

The Effectiveness of Gamified Word Cards on Vocabulary Mastery Among Vocational School Students Majoring in Automotive Technology

Lintang Sabil Fatwa¹

English Education Study Program, Faculty of Language and Arts, State
University of Surabaya, Indonesia
lintang.22117@mhs.unesa.ac.id

Muhaimin Abdullah²

English Education Study Program, Faculty of Language and Arts, State
University of Surabaya, Indonesia
muhaiminabdullah@unesa.ac.id

Abstrak

“Penelitian ini mengkaji pengaruh gamified word cards terhadap penguasaan kosakata siswa sekolah kejuruan jurusan teknik otomotif. Dua rumusan masalah diajukan dalam penelitian ini, yaitu apakah penggunaan gamified word cards secara signifikan meningkatkan penguasaan kosakata siswa kejuruan, dan bagaimana distribusi nilai tes harian siswa pada setiap sesi perlakuan menggunakan gamified word cards. Penelitian ini menggunakan pendekatan kuantitatif dengan desain pra-eksperimental satu kelompok. Sampel penelitian terdiri dari 26 siswa sekolah kejuruan jurusan teknik otomotif. Data dikumpulkan melalui pre-test, post-test, dan tes harian. Data dianalisis menggunakan Wilcoxon Signed-Rank Test dan statistik deskriptif. Hasil penelitian menunjukkan peningkatan yang substansial dari pre-test ($M = 27,31$) ke post-test ($M = 72,88$), didukung oleh hasil Wilcoxon Signed-Rank Test yang mengonfirmasi adanya peningkatan yang signifikan secara statistik ($Z = -4,200$, $p < 0,001$), yang menunjukkan bahwa penggunaan gamified word cards secara signifikan meningkatkan penguasaan kosakata siswa. Nilai rata-rata tes harian tertinggi tercatat pada sesi perlakuan ketiga melalui permainan ShowDown! ($M = 86,15$). Temuan ini mengindikasikan bahwa gamified word cards merupakan media pembelajaran kosakata yang efektif bagi siswa kejuruan jurusan teknik otomotif, khususnya dalam konteks pembelajaran dengan kebijakan larangan penggunaan telepon seluler”.

Kata Kunci: Penguasaan Kosakata, Gamifikasi Kartu Kata, SMK, Pembelajaran Berbasis Game

Abstract

“This study examined the effect of gamified word cards on the vocabulary mastery of vocational school students majoring in automotive technology. Two research questions were proposed: does the use of gamified word cards significantly improve vocational students' vocabulary mastery, and what is the distribution of students' daily test scores across the gamified word cards activity treatment? This study employed a quantitative research approach using a one-group pre-experimental design. The sample consisted of 26 vocational students majoring in automotive technology. The data were collected through a pre-test, post-test, and daily tests. Furthermore, the data were analyzed using the Wilcoxon Signed-Rank Test and descriptive statistics. The results indicated a substantial increase from pre-test ($M = 27.31$) to post-test ($M = 72.88$), supported by the Wilcoxon Signed-Rank Test, which confirmed a statistically significant improvement ($Z = -4.200$, $p < .001$), demonstrating that the use of gamified word cards significantly improved students' vocabulary mastery. The highest daily test mean score was recorded in the third treatment session with the game called ShowDown! ($M = 86.15$).

These findings suggest that gamified word cards are an effective vocabulary learning medium for automotive technology vocational students, particularly in settings where mobile phone use is prohibited.

Keywords: Vocabulary Mastery, Gamified Word Cards, Vocational School, Game-Based Learning

INTRODUCTION

Teaching vocabulary presents a unique challenge that requires creative instruction and consistent reinforcement. One effective strategy for teaching vocabulary is gamification, which incorporates game elements into the learning process to enhance students' engagement. Classroom gamification can be classified into two types based on the technology: digital and non-digital. Digital gamification integrates technology into learning, whereas non-digital gamification is implemented without technology. Jaramillo-Mediavilla et al. (2024) determined that both digital and non-digital gamification enhance students' motivation, engagement, and learning outcomes, although most existing evidence has focused on technology-supported learning environments.

Banning mobile phones can create an efficient classroom atmosphere and enhance student focus during the learning process. Previous research has found that banning mobile phones can decrease classroom distractions, enhance students' concentration, and create a more productive learning environment (Böttger & Zierer, 2024). In Indonesia, Suswandi & Ripandi (2024) found that restricting mobile phone use during classes is an effective strategy to increase student interest in learning. Related to several findings above, the school chosen in this study similarly implements the same strategies, banning mobile phones to increase student concentration during classes and minimize distractions. Based on the issues above, the need for alternative strategies that are engaging, effective, and aligned with the school's non-digital learning environment is highlighted. Therefore, the use of gamified word cards is proposed in this research as a potential solution to enhance students' vocabulary mastery.

Appropriate learning media is essential to improve student enthusiasm. Lubis et al. (2023) found that conventional word cards significantly enhance students' vocabulary mastery. Moreover, Muhayyang (2023) found that the incorporation of word card media in learning significantly increases student vocabulary in seventh-grade junior high school. The present study investigated the effectiveness of gamified word cards as a non-digital strategy to enhance vocational students' vocabulary mastery, especially vocabulary relevant to their field that can be applied in daily and professional contexts. This research offers innovation in the contextualization of vocabulary learning for vocational students.

