The effectiveness of computer assisted learning platforms on students' learning: amid Covid-19 pandemic

N. Hasimah Ibrahim Teo*, N. Azida Muhammed Noor and N. Aiza Moketar

College of Computing, Informatics and Mathematic, Universiti Teknologi MARA Melaka, 77300, Melaka, Malaysia

* Correspondence author; Email: shimateo@uitm.edu.my.

Abstract: This study is a representation of the computer-assisted learning (CALL) platforms used by Universiti Teknologi MARA for the teaching and learning process during the novel coronavirus illness outbreak starting in 2020. The goal of this paper is to examine how various computer-assisted learning environments affect students' performance, with a focus on which of the platforms would provide the best learning environment for students in terms of their ability to perform well on assessments in the face of the Covid-19 pandemic. The study was done to investigate four platforms for learning: Telegram micro-teaching, Google Meet online meetings, reading slide presentations, and recorded narrative video presentations. The report uses a quantitative way to examine how various online learning platforms affect students' performance, and it focused on how the assessment procedure was applied throughout the lockout. This paper's contribution is to paint a picture of computer-assisted learning strategies used during the Covid-19 pandemic, as well as which learning platform is best for teaching and learning and how it affects student performance differently. The findings of a survey of four groups of students taking Discrete Structure demonstrate that the platforms used for teaching and learning have a substantial impact on students' test scores and that narrative recorded video is preferred over alternative learning platforms.

Keywords: computer assisted learning platforms; online learning platforms; computer-assisted learning strategies

1. Introduction

The COVID-19 pandemic is something very historic in our lives, its existence affecting the norms of human life as well as the education system around the world. Its spread has led to the closure of all institutional education levels from kindergarten to university level. Despite the closure, teaching and learning need to continue. A study from World Bank found that five months of school closures due to COVID-19 will result in an immediate loss of 0.6 years of schooling adjusted for quality, bringing the effective learning that a student can achieve down from 7.9 years to 7.3 years [1]. Many education authorities make an immediate plan to avoid

this situation. If before the pandemic, online learning platforms were used to support face-to-face teaching, but during the pandemic, everything changed drastically. Face-to-face methods turn to online distance learning. Even online learning cannot replace traditional education, but it is highly recommended in supporting teaching activities, homework tasks, and course communication [2]. Online learning may save the situation from stalling the education process. While in this disruption, technology has served as an incredible tool in teaching and learning.

Various online learning platforms and mediums are available to support the process. Besides learning management systems, social media applications, and web conferencing software emerged as sources to complement the teaching and learning activities. Even these online technologies are ready to be utilized, but, in the Malaysian context, the acceptance of Malaysian students in higher learning institutions towards online learning is at a moderate level [3]. Furthermore, [4] found a lack of student participation in using e-learning and other resources due to system instability.

Even in these unreadiness situations, online distance learning becomes a necessity. In the case of University Technology MARA to ensure the online distance learning happens, the students and the instructors continue classes via any method such as recorded material, computer assisted learning platforms, social media platforms, or conferencing software. However, how these various platforms ensure that students get the knowledge they deserve and do not affect student performance. Thus, the goal of this study is to investigate the effect of using different learning platforms in delivering knowledge and student performance in the Discrete Structure subject.

2. Computer assisted learning platform during Covid-19 pandemic

Online Distance Learning (ODL) has been the main alternative to ensure the continuity of education during the spread of Covid-19. In the late 1980s and the 1990s, the students in remote areas learn via one-way video or two-way audio communication as the primary purpose of distance learning [5]. Now, with the rapid advancement of technology, there is numerous learning management system (LMS) platforms that have been developed to support distance learning such as Google Classroom, Blackboard and Edmodo. Online video conferencing such as Cisco Webex, Microsoft Team and Zoom also has taken place as a medium to support the two-way communication for virtual meeting and discussion during teaching and learning sessions. At the same time, the most popular messenger application such as Telegram and WhatsApp also have emerged as an efficient platform for remote or micro-teaching. These two applications are a suitable platform for remote or micro-teaching as they are convenient, low data consumption, and can cater to poor connectivity issues.

