage for Engineering Science and Applied Dynamics subjects have declined considerably over this time period. The maximum decrease recorded is approximately 30%. For Engineering Science subject, the percentage rose to 10% in July 2016 semester and then dropped dramatically to 0% in the following semester. Three (3) subjects namely Thermodynamics, Thermodynamics 1 and Applied Dynamics, experienced a steady decrease of about 5% to 15% per semester since the introduction of VLE.



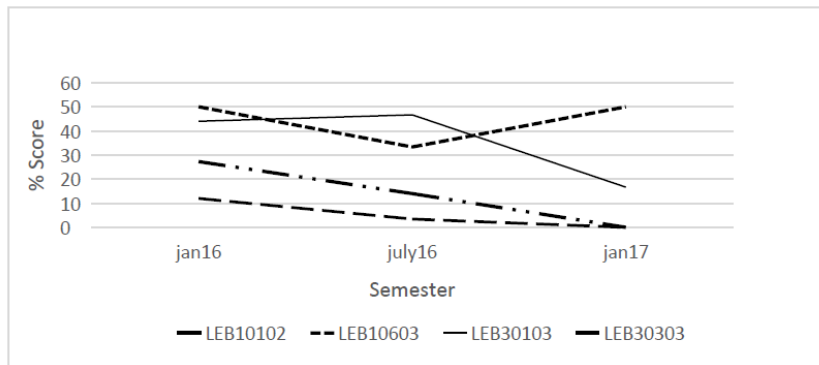
**Figure 3: Band 2 Percentage Score in Three (3) Consecutive Semesters for Technical Foundation Subjects**

Figure 4 shows the Band 1 percentage score in three consecutive semesters for Discipline Core subjects for semesters January 2016 to January 2017. The Band 1 score percentage for all subjects grew steadily within these three (3) semesters. The percentage for Marine Electro-Technology subject rose moderately for about 15% each semester while the percentage for Electro-Technique 2 subject went up slightly by 6% in July 2016 semester and by another 4% in January 2017 semester. For Power Electronics subject, the percentage increased gradually in the first semester but showed a rapid increase of 30% in January 2017 semester. Percentage for Analogue Electronics subject exhibit a similar trend as Power Electronics subject with gradual increase in July 2016 semester and the percentage increased sharply in January 2017 semester.



**Figure 4: Band 1 Percentage Score in Three (3) Consecutive Semesters for Discipline Core Subjects**

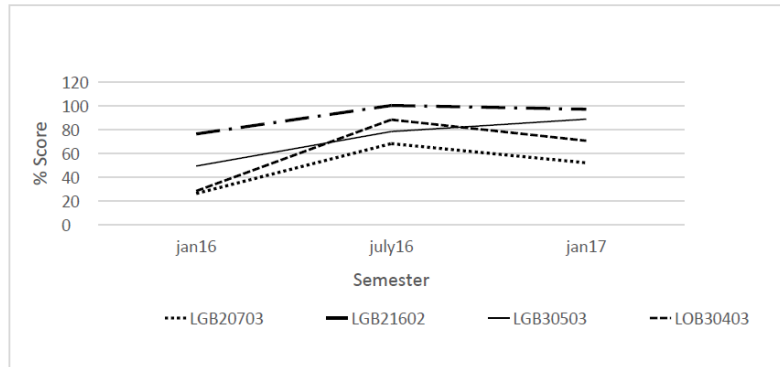
Figure 5 shows the Band 2 percentage score in three (3) consecutive semesters for Discipline Core subjects for semesters January 2016 to January 2017. Two (2) subjects experienced a steady declination of percentage namely Marine Electro-Technology and Electro-Technique 2. The other two (2) subjects, Analogue Electronics and Power Electronics, showed a different pattern during this period. Analogue Electronics fell substantially for 17% during the first semester but rose by 17 % in the last semester thus its percentage remained fixed at 50%. For Power Electronics subject, the percentage grew slightly from 2% to 46% but dropped rapidly by 30% to 16%.