Despite these encouraging findings, several research gaps that distinguish it from existing research in the field of vocabulary instruction. In the previous study, Muhayyang (2023) and Khasanah et al. (2025) investigated the use of word cards in Junior High School; both studies found that word cards significantly improved students' vocabulary mastery. However, previous studies were conducted within general English educational settings; there has been little attention to empirical studies in vocational schools with specific contexts. Furthermore, the combination of the gamification approach and word cards as an integrated instructional medium has not been previously examined in the existing literature. General English instruction cannot fully address the needs regarding specific technical vocabulary and professional workplace communication; students require focused vocabulary learning tailored to their academic and professional contexts for future workplace settings. These research gaps in previous studies underscore the essential role of the present study. The research questions are as follows:

- (1) Does the use of gamified word cards significantly improve vocational students' vocabulary mastery?)
- (2) What is the distribution of students' daily test scores across the gamified word cards activity treatment?

The study aimed to investigate whether gamified word cards significantly improve vocational students' vocabulary mastery and examine the distribution and variation of students' daily test scores across four gamified word card activities. The significance of this study lies in identifying the effectiveness of gamified word cards in improving vocabulary mastery. The findings are expected to provide both theoretical and practical contributions. Theoretically, the study contributes to the development of gamification theory in language learning, particularly in non-digital contexts, by demonstrating how competition, challenge, teamwork, points, and rewards can be embedded in simple learning media such as word cards. Practically, if gamified word cards significantly enhance vocational students' vocabulary mastery, teachers are encouraged to integrate them into daily vocabulary instruction by incorporating game elements and multisensory support.

LITERATURE REVIEW

Vocabulary mastery is an essential part of language learning, as it facilitates students' ability to comprehend and produce meaningful communication effectively (Nation et al., 2001). These perspectives underscore the dual importance of vocabulary mastery as both a fundamental goal of language learning and a demanding cognitive undertaking that requires intentional and sustained engagement with target vocabulary. Vocabulary mastery is the process of learning and incorporating new

words; the significance of vocabulary mastery in language learning is widely recognized, as acceptable vocabulary knowledge enables learners to engage more confidently and accurately in both receptive and productive language use. Therefore, vocabulary mastery should be regarded as a continuous process that combines authentic input and structured activities.

Gamification, or gameful learning design, refers to the strategic implementation of game design principles, mechanics, and elements into non-game environments (Ružic & Dumancic, 2015). Applying gamification might enhance student motivation during the learning process. (Lee & Baek, 2023) highlight the potential of gamification as a tool for English language learning, but also call for careful consideration in each design and provide guidance to maximize learning outcomes. In the educational field, gamification can increase students' participation and motivation by forming a more interactive and enjoyable learning experience (Ziehermann & Cunningham, 2011). Therefore, implementing gamification in the learning process might be an effective approach to enhance student motivation, which might affect student comprehension.

Gamified word cards combine the gamification approach and word cards as learning media. Previous research found that the successful application of gamification might be more related to the attribute of the model rather than the gamified elements' capacity (Lee & Baek, 2023). The purpose of gamified word cards was not only to memorize words, but also to motivate students to actively participate during the class rather than traditional memorization.

METHOD

This study employed a quantitative pre-experimental approach using a one-group design to analyze numerical data. This design involves only one group of participants who are assessed through a pre-test before the treatment and a post-test after the treatment. The difference between the pre-test and post-test scores is used to determine the effect of the treatment, although the design has limited control over external variables that might have influenced the results (Campbell & Stanley, 1963). This design was selected because it allows the measurement of students' improvement before and after the treatment, with gains in post-test scores indicating the treatment's effectiveness (Creswell, 2018). According to Cohen et al. (2018), the research design should align with the study's objectives while considering the research context. Therefore, participants' vocabulary mastery was assessed using a pre-test and post-test to examine the effect of gamified word cards on their vocabulary mastery.

The participants consisted of one intact eleventh-grade class at SMK N

Ngraho, East Java. Specifically, 11 TKR 1 with 26 students (Teknik Kendaraan Ringan/Automotive Technology). This intact class majored in Automotive Technology in a vocational school to differentiate vocabulary or meet the specific needs of technical vocabulary.

The participants received treatment using gamified word cards in 4 meetings. Before the treatment was implemented, a pre-test was administered based on selected word consist of several technical terms related to the students' background. After the pre-test was administered, the gamified word cards were implemented with four different games as a treatment during the learning process for students. Moreover, daily tests were managed after the learning sessions to evaluate the students' understanding of the material. The treatment was conducted through four different type of games, the four games were conduct by different formats, pair work with game named vocabulary race, small group work that consist of 5-6 students with game named A-B-C-Draw, large group work that selected though divided the class into two groups with game named ShowDown, and the last game is individual work with the game named SpeedFlip.

