

## Wayground-Based Learning for ESP: Improving Chemistry Students' English Vocabulary and Learning Motivation

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### Abstract

Vocabulary mastery remains one of the most persistent obstacles for students learning English for Specific Purposes (ESP) in technical fields such as Chemistry, where dense, Latinate terminology and low intrinsic motivation frequently discourage active engagement. This study investigated the effect of Wayground (formerly Quizizz), a gamified digital learning platform, on the English vocabulary achievement and learning motivation of first-year Chemistry students enrolled in an ESP course. A quasi-experimental design with a non-equivalent control group was employed, involving 29 students divided into an experimental group 15 students, taught chemistry-related vocabulary through Wayground-based quizzes and games, and a control group 14 students, taught through conventional print-based drills. Data were collected using a vocabulary achievement test and a learning motivation questionnaire adapted from the ARCS (Attention, Relevance, Confidence, Satisfaction) model, administered as pretest and post-test. The results of independent-sample and paired-sample t-tests revealed that the experimental group achieved significantly higher vocabulary post-test scores ( $M = 79.6$ ,  $SD = 6.5$ ) than the control group ( $M = 65.3$ ,  $SD = 7.9$ ),  $t(27) = 6.10$ ,  $p < .001$ , with a large effect size ( $d = 1.85$ ). Learning motivation also increased more substantially in the experimental group, particularly in the Attention and Satisfaction dimensions. These findings suggest that Wayground's game-based, immediate-feedback features can meaningfully enhance both lexical acquisition and affective engagement among ESP learners in technical disciplines, and they offer pedagogical implications for integrating gamified platforms into ESP vocabulary instruction.

**Keywords:** Wayground, Gamification, ESP Vocabulary, Learning Motivation, Chemistry Education

### Abstrak

Penguasaan kosakata masih menjadi salah satu kendala paling mendasar bagi mahasiswa yang mempelajari English for Specific Purposes (ESP) di bidang teknis seperti Kimia, di mana istilah-istilah berbahasa Latin yang padat serta motivasi intrinsik yang rendah kerap menghambat keterlibatan aktif mahasiswa. Penelitian ini mengkaji pengaruh Wayground (sebelumnya bernama Quizizz), sebuah

platform pembelajaran digital berbasis gamifikasi, terhadap penguasaan kosakata bahasa Inggris dan motivasi belajar mahasiswa Kimia tingkat pertama yang mengikuti mata kuliah ESP. Penelitian ini menggunakan desain kuasi-eksperimen dengan kelompok kontrol non-ekuivalen, melibatkan 29 mahasiswa yang terbagi menjadi kelompok eksperimen ( $n = 15$ ), yang diajarkan kosakata terkait kimia melalui kuis dan permainan berbasis Wayground, dan kelompok kontrol ( $n = 14$ ), yang diajarkan melalui latihan berbasis cetak konvensional. Data dikumpulkan menggunakan tes penguasaan kosakata dan kuesioner motivasi belajar yang diadaptasi dari model ARCS (Attention, Relevance, Confidence, Satisfaction), yang diberikan sebagai pretest dan post-test. Hasil uji-t sampel independen dan sampel berpasangan menunjukkan bahwa kelompok eksperimen memperoleh skor post-test kosakata yang secara signifikan lebih tinggi ( $M = 79,6$ ,  $SD = 6,5$ ) dibandingkan kelompok kontrol ( $M = 65,3$ ,  $SD = 7,9$ ),  $t(27) = 6,10$ ,  $p < 0,001$ , dengan ukuran efek yang besar ( $d = 1,85$ ). Motivasi belajar juga meningkat lebih signifikan pada kelompok eksperimen, terutama pada dimensi Attention dan Satisfaction. Temuan ini menunjukkan bahwa fitur berbasis permainan dan umpan balik langsung dari Wayground dapat secara signifikan meningkatkan penguasaan leksikal sekaligus keterlibatan afektif mahasiswa ESP di bidang teknis, serta menawarkan implikasi pedagogis bagi pengintegrasian platform gamifikasi dalam pembelajaran kosakata ESP.