**Figure 5: Band 2 Percentage Score in Three (3) Consecutive Semesters for Discipline Core Subjects**

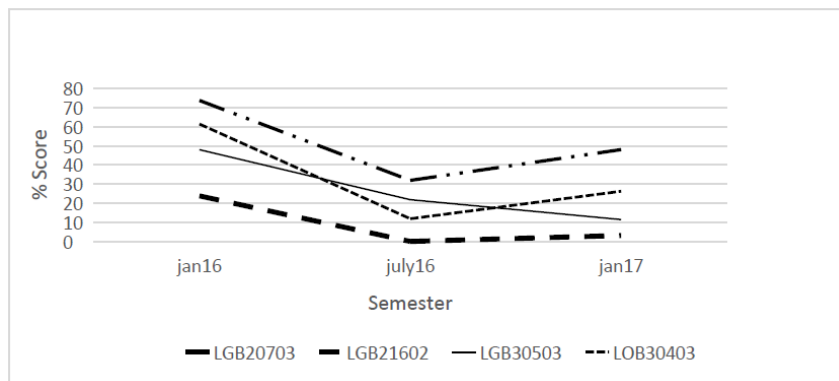
Figure 6 illustrates the Band 1 percentage score in three (3) consecutive semesters for Non-Technical subjects for semesters January 2016 to January 2017. All four (4) chosen subjects showed different results but overall it indicated a strong rise of percentage. The percentage of three (3) subjects namely E-Commerce & Information System, Introduction to Programming and Maritime Transport Operation went up in July 2016 semester but fell slightly in January 2017 semester. Only the percentage for Marketing subject increased gradually from 49% in January 2016 semester to 89 % in January 2017 semester.





**Figure 6: Band 1 Percentage Score in Three (3) Consecutive Semesters for Non-Technical Subjects**

Figure 7 illustrates the Band 2 percentage score in three (3) consecutive semesters for Non - Technical subjects for semesters from January 2016 to January 2017. This graph illustrates an opposing trend to that of Figure 5. Three (3) subjects experienced a drastic drop in percentage in the first semester of VLE introduction but showed a slight increase in January 2017 semester. Only Marketing subject’s percentage decreases almost constantly within this period. It fell gradually from 48% in January 2016 semester to 11% in January 2017 semester.



**Figure 7: Band 2 Percentage Score in Three (3) Consecutive Semesters for Non-Technical Subjects**

Overall, it can be seen that there was a definitive upwards trend in Band 1 of the academic performance for all subjects under both technical and non-technical categories. Although the increment percentage differs from one subject to the other under both categories but the general trend can be certainly determined as gradually increasing for Band 1 performers. As the percentage for Band 1 increases, the percentage of Band 2 achievers decreased gradually as well as expected.

## **DISCUSSION**

From the results obtained analysis conducted, Discipline Core subjects achieved the best outcomes since three (3) of the subjects achieved a percentage increase of above 80% with two (2) subjects recording a 100% of Band 1 achievers. As a result, these two (2) subjects namely Marine Electro-Technology and Electro-Techniques achieved 0% Band 2 achievers.

Based on the analysis, it was also deduced that subjects from the Non-Technical category produced the best improvement in terms of Band 1 percentage since the introduction of VLE in 2016. The Band 1 percentage of its two (2) subjects rose drastically to 50% in just one (1) semester.

Technical Foundation subjects have also performed considerably well. Engineering Science subject recorded 100% of Band 1 achievers in January 2017. The Band 1 percentage for the other two (2) subjects, Thermodynamics 1 and Thermodynamics also increased steadily to nearly 40% and 60% and as such the percentage of Band 2 achievers decreased. As these subjects have been listed as high failure subjects prior to January 2016 semester, the percentage decrease in Band 2 achievers gives a positive indication to the improvement in the academic performance of students undertaking these subjects throughout the study period.

In January 2017 semester, UniKL MIMET introduces a new semester system. This new semester system extends the duration of each semester from 14 weeks of T&L to 17 weeks. The academic year in 2017 now has only two (2) semesters instead of three (3) in the previous years. With this new academic calendar, a longer duration of delivery period for each subject was now possible. This gave ample time to lecturers to better plan and

familiarize themselves in using VLE. With the additional three (3) weeks of T&L, lecturers and students has sufficient time explore and utilize this T&L platform. This is a contributing factor towards the sharp increase in VLE utilization and consecutively the general increase of Band 1 achievers in 2017.

In addition to the above, under the 10th Malaysia Plan (2011-2015) development budget, UniKL MIMET was granted with RM13 milion and some portion of it was used to improve its computer facilities. This budget was used to buy 50 new PCs and set up two (2) new computer laboratories. With these laboratories, it became more convenient for lecturers and students in undertaking live online assessments. It also created more avenues for students to access online materials and utilize the VLE. In 2015, the total number of computer laboratories were five (5) with 140 number of PC and these has increased to seven (7) laboratories with 196 PCs.

