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Suitability of Quizlet for the Teaching and Learning of Simultaneous Linear Equations

适用性评估：Quizlet 在同时线性方程的教学与学习中的应用

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杨翠娴

Abstract: Due to the COVID-19 pandemic, all schools in Malaysia carried on with daily teaching and learning in an online version. Therefore, this study was conducted whilst school students in Malaysia are fairly competent with using the computer and internet to learn mathematics from their teacher. During this time, teachers had the opportunity to utilize internet-based applications to teach their students remotely. Thus, this study was conducted to discover the suitability of using Quizlet in teaching and learning *Simultaneous Linear Equations in Two Variables* in an online mode. Thirty Form 1 students from various schools in Kedah were chosen as the study sample. The pre-test and post-test were conducted to compare the students' achievement scores before and after treatment with Quizlet. A questionnaire was also distributed to discover how difficult the topic was for the students and how their attitudes and interests were towards learning the topic with the use of Quizlet. The analysis of the pre-test and post-test scores showed that students' achievement was higher after teaching and learning with Quizlet. The questionnaire responses also showed that majority of the students agreed that Quizlet has attracted their interest and motivated them to learn the topic.

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Keywords: simultaneous linear equations, Quizlet, online learning, mathematics education

摘　要：由于新冠肺炎疫情，马来西亚所有学校都以在线方式进行日常教学。因此，这项研究是在马来西亚的学生能够相当熟练地使用电脑和互联网向老师学习数学的情况下进行的。在此期间，教师有机会利用互联网的应用程序远程教学生。本研究旨在探索在线模式下使用Quizlet进行双变量联立线性方程的教学和学习的适用性。

30名来自吉打州不同学校的中一学生被选为研究样本，并采用前测和后测比较测试前后学生的成绩，还分发了一份调查问卷，以了解学生对该主题的难度以及他们对使用Quizlet学习该主题的态度和兴趣。分析表明，使用Quizlet教学后，学生的学习成绩更好。问卷调查结果也显示，大多数学生都认为Quizlet吸引了他们的兴趣，并激励他们学习这个数学单元。

关键词：同时线性方程，百智卡，在线学习，数学教学

1. Introduction

The Ministry of Education (2013) of Malaysia has performed the transformation of Malaysian education through the implementation of the Malaysian Education Blueprint (PPPM) in line with today's advancement. One of the shifts raised in PPPM is the seventh shift which is to take advantage of the Information and Communication Technology (ICT) to increase the quality of learning. Therefore, the use of internet in education has been encouraged, in fact, prioritized. With the integration of ICT in education, teachers have the opportunity to enhance the quality of teaching and learning so as to produce students who are more imaginative, creative and innovative (Ministry of Education, 2010).

In accordance to PPPM, the transformation of the school's curriculum is done on the content, pedagogy and assessment (Ministry of Education, 2013). The Secondary School Standard Curriculum (KSSM) was introduced in 2017 to replace the Secondary School Integrated Curriculum (KBSM) employed since 1989. After three years, KSSM was revised and modified into Revised KSSM.

The purpose of the Revised KSSM was to ensure that students are provided with knowledge, skills and values relevant to current needs as well as to meet with the challenges of the 21st century. Thus, the pedagogy in the Revised KSSM emphasizes on higher order thinking skills. Science, Technology, Engineering and Mathematics (STEM) is one of the focuses of the curriculum and is designed to produce globally competitive students. (Ministry of Education, 2017).

Mathematics is one of the important subjects in STEM. In addition, Mathematics is also one of the compulsory subjects taken by all secondary school students. However, Mathematics is considered a complex, highly challenging and a difficult subject to master (Phang et al., 2014). Furthermore, the emphasis on higher order thinking skills under PPPM has increased the difficulty of students in learning the subject of Mathematics and becomes a greater challenge for teachers in the teaching and learning process (Ministry of Education, 2013).

In the 21st century educational practices introduced through PPPM, technology plays a role as the empowerment or as a relevant and student-centered learning tool (Ministry of Education, 2013). Therefore, technology needs to be used comprehensively to support student learning through innovative teaching and learning methods and practices. The integration of ICT in teaching and learning not only can provide a good effect for each strategy used by teachers to meet the needs of teaching and learning, but this integration can also solve problems during the teaching and learning process to obtain results that coincide with the content (Ahmad, 2012).

According to the study by Putrawangsa and Hasanah (2018), there are three main functions of technology in assisting with Mathematics education, namely technology as a medium for learning Mathematics, technology as a tool to practice Mathematical skills and technology to help understand the concept of Mathematics.

