Proceeding Paper

A Comparison between Digital-Game-Based and Paper-Based Learning for EFL Undergraduate Students' Vocabulary Learning [†]

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† Presented at the 3rd IEEE International Conference on Electronic Communications, Internet of Things and Big Data Conference 2023, Taichung, Taiwan, 14–16 April 2023.

Abstract: This research aimed to compare two strategies for vocabulary learning (digital-game-based learning and paper-based learning). The research was conducted during the first semester of the academic year 2022/2023. A total of 40 EFL undergraduate students within the Applied English Program of a private university located in the middle part of Taiwan were selected and divided into two groups: digital-based ($n = 20$) and paper-based ($n = 20$). The instrument developed by the researcher was pre- and post-vocabulary tests for both groups. The pre-vocabulary test was implemented to identify the level of students' prior knowledge of vocabulary mastery. For the intervention, Kahoot! quiz exercises were conducted weekly for the digital-game-based group, while the paper-based group received the same quiz on paper every week. The post-vocabulary tests showed no significant difference between the students using digital-game-based quizzes and paper-based quizzes during the six-week intervention.

Keywords: vocabulary learning; digital-game-based learning; paper-based learning; Kahoot!

1. Introduction

With the prevalence of mobile devices in modern educational settings, the use of mobile devices has provided teachers with more options to incorporate digital games into their teaching methods. The swift advancement of technology has made it easier to share information and knowledge on global scale, greatly influencing the way the learners and educators learn and teach language at schools. In the classroom, technology includes everything from low-tech items, such as pencils, paper, and chalkboards, to high-tech resources, such as digital learning tools, gadgets, and computers with numerous functions and applications [1]. Students are empowered by technology, since it allows them to decide how they learn, makes education relevant to their digital-orientated lives, and prepares them long term. Students are encouraged to think critically, solve problems, collaborate, and innovate.

M-learning encourages learning and teaching via the use of wireless and mobile technology [2]. Laptops, tablet PCs, PDAs, cell phones, and other mobile devices are all considered aspects of mobile learning. There are many chances for educators to adopt digital learning tools and create an increased usage of mobile devices or mobile learning [3]. Digital-game-based learning (DGBL) is a learning strategy that blends educational information or learning concepts into video games to engage learners [4]. Game-based learning is frequently related to studying the effects of GBL, implementing educational games, and creating game-based educational techniques [5]. The arrival of digital game-based learning occurred during a global technological breakthrough in the late 20th century.

DGBL possesses the capability to capture students' interest and motivation, provide customized learning experiences, while enhancing long-term memory and offering practical opportunities [6].

Vocabulary is central to language for language learners, and a critical element of language pedagogy [7]. Teachers employ a variety of ways and techniques to teach vocabulary to ESL/EFL students, and practitioners must familiarize students with different strategies and approaches [8–10]. Synonyms, antonyms, self-defining context, dramatization, illustrations and pictures, realia, metaphorical sentences, and other strategies were used, respectively, by teachers in vocabulary teaching [11,12]. In addition, vocabulary is the center of language and the structure block of speech, and learning new words is a crucial element of language education [13–15].

There are several approaches to language acquisition in the technology era. Computer-based vocabulary learning software, blogs, cell phones, digital portfolios, online learning, electronic texting, pen pal, electronic displays, electronic reader corpora, mobile-phone-based apps such as Twitter and text messages, social networks, podcasts, and wiki websites are examples of such technologies. The availability of online applications facilitates the creation of interactive materials for students by teachers. Teachers can make learning sessions more fascinating for their students. They can make games or quizzes competitive through a leaderboard [16].

Kahoot! is one of the applicable interactive quizzes implemented in learning vocabulary. Moreover, Kahoot! is complimentary and superficial for the instructor to use for learning in the classroom. Kahoot! also supports creative energy and increases performance to achieve a stronger motivation of the student [17,18]. Several studies proved that the application creates some advantages. Kahoot! is a favorable instrument as it is beneficial for formative assessment, and enhances understanding [19]. The application of gamification improved learners' attention and drive for success [20]. Despite the advantage, some studies found that Kahoot! has some difficulties. First-time users of m-learning were dissatisfied with the functionality and features of the available tools, including the slow internet connection [21]. It showed that a slow internet connection causes the biggest problem for implementing Kahoot! within learning [22–24]. Therefore, it is essential to offer suitable facilities to help new users.