Malaysia's average internet connection speed in 2016 was 6.4 Mbps. This value increase to 8.9 Mbps in 2017. UniKL MIMET reacts positively to this with an introduction of new internet facility development packages. These development packages improve the internet connection speed up to 1.0 Gbps in 2017 and provided wider and faster Wi-Fi services at strategic places around the campus. This enables better access for all users to VLE and hence contributed to the much-improved utilization of VLE in 2017 and percentage of Band 1 achievers especially in 2017.

In addition to this, the inclusion of specific KPI on blended learning in 2017 for all lecturers also contributed to the upwards trend in the utilization of VLE platform by lecturers. The compulsory VLE activities are: to upload at least seven (7) teaching materials, conduct three (3) forum/chat sessions, organize at least two (2) online assessments and upload at least one (1) OBE teaching document. This is evident through Figure 1 in which it clearly indicates that the VLE usage increases to more than 50% for most of the subjects.

As all of the sampled subjects were based on subjects being taught by the same lecturers throughout the three (3) three semesters, it can be deduced that the respective lecturers have sufficient time and resources to improve their teaching techniques across the semesters thus the possibility of unsuitable approaches and delivery could be minimized. This resulted in creating a higher number of Band 1 achievers in the following semesters.

Based on Figure 2 to Figure 7, a slight disturbance to the general trend could be identified specifically during July 2016 semester. One of the potential contributing factors is due to the increase in the number of students in that period. This created pulling factors such as the reduced students' accessibility to personal computers, reduction in the effects of closely monitored class activities and reduction in the impact of face-to-face facilitation by lecturers during the assessments session gave negative impact to grades achieved by students.

It was also deduced that there is no clear demarcation in trends between both technical and non-technical courses. Overall trend is the same in which percentage of Band 1 achievers for both categories of subjects were the same which is increasing across the semesters. However, it is worth to note that the Discipline Core Subjects showed a more consistent increase of the period as compared to Technical Foundation and Non-Technical courses. This may due to several reasons namely, the monitoring of VLE activities by the respective Heads of Section, the teaching loads of the lecturers respective to each section, the number of student per class for each of the subjects as well as the nature of assessments conducted in each of the subjects.

As the study is ongoing, several recommendations for improvements in analyzing of data and sampling criteria should be considered. Factors such as number of students per class could be an influencing factor to the overall academic performance due to reasons as mentioned in the previous two (2) paragraphs. The types of assessments conducted for each of the subjects should also be considered as this has direct influence on the level of difficulty and preferred assessment type experienced by students. The teaching load of lecturers concerned should also be taken into consideration as this also has direct bearing on the quality of the VLE activities conducted as well as the time taken to prepare the materials for each of the VLE activities. The monitoring by Heads of Section on their respective lecturers also plays an

important role on the number of VLE activities conducted as well as the quality of the uploaded materials.

## **CONCLUSION**

The study on the impact of VLE on students' academic performance was done on sampled subjects of Discipline Core, Technical Foundation and Non-Technical types. These subjects were chosen based on stipulated sampling criteria concerning the presence of VLE activities and consistency of lecturers assigned to the respective subjects across a period of three consecutive semesters from January 2016. From the results, it was deduced that the increased in the number of VLE activities across the semesters has increased the percentage of students in Band 1 of the academic performance and subsequently reduced those in Band 2 category. Other factors that may have contributed to this such as good ICT infrastructure, close monitoring of VLE activities, consistency of lecturers teaching the subjects and lengthened semester period were also discussed.

In moving forward, UniKL MIMET is currently working in collaboration with nine (9) other universities on a project that is co-funded by Erasmus+ programme of the European Union. The objective of this project called InMotion is to incorporate Open Modelling and Simulation Environment (OMSE) platform through integration, harmonization and aggregation of various types of quality-controlled e-Learning components. This will in turn creates a more adaptive learning environment both meeting the needs of today and oriented towards technologies of tomorrow. Existing VLE for identified subjects will be embedded with Computer Modelling and Simulation in Engineering (CMSE) elements and is aimed at helping students to better visualize the dynamics of an engineering system. This initiative is expected to enhance the learning experience of students, the utilization of VLE platform by lecturers as well as improving the academic performance of students. Further study will be carried out at the end of the InMotion project to study the extent of the positive impacts that this will bring to the T&L activities of the University.

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