Interactive learning is a learning process that is carried out actively using the medium of the internet. According to Razak (2013), interactive learning methods have increased his students' understanding and interest in the classroom. This indicates that interactive learning is one of the methods that should be chosen for the process of teaching and learning Mathematics.

Teachers should constantly improve the quality of teaching and learning to keep pace with the development of knowledge, technology, and arts as well as the development of times and global demands (Mulyasa, 2018). Therefore, teachers need to choose the learning medium that is most suitable with their teaching to achieve the objectives of the lessons.

Youtube has been the main platform for teachers to publish video recordings for students to view. Via Youtube, students can learn mathematics lessons conveniently and have a better understanding of the lesson. Students love watching YouTube videos made by their teacher as they can watch them repeatedly to fully understand the mathematics lesson anytime as long as they are connected to the internet (Insorio & Macandog, 2022).

If teachers plan to conduct teaching and learning using internet for student exercises or assessments, then Kahoot and Quizizz are very popular game-based quiz platforms which are suitable to use. Gamification in mathematics lesson with Kahoot! helps students to be more motivated and focus, and makes them happy to learn mathematics (Stoyanova et al., 2017). In Quizizz, the display of students' scores can help teachers evaluate their achievement faster and easier than using paper and pencil. At the same time, students would find that lessons with Quizizz attractive and not boring (Saleh & Sulaiman, 2019).

Quizlet is more suitable as a complete online teaching and learning platform for teachers. Quizlet (http://quizlet.com) is a browser based online and mobile application that provides a platform for the creating, sharing and practicing of matched information such as one might find in a set of flashcards (Cunningham, 2017). In Quizlet, teachers can select various learning modes to build their own learning sets. The learning modes in Quizlet include *scan card, match answer to question* and *live broadcast* which can be used to conduct group activities online.

Previous studies on the use of Quizlets in learning language and vocabulary have shown a positive effect in improving students' performance. A study by Sanosi (2018) on the use of Quizlet in teaching and learning vocabulary showed that it had a good effect on the students and students' achievement had improved

in the post-test. In addition, the use of Quizlet in language learning has increased the level of vocabulary mastery of Al-Malki's students (Al-Malki, 2020). His research shows that the use of Quizlet is indeed effective in language learning. Sailin et al. (2020) showed that this application was indeed helpful in improving student achievement in Science subject. He also suggested other researchers to study the use of Quizlet in the teaching and learning of other subjects.

This paper contains the results of a study on the use of Quizlet for teaching and learning the topic of *Simultaneous Linear Equations* in Two Variables at the Form 1 level. The purpose was not only to specifically discover the benefit of Quizlet on this specific topic but also to know how students felt about learning Mathematics in general using Quizlet.

2. Research Problem

Algebra is an important area of Mathematics for students to learn at the secondary school level. While studying algebra, students can train their minds to think abstractly, practice applying various representations as well as develop their self-thinking skills (Ministry of Education, 2015). However, Algebra is not easy for the secondary school students to master. In fact, the national report from *Trend In International Mathematics and Science Study* (TIMSS) (Ministry of Education, 2019) showed that in TIMSS assessment of the team representing Malaysia, the achievement in Algebra was not as good as that of other topics such as Numbers, Geometry, Data and Probability. The study by TIMSS is used as a reference by the Malaysian Ministry of Education in order to improve the quality of Science and Mathematics in Malaysia (Abdullah, 2018).

Algebra is one of the areas contained in Form One Mathematics. Linear Equations is one of the thirteen compulsory topics taught to the students and it is a rather challenging topic for students at that level (Leong et al., 2020). According to the study by Johari and Shahrill (2020), there are four main factors that cause students to have problems in solving simultaneous linear equations in two variables, namely

i. making mistakes during substitution

Students replace the value of the wrong variable into the equation or the student simply replaces the variable on the left or right side of the equation making the final answer still having two variables. An example of this is shown in Figure 1.

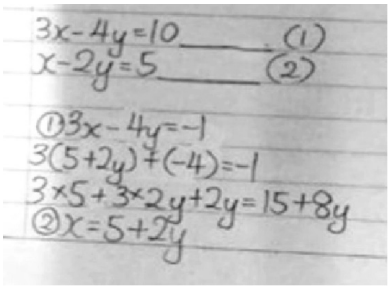


Figure 1: Mistake during replacement of variables

In Figure 1, the student rearranged equation (2) into x =5+2y and then substituted it into equation (1). The student dropped y while replacing x in equation (1). After that, the student could not simplify the equation.

ii. producing complicated equations

Students end up with a complicated equation due to mistakes while using the elimination method. An example of this is shown in Figure 2.

