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EXPLORING THE EFFECTIVENESS OF USING QUIZLET ON LEARNING DENTAL TERMINOLOGY

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Abstract

The main goal of this study is to evaluate the effectiveness of the Quizlet flashcard app for learning English dental terminology. 100 dental-technology students from a five-year junior college in southern Taiwan participated in this study. Participants had access to Quizlet for learning 281 dental terms. By using a quasi-experimental research design, data were collected from vocabulary quizzes and a questionnaire. Vocabulary quiz results were compared to measure the effectiveness of Quizlet's assistance. The questionnaire was distributed after the use of Quizlet to evaluate satisfactory features of the software. Preliminary research findings have shown a positive correlation between frequency of Quizlet use and the acquisition of dental vocabulary, at a significance level of $p < .001 \sim .005$. In addition, the participants gave positive feedback on Quizlet's functions with mean scores ranging from 4.71~5.0 (on a 6-point scale). Unexpectedly, the perceived benefits of using Quizlet did not result in satisfactory test scores because the students

did not use it extensively. Future research can focus on the correlation between students' perceptions of educational apps and their eagerness to use them.

Keywords

Quizlet, Dental Terminology, Vocabulary Learning, Dental Technology, ESP

1. Introduction

Vocabulary learning is the essential part of successful language learning. However, difficulties in learning the target lexis, such as difficult pronunciation, multiple meanings, or irregular spelling, have been stated in many studies of general English (Al-Baekani, 2019; Rahma & Dewi, 2022; Rohmatillah, 2014; Shah et al., 2022) or of English for specific purposes (ESP) (Brooks, 2014; Dilani, 2021). Studies have suggested that learning a word preliminary requires mastering its sound, form, meaning and usage. Progress is better when words are learned with auxiliary information such as visual aids (Mohammed & Yaseen, 2017; Nation, 2017; Schmidt, 2000). In addition, word knowledge increases gradually over multiple and repeated encounters. Nation (2001) goes further to acknowledge the benefits of using flashcards to maximize review intervals.

With a word or phrase on one side and its picture or definition on the other, flashcards are a valuable tool for introducing, practicing and recycling vocabulary. For most language learners, however, making flashcards can be quite time-consuming. Thanks to technological advancements, learning vocabulary has become more interesting and efficient with computer or mobile apps. Quizlet is one of them. It is an AI-enhanced learning platform that can be accessed on a smartphone or computer. This multimedia application features enjoyable learning activities, and is free to anyone who creates an account. Moreover, it is popular for its ease of use and variety of pre-made flashcard decks.

Since its launch in 2007, Quizlet has gone through several changes to its platform. The researcher carried out the research in 2019 and there were eight activities available. *Flashcard*, *learn*, *write*, *spell* and *test* were designed for study purposes, whereas *match*, *gravity*, and *live* were game-like activities for practicing studied words.

- *Flashcard*: It allows learners to add words, sound, pictures or definitions on either side of the digital cards. Learners can flip cards by mouse clicks or tabs on the screen to learn words or definitions with the help of pictures or pronunciation.

- *Learn:* Words are presented with multiple-choice answers. Learners have to choose the correct one. Another option is to type out the answer corresponding to the hint question.
- *Write:* Learners have to write the definitions or translations of presented words or pictures.
- *Spell:* Learners spell out what they hear from the audio prompts.
- *Test:* The vocabulary test includes four question types: write, multiple choice, matching and true or false. Test questions are taken from flashcard sets randomly.
- *Match:* Learners drag pictures or definitions and drop them onto corresponding words. A timer is added to increase the excitement of the game.
- *Gravity:* This game imitates falling asteroids with words in them. Learners have to type the corresponding definitions or translations before the falling words crash onto the horizon.
- *Live:* This is a collaborative game. It has two game modes: one is Team mode for students to work in groups to answer questions, the other is for individuals to play against each other. Questions in Live are presented in a multiple-choice format.

2. Literature Review

Recent studies on Quizlet-enhanced vocabulary learning mostly explore its effectiveness and retention (Barr, 2016; Cinar & Ari, 2019; Dizon, 2016; Sanosi, 2018), its potential to increase motivation (Nguyen et al., 2020; Setiawan & Wiedarti, 2020) or build learner autonomy (Nguyen et al., 2020).