**Kata kunci:** *Wayground, Gamifikasi, Kosakata ESP, Motivasi Belajar, Pendidikan Kimia*

## INTRODUCTION

English for Specific Purposes (ESP) instruction in science and technical disciplines is distinguished by a heavy reliance on discipline-specific lexis, much of which is Greco-Latinate, polysyllabic, and semantically opaque to learners without prior exposure (Coxhead, 2026). For Chemistry students, mastering terms such as "covalent," "stoichiometry," or "precipitate" is not merely a linguistic exercise but a prerequisite for comprehending laboratory manuals, international journal articles, and safety documentation written in English (Hyland, 2022). Vocabulary knowledge is widely regarded as the single most important building block of second language proficiency, since without an adequate lexical repertoire, learners cannot process input or produce meaningful output regardless of their grammatical competence (ALQAHTANI, 2015). Yet vocabulary instruction in ESP classrooms is frequently reduced to rote memorization of glossaries, a method that tends to produce short-term retention rather than durable, retrievable word knowledge (Zou et al., 2021).

Compounding this lexical challenge is the issue of learning motivation. Chemistry students typically enroll in ESP courses as a compulsory general-education requirement rather than out of genuine interest in the English language itself, which often results in low intrinsic motivation and superficial engagement with instructional materials (Zoltan Dörnyei, 2001). Motivation theory in second language acquisition has long emphasized that learners' willingness to invest effort in language learning is shaped by their perceived relevance of the task, their confidence in succeeding, and the

satisfaction they derive from the learning experience (Gardner, 1986). When ESP materials are decontextualized from students' professional interests or presented through monotonous, unidirectional methods, motivation tends to decline, which in turn undermines vocabulary retention and classroom participation (Basturkmen, 2019).

Gamification has emerged as a promising pedagogical response to these twin challenges of lexical difficulty and low motivation. By embedding learning content within game mechanics such as points, timers, leaderboards, and instant feedback, gamified platforms are theorized to increase learners' attention, sustain engagement, and lower the affective barriers associated with error-making in front of peers (Zainuddin et al., 2020; Wang & Tahir, 2020). Among the many gamified quiz platforms used in language classrooms, Wayground, the platform formerly known as Quizizz, has become one of the most widely adopted tools worldwide, now used in more than 150 countries and by the majority of schools in the United States (Wayground, 2025). Following its 2025 rebranding, Wayground expanded beyond simple quizzes into a broader supplemental learning suite that includes AI-assisted content generation, lesson bundles, and adaptive accommodations, while retaining its core game-based quiz engine that allows teachers to deliver vocabulary items as timed, self-paced, competitive activities accessible through students' own devices (Wayground, 2025). Learners join sessions using a simple access code, answer multiple-choice or matching items styled as a game show, and receive immediate scoring, which prior research on similar platforms such as Kahoot! has associated with reduced classroom anxiety and improved short-term vocabulary recall (Licorish et al., 2018).

Despite the growing popularity of gamified quiz platforms in general English classrooms, empirical evidence on their effectiveness within ESP contexts for technical majors such as Chemistry remains limited. Existing gamification studies have predominantly examined general English or EFL learners (Wang & Tahir, 2020), leaving the specific interaction between discipline-specific vocabulary demands and gamified instruction underexplored. Moreover, most prior studies on Quizizz/Wayground have measured either achievement or motivation in isolation, rather than examining both outcomes concurrently within a single ESP intervention (Zainuddin et al., 2020). This gap is particularly consequential for Chemistry ESP, where the combination of unfamiliar terminology and low affective investment may interact in ways that a generic EFL classroom does not replicate.