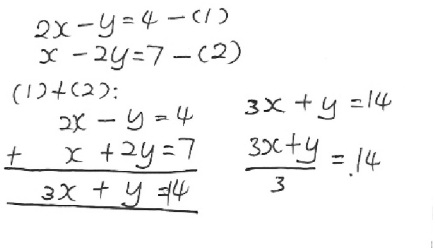


Figure 2: The mistake of complicating the equation while using the elimination method

In Figure 2, the student mistakenly changed the sign of 2y from equation (2) to positive. After adding the two equations, the student wanted to eliminate the coefficient for 3x. Therefore, 3x+y was divided by 3 on the left-hand side of

the equation but the student forgot to divide 14 by 3 on the right-hand side of the equation as well. This resulted to a more complicated equation.

iii. making computational errors

Students make a mistake in writing a positive sign or a negative sign when making calculations or students make a mistake in calculating the operations of addition, subtraction, multiplication and division. An example of this is shown in Figure 3.

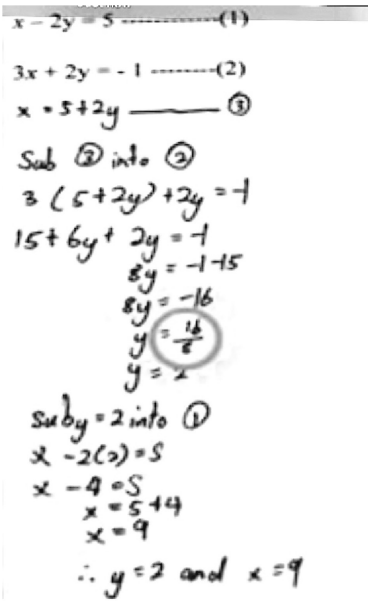


Figure 3: The mistake of writing a positive or negative sign while rearranging the equation

In Figure 3, the mistake was made when the student tried to eliminate the coefficient for *y* by dividing 8 on both sides of the equation. The student forgot to write a negative sign for 16 making the final answer wrong.

iv. making irrational errors while solving equations

Students ignore the variable that cannot be eliminated and then continue to write the final answer. An example of this is shown in Figure 4.

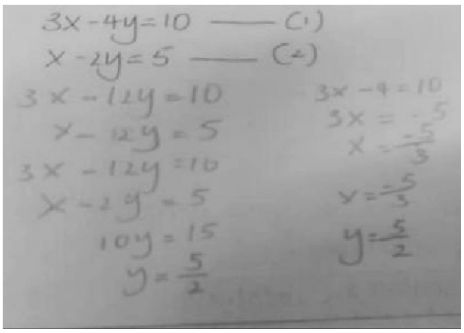


Figure 4: The mistake of ignoring a variable

In Figure 4, the student tried to use various methods to solve the equations but many mistakes were made. The student made several attempts to modify the term containing *y* but ignored *x*. Then, a number of mistakes followed which result to the wrong solution.

Simultaneous linear equations in two variables to be discussed involve two equations. Typically, teachers are recommended to teach students to find solutions for this system of equations using one of three methods, namely the graphing method, the substitution method and the elimination method.

According to the Curriculum and Assessment Standard Document (DSKP) for Form 1 Mathematics, teachers are encouraged to integrate technology in teaching. However, teachers were found to be more comfortable with the traditional teaching method, i.e. by using only textbooks and blackboards in the classroom (Said et al., 2016). As a result, students are easily confused by such abstract concepts and complex solution steps. If students are unable to understand the teacher's teaching, the teaching and learning process will become boring and unable to attract the students to learn.

Several studies have highlighted different methods for teaching and learning simultaneous linear equations in two variables. Widyastuti et al. (2017) have conducted some exercises on simultaneous linear equations with students using comics. The storyline in the comics was able to successfully translate abstract knowledge into concrete experiences so that it could be easily understood by students. Skb (2019) found that introducing the Algebrator software resulted to

the students showing a better performance in *Simultaneous Linear Equations* compared to the students who did not learn using the software. Teaching and learning using google classroom also improved students' understanding of the concept of simultaneous linear equations in two variables based on a study by Huda et al. (2019).

Quizlet was chosen for this study since it is an online learning platform where teachers can diversify the teaching and learning methods in order to encourage students to be actively involved in teaching and learning. Teachers can use Quizlet for teaching, training and making assessments. Compared to YouTube which can only be used as an instructional medium, or Quizizz and Kahoot which can only be used to provide training and assessment, Quizlet has a more complete function because it can be used to teach, train and assess and is suitable for use in the teaching and learning process (Sanosi, 2018).