Learning Management System (LMS) has become a useful tool to improve student learning skills and teaching quality. It offers various features to support the teaching and learning process, such as recourse management, online discussion, and grading and course evaluation [6]. Few studies have been done to evaluate the LMS's effectiveness as an online teaching and learning platform. A study by [7] has conducted a qualitative study to explore

the effectiveness of Google Classroom in the learning process. The result shows that the use of Google Classroom was effective in communication media, message, content, and timing. A similar result obtained from another study by [8] indicated that Google Classroom provides better access to learning material and helps get immediate feedback. Another study by [9] has been done using a quasi-experimental approach to investigate the impact of Blackboard LMS and Edmodo SLN on self-regulated learning and educational satisfaction. The results show that the Blackboard is effective in developing self-regulated learning as it provides an interactive learning environment for the student to ask questions, receive answers from peers and instructors via available social media. Meanwhile, Edmodo helps the student to develop a scheduled study plan, which eventually helps to increase their ability to manage time.

Telegram and WhatsApp are among the most popular messenger applications that have been utilized as a platform for ODL. These applications can be used on multiple platforms such as smartphones, desktops, tablets, and the web. They have similar functionality in exchanging text messages, images, videos, and voice notes using an internet connection [10]. The user also can create a group or channel and invite their contacts to join the group for discussion. WhatsApp messenger has been integrated into teaching as an instructional tool for a language teacher to promote fun and interesting language activities [11]. Studies show that WhatsApp messenger for learning language is more effective and has positively impacted students' performance and attitude [10]. Meanwhile, a study by [12] in medical research education shows that there is higher participation in the group discussion whereby the students show more interactions and freely express their emotional gestures. Similarly, a study by [13] shows that mobile learning using Telegram also had positive impacts on the students. The students found that learning via Telegram is interesting and actively involved in giving and reading feedback. They also feel more relaxed and encouraged to give opinions confidently.

3. Methodology

The study is conducted to explore the effect of various computer assisted learning platform on students' performance. In this study, students' performance is evaluated on the score obtained by students on the prepared survey questions on one topic of Discrete Structure subject, particularly topic on Non-deterministic Automata. This section discussed the question survey structure, evaluation procedure and measure.

The survey question was constructed to evaluate students' understanding of the topic being taught. The selected topic is the Non-deterministic Automata of Discrete Structure subject. There are 10 multiple-choice questions constructed, including two lowest levels of knowledge from Bloom's taxonomy [14]: remembering and understanding. Question 1 to 4 are remembering type (TR) of questions, and question 5 to 10 are the understanding type (UT) of questions and the sample questions is shown in Figure 1.
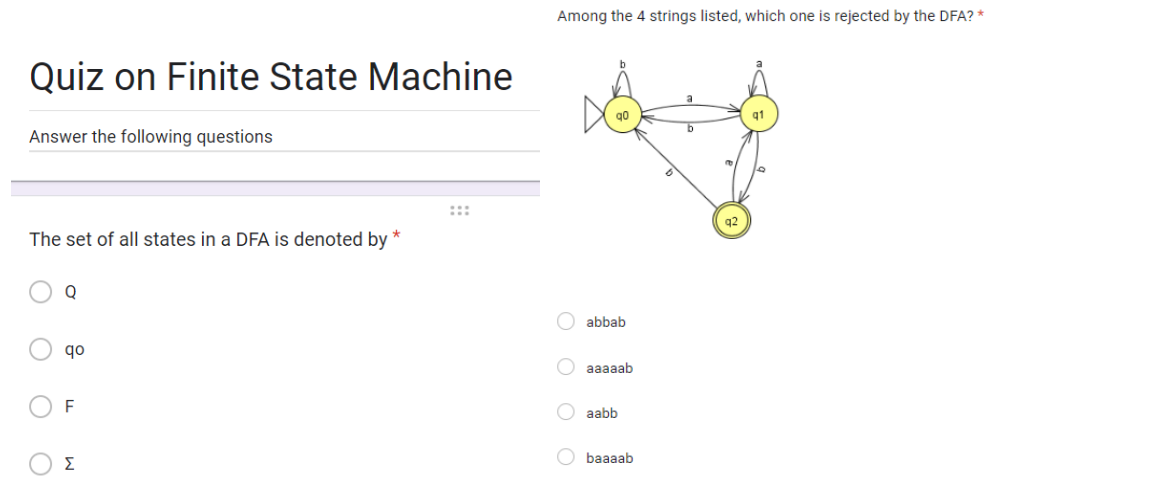
Figure 1. Sample question survey.

