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THE EFFECTS OF INTEGRATING WRITING TABLET ON BUSINESS MATHEMATICS COURSE LEARNING FOR DIPLOMA STUDENTS IN UiTM CAWANGAN SARAWAK, MUKAH CAMPUS

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Abstract: *There are different teaching tools, styles and equipment used and introduced in classrooms to substitute the use of traditional methods. Writing tablets have been in use in Malaysia. However, it has not yet been fully implemented in classrooms especially for the subject of Mathematics. This study investigated the effects of using Teaching Enabled Technology (TEC) device with the utilisation of the writing tablet in teaching Business Mathematics and its relationship on students' perception, motivation, teaching and learning activities that leads to students' performance in classroom and how the infrastructure and facilities in classroom supports technology in teaching Mathematics. A sample of 107 diploma students from two programmes and two semesters from the course of Business Mathematics was studied. Business Mathematics is one of the core subjects for diploma students in Universiti Teknologi MARA (UiTM) Sarawak, Mukah Campus. The data was collected using questionnaires and from a comparison between secondary school and final examinations results. From the data collected, it was found that the use of the writing tablet in teaching Mathematics in tertiary education could be successful and effective. The benefits include more interaction between students and lecturer in the classroom and led to their enjoyment in learning Mathematics. The study also recommended the implementation of using writing tablets in teaching Mathematics can be accommodated not only in small classrooms but also in a large hall. This study should be a good indicator for Mathematics lecturers to change from typical lecturing to include applying technology in their teaching methods*

Keywords: *Writing Tablet, Business Mathematics, Diploma, Teaching Enabled Technology*

Introduction

The concept of using technology in the classroom has been around for several years now. Teaching Mathematics in a classroom with students from different background and understanding of Mathematics is another challenge for the lecturer. Numerous methods and approaches have been used to attract students' attention during the teaching and learning process. The most common technique of teaching is through traditional classroom with whiteboard and marker. The traditional classroom with whiteboard and marker were utilised during the late of 1980s. This technique of teaching and learning are widely used in most of subjects and courses due to limitation of available technologies during that time to replace blackboard and chalks. This method of teaching and learning dominated most of the class rooms around the world due to its inexpensive and reusable. Furthermore, it also allows the students to keep pace with their instructor. In addition, whiteboarding technique was used for deep understanding, collaborative learning and active participation in class thus enhanced student's understanding (Caron *et al.*, 2017). Another advantages of whiteboard are it can be used without an electricity (Muttappallymyalil *et al.*, 2016). However, teaching and learning with whiteboard also come out with several disadvantages such as time consuming in writing, not being very effective for a large audience due to limitation of visibility, the content cannot be retrieved once erased and impacts for health problem due to inhalation of dust elements produced from the marker (Muttappallymyalil *et al.*, 2016). Therefore, inculcating the use of technology in teaching Mathematics was identified as one of the possible techniques to overcome the problems mentioned previously. By applying technology in classroom, the study shows that the students who participated performed as well or better in quiz, exam and problems. Even though the students struggled at first with the new method, they can adapt quickly and at the end of the lesson their found it satisfactory and effective (Mason, *et al.*, 2013).

In Universiti Teknologi MARA Cawangan Sarawak, Mukah campus, there are various number of programmes offered to date. All these programmes require students to take at least one Mathematics course throughout of their programme. One of the courses is Business Mathematics. Business Mathematics is one of the main subjects for diploma students in Universiti Teknologi MARA Cawangan Sarawak, Mukah campus. The purpose of this subject is to develop the mathematical skills and knowledge of students to meet the requirements of a business operation. This subject covers the fundamental of Mathematics and all mathematical applications needed in the business field. On average, a lecturer is required to interact with diploma students in the ratio of 3 hours of lectures and 1-hour tutorial. The writing tablet used was Wacom® Intuos® Creative Pen Tablet and connected to lecturer's laptop using a Wacom Wireless Kit. Teaching Business Mathematics in a small classroom with the capacity between 20-30 students and a lecture hall with the capacity of 100-150 students are challenging due to the limitation of the use of a white board to show the steps of calculation. Discussion were held with lecturers to find new initiatives on the effective way to deliver the lecture well. This research will show the relationship between the motivation and students' performance in Business Mathematics when a writing tablet is used as a part of teaching enabled technology. The findings from this research suggested that it can be an effective in teaching Business Mathematics either in a small classroom or in a lecture hall.