In Taiwan, a majority of university students use advanced technology such as mobile devices, laptops, and computers. Based on prior research, we focused on the use of mobile devices and investigated a vocabulary learning strategy that involved weekly quizzes. The students used Kahoot! as a tool to complete the quizzes. The aim of this research was to compare two different strategies: digital-game-based learning using Kahoot! quizzes, and paper-based learning using paper-based quizzes, and their impact on the vocabulary learning of EFL (English as a foreign language) students. As a result, the following research question was formulated for this research.

1. Is there any significant difference between the mean scores of the students who used digital-game-based learning (Kahoot! quiz) and the mean scores of the students who used paper-based quizzes?
2. What are student's perceptions toward the two strategies for their vocabulary learning?

2. Method

2.1. Sample and Population

The sample consisted of 38 students who were enrolled in an intermediate English course. The participants were purposefully selected among second-year students at Chaoyang University of Technology during the fall semester of the academic year 2022/2023. The participants were separated into two distinct groups: namely the digital-game-based group and the paper-based group, each consisting of 19 students.

2.2. Procedure

The researcher distributed six vocabulary quizzes to both groups to review the material covered in the course. Only the digital-game-based group received the quiz exercise through Kahoot!, whereas the paper-based group received the quiz exercise through paper and pen. Students in the Kahoot! class could see their scores right after the session finished. Contrastingly, the paper-based group took a similar quiz on paper, but received their results the following week. The goal of the quiz exercise for both groups was to see how well students comprehended the vocabulary. The researcher informed the students that the results of those quizzes had no relevance to their grades, but the scores from the post-test would be collected and calculated for grading purposes within the current course. The post-test was given to both groups after six weeks of intervention. A pre-test was also given to both groups to ensure that their vocabulary levels were similar. The same post-test was given to both groups to determine which learning strategy was more effective.

2.3. Instruments

A total of 30 questions were created for both the pre- and post-vocabulary tests, which were administered six weeks apart. To ensure the reliability and validity of the tests [25], they were reviewed and modified by two experts from the Applied English Department at Chaoyang University of Technology. The validity and reliability of the tests were calculated using the KR-21 formula, and the results indicated a score of 0.78.

The questionnaire was distributed to both groups of students after the intervention. The questionnaire included 11 items on a 5-point Likert scale, and the students were requested to complete it. Cronbach's coefficient alpha was determined to evaluate the reliability of the questionnaire. The reliability value in the digital-game-based group was 0.92 and 0.84 in the paper-based group, which were excellent and acceptable for a measure of the 11 items.

3. Results

3.1. Comparison of Gain Score

Standard deviation and mean were calculated for students' results of pre-and post-tests in the two groups. Independent sample *t*-tests and analysis of variance were used to compare the digital game-based and paper-based groups. The *t*-test was used to demonstrate statistical differences between the mean scores of the two groups. The result is presented in Table 1.

Table 1. Comparison of the pre-test between the digital-game-based group and paper-based group.

Group	N	Mean	SD	t. Value	f	Sig. (Two-Tailed)
A	19	45.26	9.949	0.135	1.352	0.978
B	19	45.00	13.170			

Table 1 demonstrates that the digital-game-based group and the paper-based group had a similar mean score on the pre-test (45.26 and 45.00, respectively). The results indicate that the value of significance (two-tailed) was 0.978, exceeding the significance level of 0.05, implying that there was no statistical significance between the two groups. Therefore, the results of both groups were statistically the same. After six weeks of implementing the two strategies, the average score of the students who used digital-game-based learning was 63.11, while the average score of the students who used paper-based learning was 61.16. The significance value (two-tailed) was 0.662. The mean scores for both groups significantly improved; however, there was still no significant difference between the two groups, as shown in Table 2.

Table 2. Comparison of the post-test between the digital-game-based group and paper-based group.

Group	N	Mean	SD	t. Value	f	Sig. (Two-Tailed)
A	19	63.11	12.849	0.441	0.655	0.662
B	19	61.16	14.338			

Table 2 shows that there was no significant difference between the students who took digital-game-based quizzes and paper-based quizzes during the six weeks of intervention.

3.2. Student Perception toward the Digital-Game-Based Quiz (Kahoot!)

Among the items evaluated (see Appendix A), the students' highest perception was for Item 1 ("I find the Kahoot! quiz exciting, interesting, motivating and funny") and Item 3 ("Getting a good grade in every quiz in the class is the most satisfying thing for me"), with a mean score of 4.21. Conversely, the lowest mean score was for Item 6 ("The Kahoot! quiz does not give any chance to cheat"), with a mean of 3.47. Table 3 presents the percentage and mean score of each item assessed.

Table 3. Student perception results for the digital-game-based quiz (Kahoot!).