The aim of this study was to see the suitability of the use of Quizlet in the teaching and learning process to help Form 1 students master the topic of *Simultaneous Linear Equations in Two Variables*. Hence, the following research questions have been formulated:

i. How are the students' mastery level in solving simultaneous linear equations in two variables before and after learning using Quizlet?
ii. What are the difficulties students face in solving simultaneous linear equations in two variables?
iii. Is Quizlet suitable to help students through the teaching and learning of simultaneous linear equations in two variables?
iv. Is Quizlet able to attract students' interest in learning the topic of *Simultaneous Linear Equations in Two Variables*?

3. Methodology

3.1 Research Sample

Teaching and learning and data collections were done online, that is, through virtual classes in a synchronous mode via the Zoom platform. A total of 30 Form

1 students from several secondary schools in Kedah volunteered as a sample for this research. All students involved had never studied or been taught the topic of *Simultaneous Linear Equations in Two Variables*. They were the target group that served as the treatment group and referred to as the study sample only.

3.2 Research Design

This study is a mixed-mode research which employed both quantitative and qualitative methods. A single group pre-test and post-test experimental method requiring only a treatment group was used in this study (Campbell & Stanley, 1963). All teaching and learning sessions were conducted online as the research was done during the COVID-19 pandemic and all schools were closed. The experiment began with teaching and learning in a conventional method (teacher-centred) for 2 online sessions.

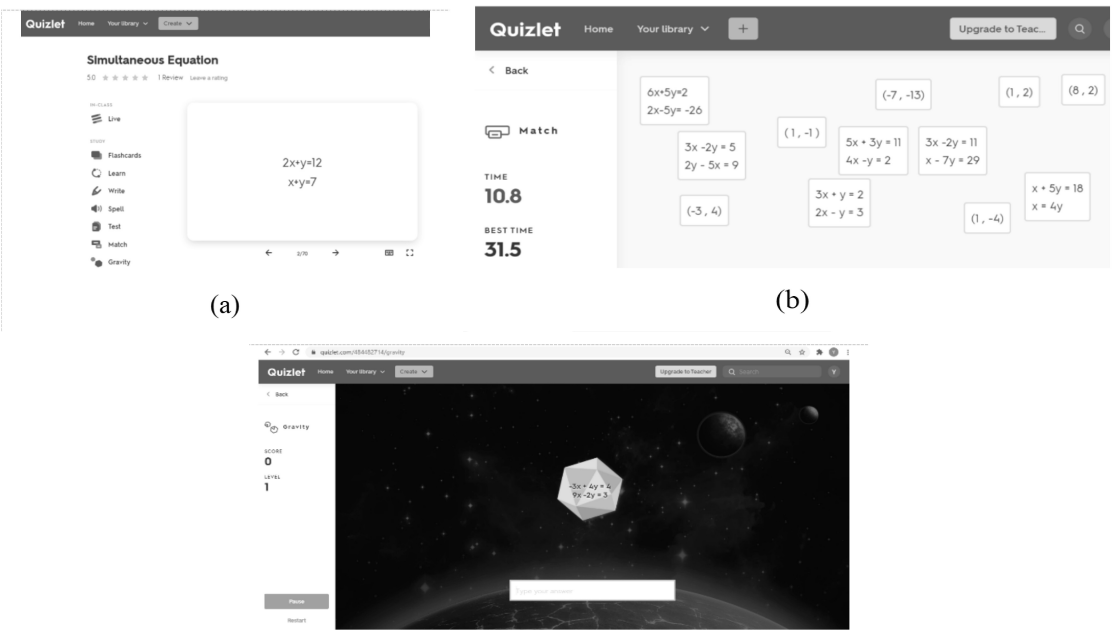
The pre-test was conducted after the completion of these two sessions. Then teaching and learning with Quizlet was conducted for 4 more sessions. Following this, the post-test was conducted. Questions in the post-test were similar to those in the pre-test. Lastly, the study sample were asked to answer a Likert-formatted questionnaire. The five agreement scales used were Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A) and Strongly Agree (SA) (Ankur et al., 2015). The items in the questionnaire were based on a similar study by Yap and Ali (2018).

Statistical Package for the Social Science (SPSS) software was used to conduct statistical analysis on the data collected. The achievement of the study sample in the pre-test was used to determine the level of mastery before treatment was given and the achievement in the post-test was used to determine the level of mastery after treatment. Normality test was done to ensure normal distribution of the data and followed by the *t*-test to see the difference in performance before and after teaching and learning Quizlet.

The analysis on the survey response were done to obtain students' perceptions on the difficulty of solving simultaneous linear equations in two variables and also to identify whether Quizlet can attract students to learn the topic.