Dizon (2016) asked nine Japanese university students to study Coxhead's (2000) academic vocabulary list via Quizlet over 10 weeks. The findings have shown that Quizlet helps Japanese students learn effectively. Moreover, students hold positive perceptions towards Quizlet's assistance and find it practical.

A similar study was conducted in Japanese by Barr (2016). Thirty-two low-level EFL university students studied TOEIC vocabulary on Quizlet. The vocabulary study sets were presented with words or phrases on one side, pictures and Japanese translations on the other. In addition, contextual information for the words and phrases is provided through the fill-in-the-blank sentences. On average, Quizlet users get higher scores in vocabulary tests than non-users in the same class. In Saudi Arabia, 42 low English level university students used Quizlet to learn assigned vocabulary for a month. The experimental group has demonstrated remarkable progress in post-

tests (Sanosi, 2018). Similar to Sanosi's research, Cinar and Ari (2019) found that 35 Turkish secondary Quizlet users outperformed 36 others in vocabulary post-test in a 4-week experiment. Furthermore, the experimental group scored higher than the control group in the retention test four weeks after the experiment. Cinar and Ari (2019) conclude that Quizlet has a significant contribution to their students' vocabulary learning and retention. They further point out that "Quizlet made a significant contribution to students' positive attitudes towards English coursework" (p. 71).

As for the relationship between users' motivation and their use of Quizlet, it is proved positive. Setiawan and Wiedarti (2020) divided 65 Indonesian high students into experiment and control groups in their quasi-experimental research. The students were observed in class and were tested afterwards by the non-parametric Wilcoxon test. The result shows that using Quizlet increases students' motivation on learning vocabulary. Furthermore, the students feel more enthusiastic and do not get bored easily when learning vocabulary on the application. Similarly, Nguyen et al. (2020) concluded from their research findings that 50 Vietnamese freshmen and 50 sophomores felt motivated when using Quizlet. They also claim the participants demonstrated autonomy by spending more time learning vocabulary via Quizlet.

Is Quizlet as helpful in assisting users to learn professional vocabulary as it does in learning general English words? Research conducted by Susila (2023) revealed an average of N-gain score 62.4% in the one group pretest-posttest design. Quizlet aided 26 Indonesian hospitality college students in enhancing their customer service English vocabulary. Valeeva et al. (2019) discovered that Russian university students did better in ecological tests with Quizlet's help. In a course of 17 weeks, sophomores and juniors were asked to learn ESP vocabulary from a career-specific textbook, websites of international environmental organizations and scientific journals. They had access to all the activities in Quizlet after class. In class, the instructor used Quizlet Live, an interactive and collaborative game, to assess the students' ecological terms. Valeeva et al. (2019) reported that "the Fisher angular transformation method have proved the hypothesis on the effectiveness of mobile learning in studying subject-specific vocabulary since the empirical value of the Fisher criterion is consistently higher than the critical value when comparing samples of test results in the experimental and control groups" (p. 924). They also pointed out Quizlet has increased the participants' motivation for learning ESP, improvements in reading comprehension of profession-related topics and active participation in discussions.

Nonetheless, some studies have argued that Quizlet does not contribute to ESP vocabulary gain. Davie and Hilber (2015) asked 26 engineering and 42 business students used Quizlet for 15 weeks to learn vocabulary in their respective fields. The chi-square value of 0.94 on the test results was considered low. They reported that “the use of the Quizlet app made no difference to student performance” (p.77). However, the questionnaire and interviews showed students thought the learning process was positive. Davie and Hilber (2015) noted that technology-assisted learning was a relatively new field then in Germany. They extrapolated that the perceived benefit may be because of a novelty effect.

Okkan and Aydin’s (2020) study was looking at Quizlet’s influence on ESP learners’ motivation. Assigned psychological vocabulary was uploaded to Quizlet by 45 Turkish university students in the *English for Psychology II* course. They then practice the ESP items over the course of 5 weeks. They had English proficiency levels between elementary (A2) and advanced (C1) according to the Common European Framework of Reference for Languages (CEFR). The pre- and post-tests and an adopted questionnaire of Vocabulary Learning Motivation Scale (Ersoy& Boyacı, 2018, cited in Okkan & Aydin, 2020) were used for data collection. Okkan and Aydin observed that the use of Quizlet did not have an effect on intrinsic motivation in vocabulary learning. Instead, the participants were more concerned with rewards from teachers or good test grades. The researchers suggested use reward expectation to motivate the participants extrinsically.

