

Using Quizlet to Enhance Technical English Vocabulary among Undergraduate Physics Students

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Abstract

Mastery of technical English vocabulary is essential for undergraduate physics students because it enables them to comprehend scientific literature, laboratory manuals, and other academic resources written in English. However, many students experience difficulties in learning and retaining technical vocabulary through conventional teaching methods. This study aimed to investigate the effectiveness of Quizlet in enhancing undergraduate physics students' mastery of technical English vocabulary. A quantitative pre-experimental design employing a one-group pre-test-post-test approach was used. The participants were 15 undergraduate students from the Physics Study Program at Institut Sains dan Kependidikan (ISDIK) Kie Raha, selected through purposive sampling. Data were collected using a 30-item multiple-choice technical vocabulary test administered before and after the implementation of Quizlet. The treatment was conducted over three meetings consisting of a pre-test, Quizlet-assisted vocabulary instruction, and a post-test. The data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, and a paired-samples t-test. The findings revealed that the mean score increased from 62.45 in the pre-test to 75.29 in the post-test. The paired-samples t-test indicated a statistically significant improvement in students' technical English vocabulary mastery. These findings suggest that Quizlet is an effective digital learning platform for supporting technical vocabulary acquisition in English for Specific Purposes (ESP) courses, particularly for undergraduate physics students.

Keywords: Quizlet, Technical vocabulary, English for specific purposes, Paired-sample T-Test

1 Introduction

English plays a vital role in higher education, particularly in science and technology, where it functions as the primary language for accessing academic knowledge, conducting research, and communicating scientific findings. Most textbooks, research articles, laboratory manuals, conference proceedings, and online learning resources in physics are published in English. Consequently, undergraduate physics students are expected to possess sufficient English proficiency to understand scientific concepts, interpret technical information, and participate in academic and professional communication. In this context, English learning at the university level should

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not only develop general language proficiency but also strengthen students' mastery of technical English vocabulary that is relevant to their discipline (Basturkmen, 2024).

Vocabulary mastery is widely acknowledged as one of the most fundamental components of language learning. Vocabulary knowledge supports learners in comprehending spoken and written texts, expressing ideas accurately, and developing the four essential language skills: listening, speaking, reading, and writing (Nation, 2013; Webb & Nation, 2017). Without sufficient vocabulary, learners often experience difficulties understanding academic materials and communicating effectively. In English for Specific Purposes (ESP), vocabulary instruction becomes even more important because students are required to acquire discipline-specific terminology that enables them to function successfully in their academic fields (Alqahtani, 2015; Basturkmen, 2024).

For undergraduate physics students, technical English vocabulary constitutes an essential component of academic success. Scientific terms such as *acceleration*, *momentum*, *electromagnetic induction*, *kinetic energy*, *velocity*, and *wave propagation* frequently appear in textbooks, laboratory instructions, journal articles, and scientific presentations. Mastering these terms allows students to understand scientific literature more effectively and communicate scientific ideas accurately. Coxhead (2000) emphasized that academic vocabulary is indispensable for students in higher education because it facilitates comprehension of discipline-specific texts and academic discourse.

However, mastering technical English vocabulary remains a significant challenge for many physics students. Based on the researcher's classroom observations while teaching English to undergraduate students in the Physics Study Program, several learning difficulties were identified. Many students struggled to recognize and understand technical English terms encountered in reading passages and scientific materials. During classroom discussions, students frequently relied on direct translation applications to interpret unfamiliar words instead of inferring meaning from context. When asked to explain scientific concepts in English, many students demonstrated limited vocabulary knowledge and lacked confidence in using appropriate technical terminology. Furthermore, students often forgot newly learned vocabulary after classroom instruction because they had limited opportunities to review and practice the words independently. These observations indicate that conventional vocabulary instruction, which mainly relies on teacher explanation and word memorization, has not yet provided sufficient support for long-term vocabulary retention.

The rapid advancement of educational technology has transformed English language learning by providing students with more flexible, interactive, and autonomous learning opportunities. Digital learning applications encourage students to engage in repeated practice, receive immediate feedback, and monitor their own learning progress. Such technology-based instruction is particularly relevant for vocabulary learning because repeated exposure and retrieval practice are essential for strengthening lexical knowledge and long-term memory (Nation, 2013).

One digital learning platform that has gained considerable attention in vocabulary instruction is Quizlet. Quizlet offers multiple learning modes, including digital flashcards, Learn, Match, Test, and Spell, enabling learners to study vocabulary through interactive and engaging activities. The application incorporates gamification features that increase learner motivation while promoting repeated retrieval of vocabulary items. In addition, Quizlet supports mobile

learning, allowing students to review vocabulary anytime and anywhere according to their individual learning pace. These characteristics make Quizlet a promising instructional tool for English vocabulary learning in higher education.