3.3 Online Teaching and Learning

Microsoft PowerPoint slides were used as blackboard to teach students in the conventional method for the first two sessions where students only used pencil and paper to complete the exercises. For the following teaching and learning sessions with Quizlet, the teacher and students interact through the Quizlet platform for all activities. The teacher used the scan card mode, matching answer with question mode and gravity mode during teaching and learning with Quizlet. Figure 5 shows an example of display for each of the mode mentioned above.



(a) (b)

(c)

Figure 5: Display of learning modes in Quizlet: (a) scan card; (b) matching answer with question; (c) gravity

Figure 6 explains the flow of the study.

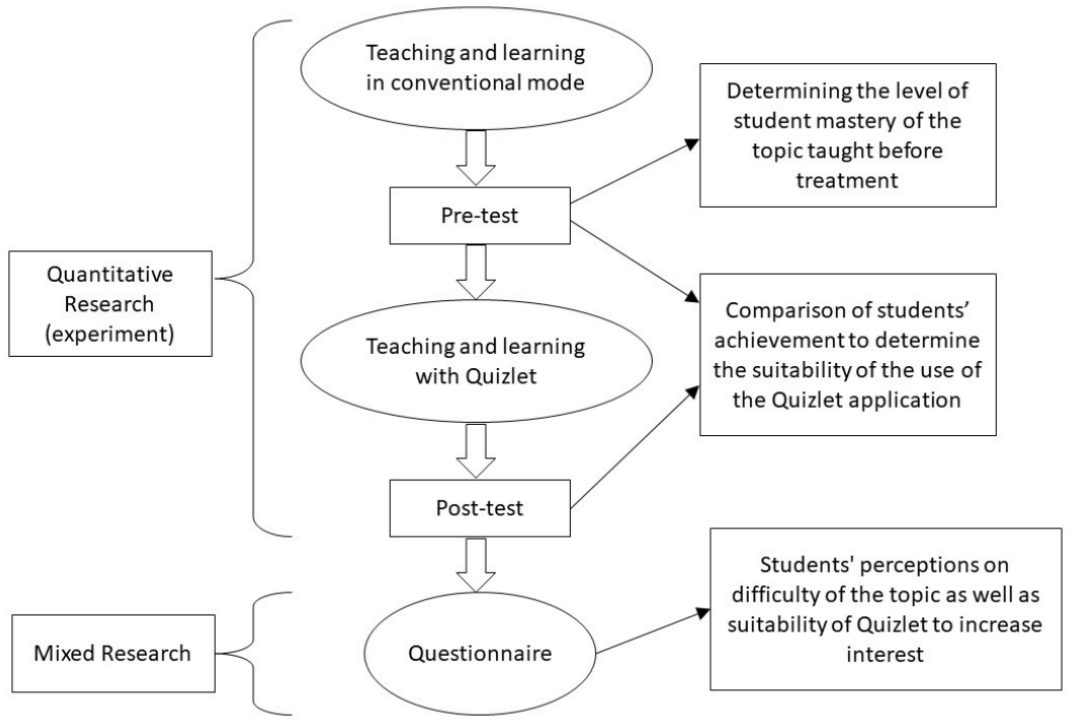


Figure 6: Research Flow

4. Data and Results

4.1 Analysis of Pre-test and Post-test Scores

Descriptive statistics, i.e. the score's mean, mode, median, standard deviation, minimum, maximum and histogram are used to see the mastery level of the study sample before and after teaching and learning with Quizlet. The analysis of pre-test scores are discussed first based on Table 1 and Figure 7.

Table 1: Pre-test Scores Analysis

Score	0	1	2	3	4	5	6
Frequency	12	0	4	1	6	7	0

Mean	Mode	Median	Standard Deviation	Minimum	Maximum
2.33	0	2	2.14	0	5

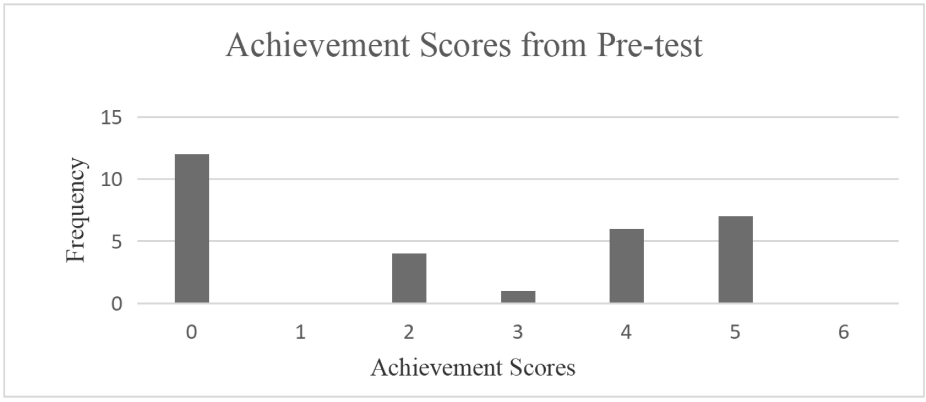


Figure 7: Histogram of Achievement Scores from the Pre-test.