Item	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Mean
	%	N	%	N	%	N	%	N	%	N	
Q1	37%	7	58%	11	-	-	-	-	5%	1	4.21
Q2	26%	5	68%	13	-	-	-	-	5%	1	4.11
Q3	37%	7	53%	10	5%	1	5%	1	-	-	4.21
Q4	26%	5	58%	11	5%	1	11%	2	-	-	4.00
Q5	11%	2	58%	11	16%	3	16%	3	-	-	3.63
Q6	16%	3	26%	5	47%	9	11%	2	-	-	3.47
Q7	11%	2	58%	11	16%	3	16%	3	-	-	3.63
Q8	21%	4	58%	11	11%	2	5%	1	5%	1	3.84
Q9	16%	3	58%	11	16%	3	5%	1	5%	1	3.74
Q10	16%	3	58%	11	16%	3	11%	2	-	-	3.79
Q11	16%	3	68%	13	5%	1	11%	2	-	-	3.89

3.3. Student Perception toward the Paper-Based Quiz

Student perception was the highest for Item 3 ("Getting a good grade in every quiz in the class is the most satisfying thing for me"), with a mean of 4.42, and the lowest mean was 3.47 for Item 11 ("Getting late results and feedback from the paper-based quiz unmotivated me"). The percentage and mean of each item are presented in Table 4. All the items for paper-based quiz is presented in Appendix B.

Table 4. Student perception results for the paper-based quiz (Kahoot!).

Item	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Mean
	%	N	%	N	%	N	%	N	%	N	
Q1	16%	3	68%	13	16%	3	-	-	-	-	4.00
Q2	11%	2	68%	13	21%	4	-	-	-	-	3.89
Q3	47%	9	47%	9	5%	1	-	-	-	-	4.42
Q4	32%	6	37%	7	26%	5	5%	1	-	-	3.95
Q5	5%	1	74%	14	16%	3	5%	1	-	-	3.79
Q6	16%	3	58%	11	16%	3	11%	2	-	-	3.79
Q7	11%	2	84%	16	5%	1	-	-	-	-	4.05
Q8	5%	1	63%	12	32%	6	-	-	-	-	3.74
Q9	5%	1	47%	9	47%	9	-	-	-	-	3.58
Q10	16%	3	37%	7	37%	7	5%	1	5%	1	3.53
Q11	5%	1	42%	8	47%	9	5%	1	-	-	3.47

4. Conclusions

There was no significant difference between the scores of the students who used digital-game-based learning (Kahoot! Quiz) and paper-based learning, but both groups showed an improvement in the post-test compared to the pre-test. The digital-game-based group showed more improvement after the intervention. The students were motivated to achieve better grades on every quiz based on the questionnaire results. In the digital-game-based group, the students believed that cheating was not possible in Kahoot! quizzes (Item 3), whereas the students in the paper-based learning group felt demotivated waiting for the results each week. It is challenging to determine which strategy was better based on the responses and results of both groups. Further research is necessary to evaluate the perception of these strategies, as this 6-week intervention could not demonstrate significant differences, indicating the need for a further extended intervention.

Appendix A

1. I find the Kahoot! quiz exciting, interesting, motivating and fun.
2. I feel positive when using the Kahoot! quiz.
3. Getting a good grade in every quizzes in the class is the most satisfying thing for me.
4. The Kahoot! quiz is more challenging than the paper-based quiz.
5. I feel that the Kahoot! quiz was familiar and simple to complete.
6. The Kahoot! quiz does not give any chance to cheat.
7. The Kahoot! quiz technique enables me to learn better.
8. I want this technique to be used in other courses.
9. I prefer taking the quiz online through Kahoot! to a paper-based quiz.
10. The Kahoot! quiz environment is appropriate and convenient for test-taking.
11. Getting immediate results and feedback from the Kahoot! quiz system motivates me.

Appendix B

1. I find the paper-based quiz exciting, interesting, motivating and fun.
2. I feel positive when using the paper-based quiz.
3. Getting a good grade in every quiz in the class is the most satisfying thing for me.
4. The paper-based quiz is more challenging than the online quiz.
5. I feel that the paper-based quiz was familiar and simple to do.
6. The paper-based quiz does not give any chance to cheat.
7. The paper-based quiz technique enables me to learn better.
8. I want this technique to be used in other courses.
9. I prefer taking the paper-based quiz to an online quiz.
10. The paper-based quiz environment is appropriate and convenient for test-taking.
11. Getting late results and feedback from the paper-based quiz unmotivated me.

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