The effectiveness of Quizlet is supported by several learning theories. Nation (2013) argued that vocabulary mastery develops through repeated encounters with words in meaningful contexts. Similarly, Retrieval Practice Theory explains that actively recalling previously learned information significantly improves long-term memory compared with passive review. Furthermore, Spaced Repetition Theory suggests that reviewing vocabulary at gradually increasing intervals reduces forgetting and enhances vocabulary retention. Quizlet integrates these principles by providing repeated vocabulary practice through various learning activities. In addition, Mayer's (2021) Cognitive Theory of Multimedia Learning proposes that learners understand information more effectively when verbal explanations are combined with visual representations and audio input. Quizlet accommodates these principles by integrating text, pronunciation audio, and images into vocabulary learning activities.

Previous studies have demonstrated the positive contribution of Quizlet to vocabulary learning in English as a Foreign Language (EFL) contexts. Ho and Kawaguchi (2021) reported that Quizlet significantly improved learners' receptive vocabulary knowledge compared with conventional learning methods. Nguyen (2022) found that Quizlet enhanced vocabulary retention because learners were able to review vocabulary repeatedly outside the classroom. More recently, a systematic review by Özdemir et al. (2024) concluded that Quizlet positively influences vocabulary achievement, learner motivation, engagement, and autonomous learning across different educational settings.

Although previous studies have confirmed the effectiveness of Quizlet, most research has concentrated on general English vocabulary among secondary school students or English-major students. Research investigating Quizlet for developing technical English vocabulary within English for Specific Purposes (ESP), particularly among undergraduate physics students, remains limited. In addition, few studies have incorporated lecturers' classroom observations as empirical evidence to explain the practical need for technology-supported vocabulary instruction in science education. Therefore, further investigation is needed to examine whether Quizlet can effectively improve technical English vocabulary mastery among undergraduate physics students.

Based on the background and research gap identified in this study, the present research seeks to investigate the effectiveness of Quizlet in enhancing technical English vocabulary mastery among undergraduate physics students. Specifically, this study addresses the following research question: To what extent does the use of Quizlet enhance technical English vocabulary mastery among undergraduate physics students? Accordingly, the primary objective of this study is to examine whether the integration of Quizlet as a digital vocabulary learning platform significantly improves undergraduate physics students' mastery of technical English vocabulary. Furthermore, this study aims to provide empirical evidence regarding the effectiveness of Quizlet in supporting English for Specific Purposes (ESP) instruction and to offer practical insights for English lecturers in integrating digital learning technologies into vocabulary instruction for science students.

2 Methods

This study employed a quantitative approach using a pre-experimental research design with a one-group pre-test–post-test design. This design was selected because it enables the researcher to examine the effectiveness of Quizlet in enhancing undergraduate physics students' technical English vocabulary mastery by comparing their vocabulary achievement before and after the implementation of the treatment. The design involved three stages: administering a pre-test (O_1), implementing Quizlet as the instructional treatment (X), and administering a post-test (O_2). The research design can be illustrated as follows¹:

$$O_1 - X - O_2$$

The population of this study consisted of all undergraduate students enrolled in the Physics Study Program at Institut Sains dan Kependidikan (ISDIK) Kie Raha during the 2025/2026 academic year. Since the research was conducted in one class of students taking the English course, a purposive sampling technique was employed. Purposive sampling was considered appropriate because the selected participants met the predetermined criteria, namely being enrolled in the English course for physics students and having limited experience in learning technical English vocabulary through digital learning applications. The sample consisted of 15 undergraduate physics students who voluntarily participated in the study.

The instrument used in this research was a technical English vocabulary test developed by the researcher based on the learning outcomes of the English course and the technical terminology commonly encountered in introductory physics topics. The test consisted of 30 multiple-choice questions covering vocabulary related to mechanics, motion, force, energy, electricity, magnetism, waves, and thermodynamics.

The data were collected in three consecutive meetings. In the first meeting, a pre-test consisting of 30 multiple-choice questions was administered to assess the students' initial technical English vocabulary mastery. The second meeting was dedicated to the treatment, during which the researcher implemented Quizlet as the instructional media. Students learned and practiced technical English vocabulary through Quizlet features, including Flashcards, Learn, Match, and Test, under the researcher's guidance. In the third meeting, a post-test with the same specifications as the pre-test was administered to measure students' technical English vocabulary mastery after the treatment.

The data obtained from the pre-test and post-test were analyzed using IBM SPSS Statistics. Descriptive statistics, including the mean, standard deviation, minimum score, and maximum score, were calculated to describe the students' technical English vocabulary mastery before and after the implementation of Quizlet.

¹O represents observations (pretest and posttest, respectively), while X represents the implementation of the Quizlet as the learning media.