Referring to Table 1 and Figure 7, the mean, mode and median score values from the pre-test are 2.33, 0 and 2. The histogram in Figure 7 is skewed to the right since the mode and median scores are less than the mean score. Most of the scores are scattered to the left of the mean score. The range of scores obtained by the students was between 0 and 5. No one obtained the highest score, i. e. a score of 6. The standard deviation which is 2.14 is close to the mean and median scores.

The majority of students obtained a score of 0 indicating that most of them were still unable to answer questions on simultaneous linear equations in two variables. A mean score of 2.33 indicates that the average number of questions answered correctly by students in the pre-test was at least two questions. Thus the level of mastery of the study sample was still low after teaching and learning in a conventional method.

Table 2 shows the achievement of students in the post-test while Figure 8 is a histogram constructed based on the post-test scores.

Table 2: Post-test Scores Analysis

Score	0	1	2	3	4	5	6
Frequency	6	2	2	1	4	8	7

Mean	Mode	Median	Standard Deviation	Minimum	Maximum
3.57	5	4.5	3.00	0	6

Figure 8: Histogram of Achievement Scores from the Post-test.

The histogram for the pre-test in Figure 8 is skewed to the left. The mean, mode and median scores were 3.57, 5 and 4.5. Thus, the mode and median scores were higher than the mean scores. Most of the scores are scattered to the right of the mean score. The score range is between 0 and 6. This indicates a relatively large range of scores. The standard deviation for the post-test scores is 3.

Students' achievement in the pre-test and post-test was also compared through data scores that were analyzed by SPSS. Table 3 shows the students' achievement scores while Figure 9 is a histogram constructed for the pre-test and post-test.

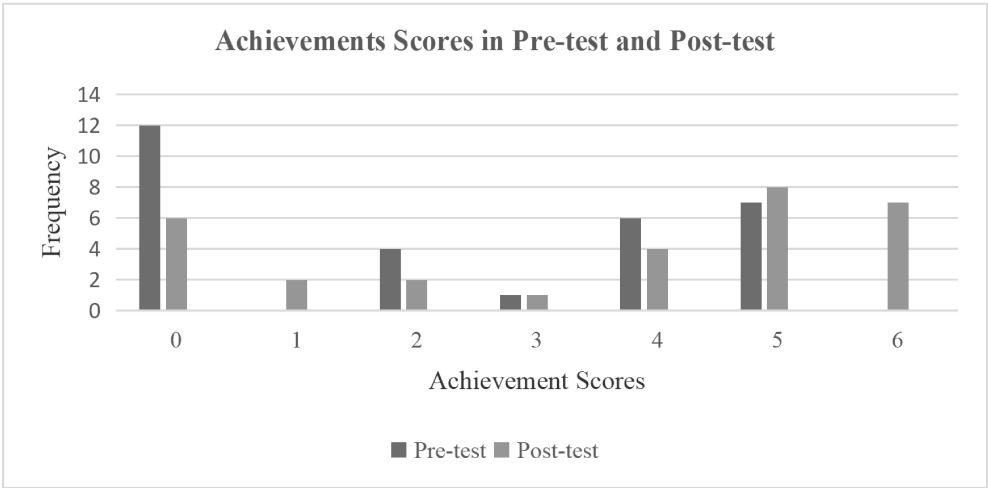


Figure 9: Histogram of Achievement Scores from the Pre-test and Post-test

Table 3: Analysis of Achievements Scores from the Pre-test and Post-test

Score	0	1	2	3	4	5	6
Frequency of pre-test	12	0	4	1	6	7	0
Frequency of post-test	6	2	2	1	4	8	7

	Mean	Mode	Median	Standard Deviation	Minimum	Maximum
Pre-test	2.33	0	2	2.1	0	5
Post-test	3.57	5	4.5	3.00	0	6

From the comparison of data scores for the pre-test and post-test, it was found that the mode value increased from 5 to 6 with a total of seven students obtaining a score of 6 in the post-test. The number of students who obtained a score of 0 in the post-test has dropped, i. e. from twelve students to six students. The median value also improved from 2 to 4.5 and the mean value increased from 2.33 to 3.57. Therefore, the mastery level of the students was increased overall after teaching and learning with the Quizlet.