Literature Review

Inculcate Technology in Teaching Mathematics

In teaching and learning, we are mostly use what, how and why to deliver the knowledge. According Paul R. Halmos (1994), stated that to be educated means to remember something, to be able to use it and to understand it. Education is not the same as memorising facts without

knowing on what, how or why it is being used. Teaching is a method to deliver the knowledge, skills and experience from a teacher to the students. Teaching is part of the educational process where it involved the utilisation of distinct number of inputs. Walking through millennia, teaching and education have encountered a lot of challenges and high demands either from the system, university, faculty and from students. Therefore, to confront these problems, an academician needs to be creative and innovative in teaching. One of the methods and approach is to inculcate the use of suitable teaching enabled technology in the teaching and learning process in class.

Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological process and resources (Robinson R., Molenda M., and Rezabek L., 2008). Inculcate technology neither replaces academicians in classroom nor makes the academicians invisible to the students. The use of technology in the classroom helps the academician to plan and deliver knowledge in a better way. This shows how academicians are more responsive and effective towards their profession. Having an effective teacher can dramatically alter students' educational and economic outcomes (Adnot M., et. al., 2016). Combination of teaching and technology contributes to high impact in students' performance and achievement. Technology changes the classroom from dull plain box to a more dynamic edgeless form experience.

Tablet as a Teaching Tool in Teaching Mathematics

Teaching Mathematics in traditional ways without any improvement may lead to a dull plain classroom experience. However, it is difficult to facilitate the learning processes fully electronically, because of the nature of Mathematics which involved calculation skills and practical. Nevertheless, using technology in teaching Mathematics have potential for easier interaction with content and the lecturer (Galligan, L., Hobohm, C., & Loch, B., 2012). According to Loch & Donovan (2016), application of writing tablet in teaching of mathematics involved a combination of power point slides with additional handwriting on the tablet with stylus to emphasize the key concepts or to facilitate modifying a path to a problem solution in response to student questions. Furthermore, the students also can actively contribute to the lecture and may find their question or answer recorded on the lecture slide. The revolution in technology creates the need to shift from a traditional classroom for a better way to deliver the knowledge of Mathematics. According to Galligan, L., *et. al.,* (2010) Tablet PCs can create an environment that can maximise student learning opportunities, empowering both student and teacher. If used to its full potential, it captures, clear and recordable mathematical thinking in action and can provide purposeful and timely feedback. Therefore, the purpose of this study is to determine the compatibility and students' response and performance whenever the lecturer uses the writing tablet as a teaching tool in delivering the course.

Methodology

A quantitative research approach using questionnaire method was used in this study to collect the data from 107 diploma students. The students were from two programmes namely Diploma in Planting Industry Management and Diploma in Business Studies respectively. The questionnaire was given at the end of semester to students of the Business Mathematics course. At the beginning of the semester, lecturer used a whiteboard to deliver the course. From the second week of lectures until the end of the semester, the lecturer shifted from whiteboard to the used of writing tablet as a teaching tool. There are five parts in the questionnaire; Part A (Demographic), Part B (Perception), Part C (Motivation), Part D (Teaching and learning activity in classroom and students' performance and achievement) and Part E (Infrastructure

and facilities) respectively. Likert scale from 1 (strongly disagree) to 5 (strongly agree) was used in the questionnaire.

The classes were conducted in two ways. Every students were provided with the notes at the beginning of semester which contains the theories, formulas and simple explanations. Students either bring their own laptop, tablet or just the hardcopy of the notes. During classes, lecturer shows the slides and use writing tablet to show in lecture hall or tutorial room on how to solve the problem related to Business Mathematics. Students can see how the actual solutions are and both parties can do the discussion and sharing ideas on how to solve it. In some cases, for example students have their own suggestion ideas, therefore lecturer will pass his/her writing tablet and the student write on it and show it to the rest of the class on the slides. Lecturer manage to explain step by step, edit or rewrite during the teaching and learning process. This type of learning mostly suitable for lecture that involve theories, long formula, case study and long solution. This writing tablet also can be integrated with mathematics software. Therefore, it is also suitable for teaching Mathematics or Business Mathematics that involve large group or even small group of class.