3 Results

3.1 Students' Technical English Vocabulary Mastery Before and After the Implementation of Quizlet

To examine the effectiveness of Quizlet in enhancing undergraduate physics students' technical English vocabulary mastery, a pre-test was administered before the treatment, followed by a post-test after the implementation of Quizlet. The descriptive statistics of the students' vocabulary scores are presented in Table 1.

Table 1: Descriptive Statistics of Students' Technical English Vocabulary Scores

Test	N	Total Score	Mean	Minimum	Maximum	Passed	Failed
Pre-test	15	936.8	62.45	23.3	90.0	3 (20.00%)	12 (80.00%)
Post-test	15	1129.3	75.29	60.0	93.3	13 (86.67%)	2 (13.33%)

As presented in Table 1, the students' technical English vocabulary mastery improved after the implementation of Quizlet. Before the treatment, the participants obtained a total score of 936.8 with a mean score of 62.45, which was below the minimum passing score of 70. Only three students (20.00%) achieved the passing criterion, while twelve students (80.00%) failed to meet the required standard. The students' scores ranged from 23.3 to 90.0, indicating considerable variation in their initial vocabulary mastery.

Following the implementation of Quizlet, the students' performance showed noticeable improvement. The total score increased to 1129.3, and the mean score rose to 75.29, exceeding the minimum passing score. The number of students who achieved the passing criterion increased substantially from 3 students (20.00%) to 13 students (86.67%), whereas only 2 students (13.33%) remained below the passing score. In addition, the minimum score improved from 23.3 in the pre-test to 60.0 in the post-test, while the maximum score increased slightly from 90.0 to 93.3.

Overall, the descriptive findings indicate that the implementation of Quizlet was followed by an improvement in students' technical English vocabulary mastery. The increase in the mean score by 12.84 points, together with the higher percentage of students who met the passing criterion, suggests that Quizlet contributed positively to the students' acquisition of technical English vocabulary. However, inferential statistical analysis was conducted to determine whether the observed improvement was statistically significant.

3.2 Results of the Normality Test

Before testing the research hypothesis, the normality of the data was examined using the Shapiro-Wilk test because the sample size consisted of fewer than 50 participants ($N = 15$). The results of the normality test are presented in Table 2.

As shown in Table 2, the significance values of the pre-test ($p = .120$) and the post-test ($p = .321$) were both greater than the significance level of .05. Therefore, the pre-test and post-test scores were normally distributed. Since the assumption of normality was satisfied, a paired-samples t-test was conducted to determine whether the implementation of Quizlet significantly

Table 2: Results of the Shapiro–Wilk Normality Test

Statistic	df	Sig.
0.907	15	.120
0.935	15	.321

improved the students' technical English vocabulary mastery.

3.3 Results of the Hypothesis Testing

A paired-samples t-test was performed to compare the students' technical English vocabulary mastery before and after the implementation of Quizlet. The results are presented in Table 3.

Table 3: Results of the Paired-Samples T-test

Mean Difference	Std. Deviation	t	df	Sig. (2-tailed)
12.83	9.89	5.025	14	<.001

Table 3 indicates that there was a statistically significant difference between the students' pre-test and post-test scores. The paired-samples t-test revealed a t value of 5.025 with 14 degrees of freedom, and the significance value was $p < .001$, which was lower than the predetermined significance level of .05. Therefore, the null hypothesis (H_0) was rejected, while the alternative hypothesis (H_1) was accepted.

These findings demonstrate that the implementation of Quizlet significantly improved the technical English vocabulary mastery of undergraduate physics students. The students' mean score increased from 62.45 in the pre-test to 75.29 in the post-test, with a mean improvement of 12.83 points. Furthermore, the percentage of students who achieved the minimum passing score increased substantially from 20.00% before the treatment to 86.67% after the treatment. These results provide empirical evidence that Quizlet was effective in supporting students' acquisition of technical English vocabulary in the context of English for Specific Purposes (ESP).

4 Discussion

The findings of this study indicate that the implementation of Quizlet improved undergraduate physics students' technical English vocabulary mastery. This improvement was reflected in the increase in the mean score from 62.45 on the pre-test to 75.29 on the post-test. Furthermore, the percentage of students who achieved the minimum passing score increased substantially from 20.00% before the treatment to 86.67% after the treatment. These findings suggest that Quizlet facilitated students' acquisition of technical English vocabulary by providing opportunities for repeated practice and active engagement with discipline-specific terminology.

One possible explanation for these findings is the interactive nature of Quizlet. During the treatment, students were able to learn vocabulary through various learning modes, including Flashcards, Learn, Match, and Test. These activities encouraged students to review technical vocabulary repeatedly while receiving immediate feedback on their responses. Such learning experiences differ from conventional vocabulary instruction, which often emphasizes memorization

and teacher explanation without sufficient opportunities for independent practice. Consequently, the students became more familiar with technical English terms commonly used in physics and demonstrated better vocabulary performance after the treatment.