In the Indonesian polytechnic context specifically, a related line of studies has begun to document both the affective and technological dimensions of ESP vocabulary learning. (Yuliyanti & Romadhon, 2025) found that ESP students across Business Digital, Cyber Security, and Tax Accounting majors at a Banten polytechnic predominantly experienced average-to-high levels of foreign language anxiety, with communication apprehension and fear of negative evaluation identified as the most salient contributors to learning difficulty, and with Business Digital students reporting the highest overall anxiety due to fear of peer ridicule during speaking activities. Complementing this affective picture,

(Romadhon & Yuliyanti, 2025) reported that first-year Diploma students at the same type of institution generally appreciated an AI chatbot for reinforcing the retention of business-related vocabulary through flexible, low-stakes independent practice, although students also expressed a need for richer contextual explanations and greater feature accessibility. In a related study, Romadhon and Yuliyanti (2026) (Romadhon & Yuliyanti, 2026) further demonstrated that authentic digital media, such as technology-focused YouTube discourse, could effectively bridge classroom ESP instruction and real-world professional communication for IT-oriented learners when incorporated through structured pre-viewing, while-viewing, and post-viewing activities. Taken together, these studies suggest that Indonesian polytechnic ESP learners can benefit from technology-mediated vocabulary interventions, yet they also point to a persistent, unresolved need for tools that combine engaging, low-anxiety delivery with sufficient contextual scaffolding, a gap that gamified platforms such as Wayground, with their game-based feedback and low-stakes repeated practice format, may be well positioned to address for technical majors such as Chemistry.

This study therefore aims to examine the effect of Wayground-based learning on English vocabulary achievement and learning motivation of Chemistry students enrolled in an ESP course. By comparing an experimental group taught through Wayground-based gamified activities with a control group taught through conventional drilling methods, this research seeks to provide empirical evidence on whether, and to what extent, a widely available gamified platform can address the specific lexical and motivational challenges faced by ESP learners in technical science disciplines. The findings are expected to contribute to the growing literature on technology-enhanced ESP instruction and to offer practical guidance for ESP practitioners considering the adoption of gamified platforms such as Wayground in their vocabulary teaching.

## **RESEARCH METHOD**

This study employed a quasi-experimental design with a non-equivalent control group, pretest-post-test format (Creswell, 2023). This design was selected because random assignment of students to intact classes was not feasible within the institution's academic scheduling, while the pretest-post-test structure allowed the researchers to statistically control for pre-existing differences between groups before evaluating the effect of the intervention.

### **Participants**

The participants were 29 first-year students enrolled in an ESP course at a university in Banten, Indonesia drawn from two intact Chemistry-related study program classes and assigned purposively (Palinkas et al., 1968) to an experimental group 15 and control group 14. Both groups had received at least one prior semester of general English instruction and were enrolled in the same ESP curriculum, ensuring comparable baseline exposure to English instruction prior to the intervention.

## **Instruments and Procedure**

Two instruments were used. First, a vocabulary achievement test consisting of 30 multiple-choice and matching items covering chemistry-related English terms (e.g., element names, laboratory equipment, chemical processes) was developed based on the course syllabus and validated through expert judgment and a pilot test (Cronbach's  $\alpha = .84$ ). Second, a learning motivation questionnaire comprising 20 items on a 5-point Likert scale was adapted from Keller's (2010) ARCS model, covering four dimensions: Attention, Relevance, Confidence, and Satisfaction (Cronbach's  $\alpha = .88$ ). Both instruments were administered as a pretest before the treatment and a post-test after the treatment, following procedures for cross-cultural instrument translation and administration recommended by (Behr & Shishido, 2016) and distributed online through Google Forms (Evans & Mathur, 2005).

The intervention lasted six weeks. The experimental group received chemistry-vocabulary instruction through Wayground, in which the instructor delivered weekly gamified quizzes, matching games, and flashcard-style review sessions accessed by students via a join code on their own devices, with immediate score feedback and a class leaderboard displayed after each session. The control group covered the same vocabulary items and weekly schedule but through conventional paper-based drills, glossary memorization, and teacher-led question-and-answer review without any digital gamification component. Both groups were taught by instructors with comparable teaching experience, and lesson duration, vocabulary items, and assessment content were held constant across groups to isolate the effect of the delivery method.