Results and Discussion

The data from the questionnaires were analysed using Statistical Package of Social Sciences software (SPSS). Part A in the questionnaire is all about demographic of students. All 107 respondents are diploma students and the following table showed the percentage of gender, age and study programmes of the students. Table 1 shows the demographic of the respondents for this study. There are 57.9 % female students and 42.1 % male students from two diploma programmes. Most of them were 18-19 years old which are SPM leavers with 79.4%, whereby 15% are 20-21 years old and only 1.9% are 22 years old and above. Two diploma programmes that involved in this study are Diploma in Planting Industry Management with 67.3% respondents and Diploma in Business Studies with 32.7% respondent.

Table 1: Demographic information of the respondents

		Percentage (%)
Gender	Female	57.9
	Male	42.1
Age	18-19 years old	79.4
	20-21 years old	15.0
	22-23 years old	1.9
Program	Diploma in Planting Industry Management	67.3
	Diploma in Business Studies	32.7

The main objectives of this research were to investigate the effectiveness from the students via four main points towards teaching Business Mathematics course using writing tablet. Table 2 represents the students' perception towards the use of a writing tablet during Business Mathematics lecture. Average mean from students' perception is 3.71 which means students agree with the aid of writing tablet where they were comfortable with it. Most of them are comfortable whenever the lecturer uses the writing tablet instead of whiteboard because wherever they sit in the classroom, they are still able to focus on the lecture.

Table 2: Students perception towards writing tablet during Business Mathematics' lecture

	N	Min.	Max.	Mean	Std. Deviation
Like lecturer use tablet instead of whiteboard	107	2	5	4.30	.767
Whiteboard uninteresting	107	1	5	2.93	1.030
Whiteboard old fashion in Math	105	1	5	3.15	1.116
Sit at the back of class, like lecturer use tablet	107	1	5	3.78	.904
Care free and laid-back class with tablet	106	2	5	3.88	.847
Comfortable using tablet	104	2	5	4.06	.822
Tablet more effective	107	1	5	3.90	.990

Table 3 represents students' motivation during Business Mathematics lecture. Average mean is 4.01 shows that students agree whenever the lecturer used a writing tablet during Business Mathematics lecture thus reducing their stress and mathematics anxiety. It also shows that they were interested to learn mathematics and as a result it increases their motivation in this course.

Table 3: Students motivation during Business Mathematics' lecture

	N	Min.	Max.	Mean	Std. Deviation
Less stress with tablet	106	1	5	3.80	.920
Enjoy maths with tablet	107	2	5	4.04	.941
Math class more interesting now	106	2	5	4.20	.855
Motivated with new environment	104	3	5	4.08	.720
Reduce math anxiety with tablet	107	1	5	3.91	.885

Table 4 represent students' performance in the classroom when the lecturer used the writing tablet as a teaching tool for Business Mathematics course. Average mean is 3.99 shows that teaching and learning activity in classroom using a writing tablet influence students' performance positively.

Table 4: Teaching and learning activity and students' performance in classroom

	N	Min.	Max.	Mean	Std. Deviation
Understand more using tablet	107	2	5	3.95	.745
Hate limitation of whiteboard	106	1	5	3.75	.976
Easier and save time in understanding long questions	107	1	5	4.06	.856
Communication & discussion with lecturer	106	2	5	4.14	.810
Involvement & engage among classmate	104	2	5	4.00	.683
Achievement in university greater than school	107	1	5	3.82	.899
Lecturer knows how to implement tech in teaching maths	107	2	5	4.18	.670

The final part of the questionnaire is related to faculty or university's infrastructure and facilities. From the average mean of 3.22, it illustrates that the infrastructure and facilities in both faculties are compatible with the writing tablet. Therefore, it is not impossible for the lecturers to implement technology in teaching or giving lecture for this course by using writing tablet.

Table 5: Faculty infrastructure and facilities

Items	Mean
Classrooms are compatible and supportable for lecturer to use writing tablet in teaching Business Mathematics	4.17
Lecturer takes times to set up the teaching tools (laptop, LCD projector, writing tablet etc.)	2.51
Occasionally lecturer facing problems during class (malfunction of the laptop, LCD projector or writing tablet)	2.98

Conclusion

Based on the findings of this study, it can be concluded that integrating writing tablets in teaching of Business Mathematics course can increase the motivation among diploma students

with mean value of 4.08. Students also found the used of conventional method such as white board and marker less attractive and effective in understanding of Business Mathematics course with mean value of 2.93. It also facilitated better communication between the lecturer and students especially when it comes to problem solving types of questions. With the above findings, it is recommended that lecturers fully utilise writing tablets for effective and efficient teaching not limited to Business Mathematics but in other mathematics field as well.

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