The findings are consistent with Nation's (2013) theory of vocabulary learning, which emphasizes that vocabulary mastery develops through repeated exposure, deliberate learning, and meaningful use. According to Nation, learners need multiple encounters with new words in different contexts before they can fully understand and retain them. Quizlet provides this repeated exposure by allowing learners to review vocabulary several times through different learning activities. This repeated interaction with technical vocabulary may explain the improvement observed in the students' vocabulary mastery.

The present findings also support Retrieval Practice Theory, which argues that actively recalling information from memory strengthens long-term retention more effectively than passive review (Karpicke & Blunt, 2011). Rather than simply rereading vocabulary lists, students using Quizlet were required to retrieve word meanings repeatedly through quizzes, matching activities, and self-assessment. This active retrieval process likely enhanced memory consolidation and enabled students to recall technical vocabulary more accurately during the post-test.

Another theoretical perspective supporting the findings is Spaced Repetition Theory. Quizlet encourages learners to review vocabulary at different intervals, reducing forgetting and strengthening long-term memory (Karpicke & Blunt, 2011; Wilkins, 1972). Although the treatment in this study was conducted over three meetings, students were encouraged to revisit the vocabulary independently using the Quizlet application outside the classroom. Such repeated review may have contributed to the improvement in their vocabulary mastery.

The findings are further supported by Mayer's (2021) Cognitive Theory of Multimedia Learning, which explains that learning becomes more meaningful when verbal and visual information are processed simultaneously. Quizlet combines written vocabulary, pronunciation audio and interactive activities within a single learning platform. This multimedia environment enables learners to process vocabulary through multiple cognitive channels, thereby facilitating comprehension and retention of technical English vocabulary.

The findings of the present study are consistent with previous research reporting the positive effects of Quizlet on vocabulary learning. Ho and Kawaguchi (2021) found that Quizlet significantly improved EFL learners' receptive vocabulary knowledge by providing repeated exposure to target vocabulary through digital flashcards and interactive learning activities. Similarly, Nguyen (2022) reported that students who used Quizlet demonstrated better vocabulary retention because the platform enabled them to review learning materials independently both inside and outside the classroom.

More recent evidence also supports the findings of this study. A systematic review and meta-analysis by Özdemir et al. (2024) concluded that Quizlet has a positive impact on vocabulary achievement, learner engagement, motivation, and autonomous learning across different educational contexts. These findings suggest that Quizlet is not only an effective vocabulary learning application but also a tool that encourages students to take greater responsibility for their own learning.

Despite these similarities, the present study contributes to the existing literature by focus-

ing on technical English vocabulary in an English for Specific Purposes (ESP) context. Most previous studies have examined general English vocabulary among secondary school students or English-major students. In contrast, this study investigated undergraduate physics students who require technical English vocabulary to understand scientific texts, laboratory instructions, and academic literature related to physics. Therefore, the present findings extend previous research by demonstrating that Quizlet can also support discipline-specific vocabulary learning in higher education.

5 Conclusion and Recommendation

This study aimed to investigate whether the use of Quizlet could enhance the technical English vocabulary mastery of undergraduate physics students. Based on the findings, it can be concluded that the implementation of Quizlet improved the students' technical English vocabulary mastery. This improvement was evidenced by the increase in the students' mean score from 62.45 in the pre-test to 75.29 in the post-test, as well as the substantial increase in the percentage of students who achieved the minimum passing score after the treatment. These findings answer the research question by demonstrating that Quizlet is an effective digital learning platform for improving technical English vocabulary in an English for Specific Purposes (ESP) context. The interactive features of Quizlet, such as Flashcards, Learn, Match, and Test, provided students with opportunities for repeated practice, active engagement, and independent learning, which contributed to better vocabulary acquisition and retention.

Based on the findings of this study, English lecturers, particularly those teaching English for Specific Purposes (ESP), are encouraged to integrate Quizlet into vocabulary instruction to provide students with more interactive and autonomous learning experiences. Students are also encouraged to use Quizlet regularly outside the classroom to reinforce their understanding and retention of technical English vocabulary.

For future researchers, it is recommended to conduct studies with larger and more diverse samples involving students from different universities and academic disciplines. Future research should also employ quasi-experimental or true experimental designs with control groups to provide stronger evidence of the effectiveness of Quizlet. In addition, longer treatment periods and follow-up assessments are recommended to examine the long-term retention of technical English vocabulary. Researchers may also compare Quizlet with other digital vocabulary learning platforms to identify the most effective technology for supporting vocabulary learning in English for Specific Purposes (ESP).

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