## **Data Analysis**

Data were analyzed using IBM SPSS version 25.0. Descriptive statistics (means and standard deviations) were computed for both instruments at pretest and post-test. Paired-sample t-tests were used to examine within-group gains from pretest to post-test, while independent-sample t-tests were used to compare the experimental and control groups' post-test scores. Effect sizes were calculated using Cohen's  $d$  to determine the practical magnitude of the observed differences. Given the relatively small sample size in each group, normality (Shapiro-Wilk) and homogeneity of variance (Levene's test) assumptions were checked prior to hypothesis testing and were satisfied for both variables.

## **RESULTS AND DISCUSSION**

### **Vocabulary Achievement**

The data took from both experimental and control group. Table 1 presents the descriptive statistics for the vocabulary achievement test. At pretest, the experimental and control groups showed comparable mean scores, confirming that the two groups began the intervention at a similar level of

chemistry-related English vocabulary knowledge. Following the six-week intervention, the experimental group's mean score increased markedly, exceeding the gain observed in the control group.

Table 1

Vocabulary Achievement Test

| Group                    | N  | Pretest M (SD) | Post-test M (SD) | Gain |
|--------------------------|----|----------------|------------------|------|
| Experimental (Wayground) | 15 | 58.4 (8.2)     | 79.6 (6.5)       | 21.2 |
| Control (Conventional)   | 14 | 57.9 (7.6)     | 65.3 (7.9)       | 7.4  |

Based on table 1, an independent-sample t-test on pretest scores confirmed no significant difference between groups prior to treatment,  $t(27) = 0.22$ ,  $p = .83$ , indicating baseline equivalence. A paired-sample t-test showed a statistically significant increase from pretest to post-test in both the experimental group,  $t(14) = 11.20$ ,  $p < .001$ , and the control group,  $t(13) = 5.40$ ,  $p < .001$ , indicating that both instructional approaches produced vocabulary gains. However, an independent-sample t-test on post-test scores revealed that the experimental group significantly outperformed the control group,  $t(27) = 6.10$ ,  $p < .001$ , with a large effect size (Cohen's  $d = 1.85$ ), indicating that the magnitude of improvement attributable to Wayground-based instruction was substantially greater than that produced by conventional drilling.

This finding is consistent with prior research indicating that digital game-based vocabulary learning tends to outperform traditional rote methods due to the repeated, low-stakes retrieval practice, immediate feedback, and increased exposure frequency that gamified platforms provide (Nation, 2013). The competitive and time-pressured format of Wayground quizzes may have encouraged students to engage in more frequent retrieval attempts than static glossary memorization allows, a mechanism consistent with the testing effect described in vocabulary acquisition research (Zou et al., 2021). Furthermore, because Wayground allows learners to use their own devices and receive instant scoring without direct public correction by the teacher, students may have felt less apprehensive about making errors, aligning with earlier findings that gamified quiz platforms can reduce the fear of negative evaluation that commonly inhibits participation in language classrooms (HORWITZ et al., 1986). Given the modest sample size of this study, these results should nonetheless be interpreted as preliminary evidence warranting confirmation with a larger cohort.

## Learning Motivation

Besides its impact on the cognitive aspect of vocabulary mastery, the Wayground-based instructional intervention was also expected to influence students' affective dimension, namely learning motivation. This is important to examine given that the significant vocabulary gains shown in Table 1 do not necessarily guarantee students' emotional and psychological engagement throughout the learning process. To measure this dimension, students' learning motivation was analyzed using a questionnaire

based on the ARCS model (Attention, Relevance, Confidence, Satisfaction), which allowed the researcher to identify in greater detail which motivational components were most affected by the use of the gamified learning medium. The descriptive results of this measurement are presented in Table 2. Both groups reported comparable motivation levels at pretest, but the experimental group demonstrated a considerably larger increase at post-test, particularly within the Attention and Satisfaction dimensions.