While Quizlet has been seen as a useful tool for learning vocabulary, some studies have presented inconclusive findings in its effectiveness on ESP courses. The researcher extrapolates the language proficiency levels of the learners may be a crucial factor in the incongruous research findings. An ESP course does not aim to prepare learners to master all aspects of the target language itself. Instead, ESP learners need to apply their language abilities to understand career-specific terms or concepts for their future jobs. In other words, they obtain job-ready knowledge or skills through the medium of English, and they need to reach an intermediate or higher language proficiency level (Dudley-Evans, 2001; Dudley-Evans & St John, 1998) to gain ESP vocabulary competently.

Since the Covid pandemic, many educational institutions around the world have resorted to technology for assisting learning. Using Quizlet is one example to offer language learners opportunities by breaking down barriers of location. From the existing literature on the subject and the perceived outcomes of using Quizlet to help dental technology majors learn terminology, the

impact of implementing Quizlet on students' progress and satisfaction need to be explored so that improvements in teaching can be made.

3. Research Methodology

3.1. Scope of the Study

While the effectiveness of using Quizlet in assisting vocabulary learning has been well documented, the impact of using Quizlet on the acquisition of medical terminology of adolescents (age 17-19 years) is poorly understood. In view of this situation, the aim of this study is to report on the following two questions:

- (1) Does the use of Quizlet promote the learning outcomes of dental terminology?
- (2) Do classes hold different perceived benefits of using Quizlet?

The scope of the study will focus on the effectiveness of Quizlet use in learning dental terminology specifically and is restricted to select Quizlet in 2019 version. The study is limited to a five-year junior college located in Taiwan with 100 participants between the ages of 17 and 19. The experiment will last for 8 weeks and will end before the mid-term exam. Furthermore, the study also involves an analysis of the participants' perspectives on their experience in using Quizlet by completing a short questionnaire.

3.2. Setting and Participants

The ESP course, *English for dental technology*, was scheduled for the spring semester of the second academic year. The lecturer who has taught the course over the last 5 years provided the students with handouts in PowerPoint format. He gave a vocabulary quiz at the end of each unit. Students were expected to learn dental terminology in English so that they could read short articles or dental equipment manuals fluently. The classes met once a week during an 18-week semester. Each meeting was 100 minutes. After deducting the mid-term and final weeks, the total class hours were approximately 26.7 hours.

The target population of the research was the second-year dental technology majors. A total of 100 students from two intact classes were recruited for the research. According to the government policy in Taiwan, students study English at school from grade 3, about 8 years old. Hence, the participants have had a considerable hours of general English education. Their English proficiency levels fall between CEFR A1 to B1.

3.3. Research Design

The research design adopted a quasi-experiment to compare the vocabulary learning performance and the participants' perspectives after using Quizlet. The treatment was distributed evenly to both classes (see Table 1). In other words, the treatment class D1 used Quizlet to practice dental terms in units 1 and 2 whereas the control class D2 had no access to Quizlet learning the same terms. Four weeks later, D2 practiced the dental terms in units 3 and 4 on Quizlet, but the control group D1 did not use the application. The lecturer gave a vocabulary quiz, either in a verbal or pen-and-paper form after the completion of each unit. The researcher distributed a questionnaire in class to 100 participants at the end of the experiment to elicit their feedback on using Quizlet.