Before comparing the mean score of the pre-test and post-test using the paired sample t-test, the data was analyzed to verify that the scores were normally distributed. Skewness and Kurtosis tests were used to test the normality of the scores. The research hypotheses for skewness and Kurtosis were as follows:

H_0 : *Scores are normally distributed.*

H_1 : *Scores are not normally distributed.*

According to Chua (2014), the data have a normal distribution if the skewness value and the Kurtosis value are in the range of -1.96 to +1.96. After the data of both tests were analyzed with SPSS, the skewness and Kurtosis values are as recorded in Table 4.

Table 4: Skewness and *Kurtosis* on Data of Pre-test and Post-test

	Pre-test	Post-test
Skewness	0.031	-0.575
Kurtosis	-1.805	-1.291

According to Table 4, the skewness values for pre-test and post-test data were 0.031 and -0.575. The Kurtosis values for pre-test and post-test data were -1.805 and -1.291. Since the skewness and Kurtosis values for these two tests were in the range of -1.96 to +1.96, then the data from the pre-test and post-test were said to be normally distributed. Therefore, the null hypothesis was accepted.

Because the data from the pre-test and post-test were normally distributed, parametric tests such as *t*-test could be used to analyze the data. Inferential statistics, i. e. paired sample *t*-test was used to test the mean values of the pre-test and post-test scores. The purpose of the *t*-test used was to find out whether there was a significant difference between the mean scores from the pre-test and post-test (Bluman, 2007). The research hypotheses for the paired sample *t*-test were as follows:

H_0 *: There was no significant difference between the mean scores of pre-test and post-test.*

H_1*: There was a significant difference between the mean scores of pre-test and post-test.*

Table 5: Comparison of mean scores from pre-test and post-test by paired sample *t*-test

Mean for pre-test	2.33	*t*	-5.076
Mean for post-test	3.57	*p*-value	0.000021
		Confidence level (α)	0.05

Referring to Table 5, using the confidence level α= 0.05 (95%), the p-value obtained from this paired sample *t*-test was less than 0.05. Thus, the null hypothesis was rejected. In conclusion, there was a significant difference between the mean scores of the pre-test and the post-test.

The results from this t-test showed that using Quizlet had helped the students to improve their performance in the topic of *Simultaneous Linear Equations in Two Variables*.

4.2 Analysis of Questionnaire Responses

The questionnaire distributed to the study sample consisted of ten objective questions and the responses were measured using a Likert scale. In addition, one open-ended question was also included. SPSS was used to analyze each item of the questionnaire to obtain the percentage (%) and mean score.

SPSS was used to analyze each item of the questionnaire to obtain the frequency (F), percentage (%) and mean score. The mean score of above 3.5 would indicate that the study sample agrees with the item statement. The results from the analysis of the questionnaire items are listed in Table 6.

Table 6: Frequency, percentage and mean score for each questionnaire item

Item	SD		D		N		A		SA		Mean
	F	%	F	%	F	%	F	%	F	%	
1	0	0.0	0	0.0	11	36.7	13	43.3	6	20.0	3.83
2	0	0.0	18	60.0	12	40.0	0	0.0	0	0.0	2.40
3	3	10.0	14	46.7	9	30.0	4	13.3	0	0.0	2.47
4	0	0.0	2	6.7	6	20.0	17	56.7	5	16.7	3.83
5	0	0.0	1	3.3	11	36.7	11	36.7	7	23.3	3.80
6	0	0.0	3	10.0	11	36.7	11	36.7	5	16.7	3.60
7	1	3.3	2	6.7	11	36.7	13	43.3	3	10.0	3.50
8	0	0.0	2	6.7	4	13.3	17	56.7	7	23.3	3.97
9	0	0.0	1	3.3	4	13.3	13	43.3	12	40.0	4.20
10	1	3.3	0	0.0	3	10.0	12	40.0	14	46.7	4.27
11	0	0.0	0	0.0	12	40.0	10	33.3	8	26.7	3.87

Referring to Table 6, the mean score of every item is higher than 3.5 except for item 2 and item 3. This indicates that the majority of students agreed with all statements in the questionnaire other than the second and third statements.

Based on Table 6, the percentage of respondents who chose Agree and Strongly Agree for each question was combined and displayed in Table 7.