The participants for this study are the Faculty of Computer Science students in UiTM, taking Discrete Structure Subject. The survey question is distributed to 190 students from six groups of students taking these subjects. However, only four groups' data are evaluated for this study due to fewer responses from those two groups. Table 1 shows the number of participants and the response received.

Table 1. Participants for the study.

Program	Group	Participants	Response
CS230 – Computer Science	A	47	26
CS230 – Computer Science	B	32	15
CS253 – Multimedia Computing	C	29	27
CS230 – Computer Science	D	22	21
CS251 – Netcentric	E	28	4
CS230 – Computer Science	F	32	3

Each group participant needs to learn the topic before answering the survey questions. Students were asked to answer the question on the week of that topic learning. Each student is given 10 minutes to answer all the questions. The number of participants is relatively small due to the unwillingness of students to participate. The only group that has at least nearly half of participant responses had been analyzed in this study. Therefore, only data from groups A, B, C and D are analyzed in this study.

4. Result and discussion

This section discussed the result obtained from the focus group survey. There are four groups of Computer science students in UiTM undertake Discrete Structure subject. Each group using different computer assisted learning platforms which are microteaching, Google meet, PowerPoint, narrative PowerPoint slide for group A, B, C, and D, respectively.

The result is discussed according to the research question mention in section 1.0. The first result is on the overall correct answer percentage obtained from this focus group study and is calculated by dividing number of students answer correctly with total number of students in the group. Table 2 shows the overall percentage of the correct answers obtained from the assessment given to four students' groups.

Table 2. Percentage of the correct answer obtained.

	Group A	Group B	Group C	Group D
Q1	46.2	40.0	44.4	85.7
Q2	100.0	100.0	96.3	100.0
Q3	42.3	60.0	51.9	85.7
Q4	57.7	60.0	22.2	81.0
Q5	57.7	80.0	70.4	90.5
Q6	50.0	46.7	29.6	71.4
Q7	65.4	26.7	48.1	66.7
Q8	46.2	73.3	25.9	57.1
Q9	53.8	73.3	33.3	47.6
Q10	61.5	66.7	51.9	52.4

The experiment survey was conducted to identify which of the computer assisted learning platforms is more efficient for teaching Discrete Structure subject. The mean value obtained as in Table 3 indicates that students who received learning thru narrative recorded video performed slightly better than learning thru google meet and all other learning platforms conducted in this experiment survey with mean value of 80. This might be due to the possibility of narrative recorded video that able to be playback at any time as students need. The online learning method using a PowerPoint slide alone has the lowest mean value which is 50. Although PowerPoint can be playback repeatedly, it has no further audio explanation, and students can only read the contents written on the slide. The medium value for all groups is higher or equal to the mean value and this indicates that most of the students have a higher percentage to pass the examination. Group D has also obtained better grade compared to other groups

Table 3 shows the result of student performance against knowledge level. The question set evaluate students in two knowledge level, which are remembering and understanding from Bloom taxonomy. The percentage is calculated by adding number of students who correctly answer questions for each group and divide it by total number of students for the group.

Table 3. Percentage distribution for score obtained by the students' group.