Table 2  
ARCS-based motivation questionnaire

| Group                    | N  | Pretest M (SD) | Post-test M (SD) |
|--------------------------|----|----------------|------------------|
| Experimental (Wayground) | 15 | 3.10 (0.42)    | 4.02 (0.35)      |
| Control (Conventional)   | 14 | 3.05 (0.40)    | 3.28 (0.44)      |

In table 2, an independent-sample t-test on post-test motivation scores showed a statistically significant difference favouring the experimental group,  $t(27) = 5.20$ ,  $p < .001$ , with a large effect size (Cohen's  $d = 1.60$ ). Item-level analysis indicated that the largest gains for the experimental group occurred in items related to Attention (e.g., enjoyment of the lesson format) and Satisfaction (e.g., feeling a sense of accomplishment after quizzes), while gains in Confidence were comparatively modest, suggesting that although students found Wayground-based lessons more enjoyable and rewarding, some residual anxiety about their English proficiency in a technical field persisted.

These results align with self-determination theory, which posits that learning environments supporting competence and enjoyment tend to foster more autonomous, sustained motivation than environments relying on repetitive, teacher-controlled drills (Deci & Ryan, 2000). The leaderboard and scoring features of Wayground likely satisfied students' need for competence by providing visible markers of progress, while the game-like interface addressed the relevance dimension of the ARCS model by framing vocabulary practice as an engaging activity rather than an obligatory task (Keller, 1987). The comparatively smaller gain in the Confidence dimension mirrors findings from ESP anxiety research suggesting that fear of negative evaluation in technical, high-stakes fields is not fully resolved by gamification alone and may require complementary strategies such as scaffolded speaking practice or explicit correction feedback (Dewaele & Dewaele, 2020; Kabic, 2022). This pattern is also consistent with Yuliyanti and Romadhon's (2025) finding that Indonesian polytechnic ESP students in technical majors continue to report communication apprehension and fear of negative evaluation as persistent anxiety sources even at an overall average anxiety level, suggesting that these affective barriers are somewhat independent of the instructional medium used and may require attention beyond gamified vocabulary practice alone.

Taken together, the findings suggest that Wayground-based learning offers a dual benefit for ESP instruction in technical disciplines: it improves discipline-specific vocabulary achievement more effectively than conventional drilling, and it enhances learners' motivation, particularly their attention

and satisfaction, though not uniformly across all motivational dimensions. Because the sample in this study was limited to 29 students across two intact classes, these findings should be regarded as an initial indication rather than a generalizable conclusion, and they support the broader argument that gamified digital tools should not be viewed as a replacement for structured ESP pedagogy but as a complementary strategy that can be integrated alongside explicit vocabulary instruction and confidence-building activities to maximize their pedagogical value (Zainuddin et al., 2020).

## CONCLUSION

This study examined the effect of Wayground-based gamified learning on the English vocabulary achievement and learning motivation of Chemistry students in an ESP course, involving 29 students (15 in the experimental group and 14 in the control group). The results demonstrated that students taught through Wayground achieved significantly higher vocabulary post-test scores and reported greater increases in learning motivation, particularly in the Attention and Satisfaction dimensions, compared to students taught through conventional drilling methods. These findings indicate that gamified quiz platforms such as Wayground can serve as an effective supplementary tool for teaching discipline-specific vocabulary in technical ESP contexts, by providing frequent low-stakes retrieval practice, immediate feedback, and an engaging, competitive learning format. However, the relatively modest gain observed in the Confidence dimension suggests that gamification alone may not fully address learners' underlying language anxiety in high-stakes technical fields, pointing to the need for complementary pedagogical strategies. Given the limited sample size, future research involving larger and more diverse samples, longer intervention periods, and qualitative data on students' perceptions would further clarify the conditions under which gamified platforms most effectively support ESP vocabulary learning and motivation.

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