Table 1 : Research Design

Week	Class D1 (N=54)	Class D2 (N=46)
1 ~ 4	1. Introducing & demonstrating <i>Quizlet</i> to the treatment group 2. Theme: Unit 1 Dental Anatomy Unit 2 Oral Anatomy 3. Material : lecturer's handouts 4. Practice vocabulary with <i>Quizlet</i> 5. Vocabulary quizzes	1. Theme: Unit 1 Dental Anatomy Unit 2 Oral Anatomy 2. Material : lecturer's handouts 3. Practice vocabulary with worksheets 4. Vocabulary quizzes
5 ~ 8	1. Themes: Unit 3 Crown and Bridge Prosthetics Unit 4 Plate Denture Prosthetics 2. Material : lecturer's handouts 3. Practice vocabulary with worksheets 4. Vocabulary quizzes	1. Introducing & demonstrating <i>Quizlet</i> to the treatment group 2. Theme: Unit 3 Crown and Bridge Prosthetics Unit 4 Plate Denture Prosthetics 3. Material : lecturer's handouts 4. Practice vocabulary with <i>Quizlet</i> 5. Vocabulary quizzes

(Source : Author's Own Illustration)

3.4. Data Collection

The quantitative data were collected via vocabulary scores and a questionnaire. Vocabulary scores were compared to evaluate the effectiveness of the intervention. There was a total of 281 dental terms used for the research. D1 practiced 140 terms in units 1 and 2 with the help of Quizlet, whereas D2 used Quizlet to practice 141 terms in units 3 and 4.

A 10-item questionnaire was administered at the end of experiment to gauge the degree of the participants' perceived usefulness of Quizlet in learning dental terminology. The questionnaire was adapted from the technology acceptance model (Davis, 1989), which measures a user's behavioral intention of a technology-empowered device. A six-point Likert scale (strongly disagree = 1, strongly agree = 6) was employed to encourage participants to consider the question more carefully when they felt neutral about it. The reliability of the 10 items was verified by Cronbach's Coefficient Alpha with a value greater than 0.7 ($\alpha = .91$), showing a high level of internal consistency.

3.5. Data Analysis

Eighty-four out of 100 participants returned the questionnaire. The researcher excluded 11 people who did not use Quizlet application at all. In the end, 73 questionnaires were included for analyzing Quizlet experience, of which 43 were from D1 and 30 from D2. The statistical analysis software SPSS was used to analyze data from the questionnaire and the vocabulary scores. Descriptive statistics and Pearson's correlation coefficient (r) were performed to measure the linear correlation between the use of Quizlet and the learning outcomes. The independent t -test was used to determine if classes differed from each other in terms of the satisfactory perception with Quizlet.

4. Results of the Study

RQ1: Does the use of Quizlet promote the learning outcomes of dental terminology?

Because vocabulary tests were part of the course requirements, test scores of all the participants ($N = 100$) were included for data analysis. Descriptive statistics were performed to provide a general understanding how well the two classes performance in vocabulary tests with or without the assistance of Quizlet. We can see from Table 2 that the first two units with Quizlet's help, D1 had a mean of 50.37 ($SD = 32.04$) and 45.93 ($SD = 29.69$) but had lower test scores in the control units 3 ($M = 36.67$, $SD = 27.47$) and 4 ($M = 40.65$, $SD = 27.54$). By comparison, D2 performed worse than D1 in all four units. When they used Quizlet to practice dental terms, the mean score on the test in unit 3 was 27.28 ($SD = 23.18$) while unit 4 was 19.57 ($SD = 20.22$). These unexpected results may be due to the accumulation of difficulties in dental terminology.

Table 2: Means and Standard Deviations of vocabulary test scores in each unit by two classes

Class	Unit 1		Unit 2		Unit 3		Unit 4	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>

D1 (N=54)	50.37	32.04	45.93	29.69	36.67	27.47	40.65	27.54
D2 (N=46)	26.96	23.75	31.30	20.40	27.28	23.18	19.57	20.22

(Source : Author's Own Illustration)

We used a Pearson correlation coefficient to measure the relationship between Quizlet use and vocabulary test scores. Quizlet use was measured based on the completion rate of activities offered by Quizlet. As shown in Table 3 below, there was a positive correlation between the two variables in both classes at the significant level of $p < .01 \sim .05$.