Table 7: Percentage of students who agreed with the questionnaire statement

Item	Statement	Percentage A & SA (%)
1	I am very interested in the subject of Mathematics.	63.3
2	I can solve simultaneous linear equations in two variables.	0.00
3	*Simultaneous Linear Equations in Two Variables* is a difficult topic to master. If Yes, please write the reason: _____	13.3
4	Quizlet is suitable to use in the teaching and learning of simultaneous linear equations in two variables.	73.4
5	Quizlet can facilitate the process of learning simultaneous linear equations in two variables.	60.0
6	Quizlet can help me to understand the teacher in the teaching and learning of simultaneous linear equations in two variables.	53.4
7	Quizlet can help me discover my level of mastery in solving simultaneous linear equations in two variables.	53.3
8	Quizlet is able to improve my mastery of simultaneous linear equations in two variables.	80.0
9	Quizlet can help me focus on teaching and learning simultaneous linear equations in two variables.	83.3
10	Quizlet attracts my interest to learn simultaneous linear equations in two variables.	86.7
11	I like using Quizlet to study simultaneous linear equations in two variables.	60.0

From Table 7, 63.3% of the students were interested in Mathematics (item 1). However, the responses for item 2 showed that none of the students agreed that they can solve linear equations simultaneously in two variables. When Table 6 was referred, it appeared that 60% disagreed with this statement while the rest neither agreed nor disagreed. This implied that students were not convinced that they could correctly answer the question of simultaneous linear equations in two variables. However, only 13.3% of them felt that *Simultaneous Linear Equation* is a difficult topic to master. Some of the reasons given are displayed below.

1. "The steps of solving simultaneous linear equations in two variables are very complicated."
2. "I can't remember the solution steps."
3. "This title is difficult because I am confused with the three methods of solution."

Analysis of items 4 to item 8 showed that 73.4% of the students felt that Quizlet is suitable to use in teaching and learning the topic of *Simultaneous Linear Equations in Two Variables*. 60% of the students agreed that Quizlet can facilitate teaching and learning while 53% of students indicated that Quizlet can help them understand the teacher's teaching as well as indicate their level of mastery in the topic. 80% of the students agreed that Quizlet was able to improve their skills in solving simultaneous linear equations in two variables.

Analysis of items 9 to item 11 showed 60% of the students like to use Quizlet for learning. 80% of the students thought that the Quizlet could help them concentrate in learning while 86.7% of the students thought that Quizlet could attract their interests in learning simultaneous linear equations in two variables.

5. Discussion

After performing the statistical analysis on the scores of the pre-test and post-test, as well as the scores obtained from the questionnaire responses, the following are the summary of results which answers the research questions posed at the beginning:

i. students' mastery level in the post-test was better than in the pre-test.
ii. students felt that *Simultaneous Linear Equations in Two Variables* is not a difficult topic to master but the solution steps are very complicated.
iii. based on the results of the paired sample *t*-test, there was a significant difference between the mean score of the pre-test and the mean score of the post-test which indicates that the use of Quizlet has helped students achieve a better result.

iv. the questionnaire responses indicated that the use of Quizlet was able to attract students' interest to learn simultaneous linear equations in two variables.

Based on the study, *Simultaneous Linear Equations* in Two Variables is not an extremely difficult topic for secondary school students to master. In fact, a study by Wati et al. (2018) concluded that students with high mathematics achievement do not have any difficulty in solving linear equation problems. However, the complexity of the equation solution steps resulted to as many as 40% of the students in this study obtained a score of 0 in the pre-test. With the use of Quizlet application in teaching and learning, however, the percentage of students with a score of 0 was reduced from 40% to 20% while the percentage of students who obtained a score of 6 and a score of 7 increased from 23% to 30%. This shows that the use of Quizlet application is appropriate and effective to assist students in improving their skill in answering mathematics questions.

6. Conclusion

The results from this study showed that Quizlet has the potential of improving students' performance in Algebra and also suitable to be applied in an online teaching and learning environment.

It is important to note, however, that online learning with technological tools does not necessarily result to students having a better grade compared to learning with the traditional method. In fact, a study by Drijvers et al. (2014) showed that Grade 8 students who were taught Algebra with online resources scored slightly lower than those taught in the traditional mode. Thus, the online learning should not entirely replace the traditional method of teaching, rather it should be done as an additional learning activity for students to enhance their knowledge in a specific topic of Algebra.

Based on the results of this study, some suggestions for future studies are as follows:

i. study the level of teachers' skills in integrating technology in an online environment to teach Mathematics.
ii. study the effectiveness of the integration of Quizlet with other applications such as educational video in the teaching and learning of Mathematics.
iii. study the effectiveness and suitability of Quizlet in teaching and learning other topics of Algebra.

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