	Group A	Group B	Group C	Group D
Remembering (Q1 to Q4)	61.5	70.0	65.7	90.5
Understanding (Q5 to Q6)	60.6	72.5	66.9	90.5

The result shows that no significant difference in percentage distribution for both remembering and understanding categories. Remembering is to assess the theoretical or factual knowledge, while understanding is to assess whether a student knows what is being taught and explain the ideas. Teaching theory could be somehow easy compare to making the student understand certain concepts in online learning. It needs further explanation to make sure the student understands the concepts being taught. The result indicates that an online learning platform is able to convey teaching material for both knowledge levels.

5. Conclusion

The educational system delivery has shifted to online learning completely during the novel coronavirus outbreak that hit Malaysia early this year. The lockdown has forced the whole education system to implement online learning regardless of the level of readiness of the system particularly the students and instructors. Various computer assisted learning approaches have been utilized to suit different teaching and learning constraints, including insufficient resources such as low to no internet connection, inadequate devices and distracting teaching and learning environment. With all these constraints, most students able to go through the first semester of online learning successfully. This study will give and insight to instructors and students to better prepare for another semester of online learning this year.

Acknowledgments

Conflicts of interests

The authors declare no conflict of interests.

References

[1] Azevedo JP, Hasan A, Goldemberg D, Geven K, Iqbal SA. Simulating the potential impacts of COVID-19 school closures on schooling and learning outcomes: A set of global estimates. *World Bank Res. Obs.* 2021, 36(1):1–40.
[2] Shi X. A Comparative Study of E-learning Platform in Reading and Translating Course for Engineering Students. *Int. J. Emerg. Technol. Learn.* 2016, 11(4):120–125.
[3] Yiong BLC, Sam HK, Wah TK. Acceptance of e-learning among distance learners: A Malaysian perspective. In *Proceedings: Ascilite Conference.* 2008, pp. 541–551.
[4] Salim KR, Abdullah M, Ali NL, Ali R. Usage of Online Learning Resources among Academic Staff at a Malaysian University. *Int. J. Eng. Technol.* 2018, 7:16–20.
[5] Anaraki F. Developing an effective and efficient elearning platform. *Int. J. Comput. Internet Manag.* 2004, 12:57–63.
[6] Fathema N, Shannon D, Ross M. Expanding the Technology Acceptance Model (TAM) to examine faculty use of Learning Management Systems (LMSs) in higher education institutions. *J. Online Learn. Teach.* 2015, 11:210–232.

[7] Alim N, Linda W, Gunawan F, Saad MSM. The effectiveness of Google classroom as an instructional media: A case of state islamic institute of Kendari, Indonesia. *Humanit. Soc. Sci. Rev*. 2019, 7:240–246.

[8] Dash S. Google classroom as a learning management system to teach biochemistry in a medical school. *Biochem. Mol. Biol. Educ*. 2019, 47:404–407.

[9] Javaid M, Haleem A, Vaishya R, Bahl S, Suman R, *et al.* Industry 4.0 technologies and their applications in fighting COVID-19 pandemic. *Diabetes Metab. Syndr. Clin. Res. Rev.* 2020, 14:419–422.

[10] Barhoumi C. The Effectiveness of WhatsApp mobile learning activities guided by activty theory on students' knowldege management. *Contemp. Educ. Technol.* 2020, 6(3):221–238.

[11] Shariffuddin SA, Shaaidi WRW, Hashim SM. Social networks as instructional tools beyond a classroom. *Int. J. Adv. Appl. Sci*. 2017, 4(12):185–192.

[12] Mulkalwar AA, Dashputra AV, Jaipuri AT, Sutar PV, Mulkalwar SA, *et al.* Evaluation of efficacy of WhatsApp messenger application in medical research education. *Int. J. Res. Med. Sci.* 2019, 8(1):265–271.

[13] Iksan ZH, Saufian SM. Mobile learning: innovation in teaching and learning using Telegram. *Int. J. Pedagog. Teach. Educ.* 2012, 1(1):19–26.

[14] Bloom BS. Taxonomy of educational objectives. *Sci Comput.* 1956, 1:20–24.