Table 3: Correlations between vocabulary test scores and use of Quizlet

Class	Quizlet use	Unit 1		Unit 2		Unit 3		Unit 4	
		<i>r</i>	<i>sig</i>	<i>r</i>	<i>sig</i>	<i>r</i>	<i>sig</i>	<i>r</i>	<i>sig</i>
D1	Unit 1	.347*	.010	.275*	.045	.365**	.007	.347*	.010
	Unit 2	.357*	.008	.243	.076	.330*	.015	.305*	.025
D2	Unit 3	.376*	.010	.489**	.001	.601**	.000	.496**	.000
	Unit 4	.196	.193	.312*	.035	.443**	.002	.303*	.041

Notes: ** $p < .01$, two-tailed.

* $p < .05$, two-tailed.

(Source : Author's Own Illustration)

RQ2: Do classes hold different perceived benefits of using Quizlet?

Descriptive statistics analysis in Table 4 has indicated that both classes held positive perception towards Quizlet's usefulness. The means ranged from 4.58 in Q5 to 5.17 in Q2. Given that, there was no significant difference between the classes regarding their perceived benefits of using Quizlet.

Table 4: Summary of descriptive statistics and t-value of Quizlet features by two classes

Questions of Usefulness	D1 (N=43)		D2 (N=30)		Difference
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t value</i>
Q1. Using FLASHCARD would be useful to learn dental terms	4.60	1.14	5.10	0.71	-2.286
Q2. Using PRONUNCIATION would be useful to learn dental terms	4.63	1.02	5.17	0.75	-2.599
Q3. Using PICTURE would be useful to learn dental terms	4.91	1.0	5.03	0.72	-.630

Q4. Using MATCH would be useful to learn dental terms	5.02	0.94	5.10	0.71	-.397
Q5. Using GRAVITY would be useful to learn dental terms	4.58	0.96	4.90	0.85	-1.500
Q6. Using TEST would be useful to learn dental terms	4.88	0.91	5.03	0.67	-.812
Q7. Using SPELLING would be useful to learn dental terms	4.77	1.02	4.83	0.87	-.296
Q8. I would find practicing dental terms on Quizlet is more interesting than worksheets	4.81	1.20	5.10	0.71	-.1274
Q9. I think using Quizlet would enable dental terms stay longer in memory	4.84	1.17	4.93	0.74	-.429
Q10. In general, I would find using Quizlet useful to learn dental terms	4.74	0.93	4.80	0.76	-.281
Average	4.78	1.03	5.0	0.75	-1.050

5. Discussions

ESP courses focus on task-specific vocabulary and communication, as a result, a good mastery of vocabulary is essential for ESP learners. *English for dental technology* is an ESP course aimed at delivering dental jargons and fundamental knowledge via the medium of English. To help dental technology students acquire subject-specific vocabulary, we used a digital flashcard app to explore its effectiveness on learning dental terminology. The students perceived the use of Quizlet as beneficial (see Table 4), and there was a positive correlation between frequency of Quizlet use and the acquisition of dental terminology (see Table 2). However, both classes did not perform well in the vocabulary quizzes. The current research findings are in line with previous research conducted by Davie and Hilber (2015). Quizlet didn't really help their participants perform better even though they had a good opinion of it.

We do not fully understand how the students' views on Quizlet impact their willingness to use it. We extrapolate that our participants' low English proficiency levels and low perceived self-efficacy may hinder their willingness to learn 281 dental terms, despite Quizlet's assistance. This is illustrated in the mean scores of each test, with D2 particularly performed badly in unit 4 (M = 19.57). Our second extrapolation is that using Quizlet as part of in-class activity may be an influential factor in performance. Previous findings suggest that including Quizlet as an in-class assessment increases the students' willingness to seek assistance from Quizlet (Valeeva et al.,

2019). Because two meetings were canceled as a result of national holidays, the ESP instructor resorted to leaving Quizlet as an after-class activity. Even though he rewarded students who completed the required activities with extra credit points, the students were not motivated enough to practice the dental terms with Quizlet sufficiently in their spare time.

6. Conclusion

The trends of implementing online applications to promote vocabulary learning are inevitable. Based on the current research findings, Quizlet offers ESP learners a pleasant online learning experience. Its multimedia features give users an interactive and collaborative option to teach or to learn. However, additional research is necessary to comprehend the connection between students' perceptions towards educational apps and their eagerness to use them. Caution is advised when extrapolating the present results to other ESP programs. The findings are restricted only to teenaged learners of the dental technology field and may not be extrapolated to other populations.

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