Statistical analyses in this study were conducted using the SPSS software. Before the inferential statistical analysis, Cronbach's Alpha for the research instrument was 0.81, indicating good reliability, and the validity of the research instrument was verified by two teachers of the vocational school related to the students' major. The normality of the collected data was assessed using the Shapiro-Wilk test, which is widely recommended for samples consisting of fewer than 50 participants.

Normally distributed data ($p > 0.05$) facilitated the application of a dependent-samples t-test, while non-normally distributed data ($p < 0.05$) facilitated the application of the Wilcoxon Signed-Rank Test to compare pre-test and post-test scores. The alpha level was established at $p < 0.05$. This analytical method guaranteed that the results were statistically sound and offered definitive empirical evidence regarding the effect of gamified word cards on the vocabulary mastery of vocational school students majoring in automotive technology.

The research was executed in compliance with ethical protocols. The school and students were apprised of the study's objectives and procedures, with participation being voluntary. All data were maintained in confidentiality and utilized exclusively for scholarly purposes.

FINDINGS AND DISCUSSION

FINDINGS

The subsequent phase involved assessing the normality of the data distribution, specifically the variance between pre-test and post-test scores. The Shapiro-Wilk test was utilized due to the sample size being less than 50 ($n = 26$). The p-value for the pre-test was .006, and the p-value for the post-test was .000. Both values fell below the criterion of 0.05, signifying that the data were not normally distributed. This finding indicated that the prerequisites for parametric testing were not satisfied, warranting the application of the Wilcoxon Signed-Rank Test as the appropriate non-parametric alternative to assess variations in vocabulary mastery before and after the implementation of the gamified word cards treatment.

Wilcoxon Signed-Rank Test was selected to analyze the difference between the pre-test scores and post-test scores.

Table 1 : Wilcoxon Signed-Rank Test

	Post-test TKR 1 - Pre-test TKR 1
Z	-4.200
Asymp. Sig. (2-tailed)	<.001

The data revealed that the significant value was less than 0.001 (<.001), indicating a highly statistically significant difference between the treatment classes after the treatment. Since the significant value was less than 0.05 (<0.05), the null hypothesis (H_0), which stated that the employment of gamified word cards does not significantly improve vocational students' vocabulary mastery, was rejected. Whereas the alternative hypothesis (H_a) that stated, the employment of gamified word cards does significantly enhance vocational students' vocabulary mastery, was accepted.

Furthermore, descriptive statistics of each daily test score were applied to answer the second research question, which questioned the distribution of students' daily test scores across the gamified word cards activity treatment. Since the second research question was about the distribution of daily test scores, the mean score of each daily test was analyzed to address the question.

Table 2: Descriptive Statistics of Students' Daily Test

	N	Minimum	Maximum	Mean	Std. Deviation
DT1	26	20	100	66.15	22.464
DT2	26	20	80	67.69	18.827

DT3	26	20	100	86.15	24.507
DT4	26	0	100	72.31	34.445
Valid N	26				

The results indicated that the highest mean score was achieved during Daily Test 3 with the game treatment called Showdown! The treatment class students gained 86.15 mean score (SD=24.507). Second places of highest daily score was achieved during Daily Test 4; the treatment class students gained 72.31 mean score (SD=34.445). The third place of highest daily score was achieved in Daily Test 2, with the score 67.69 mean score (SD=18.827), and the last place in Daily Test 1, with score, 66.15 mean score (SD=22.464). The gain between the highest daily score in Daily Test 3 and the remaining sessions was considerable, with a difference of 20.00 points from Daily Test 1 (M=66.15), a difference of 18.46 points from Daily Test 2 (M=67.69), and a difference of 13.84 points from Daily Test 4 (M=72.31).

DISCUSSION

The results of this study demonstrated that students achieved a significantly higher level of vocabulary mastery following the implementation of gamified word cards, proved by the Wilcoxon Signed-Rank Test ($z = -4.200$, $p < .001$). This significant enhancement can be attributed to the capacity of gamified word cards to facilitate repeated and meaningful engagement with target vocabulary, which effectively supported students' long-term memory retention of word meanings. This effect is consistent with Nation et al. (2001) framework, which emphasized that word cards strengthen learners' memory through repeated recall of target vocabulary and systematic exposure to vocabulary meanings. In the present study, rather than passively receiving vocabulary instruction, students were actively required to recall and apply target vocabulary through varied game-based activities, each of which provided a new and engaging context for encountering the same vocabulary items. This active and repeated engagement with target vocabulary appears to have deepened students' cognitive processing of word meanings, thereby contributing to the significant improvement observed at the post-test stage.

The findings of this study are supported by Reynolds et al. (2020), who established that word cards enable learners to efficiently master vocabulary through repeated exposure and retrieval of meaning. The present study expands this finding by demonstrating that incorporating word cards within a gamified

framework further strengthens this process, as the interactive and motivating nature of the gamified activities encouraged students to engage more actively and consistently with target vocabulary throughout the treatment period. This active engagement is particularly significant given that vocabulary items encountered only through passive memorization are susceptible to rapid forgetting. Reynolds et al. (2020), explained that the gamified format may have mitigated this tendency by providing students with multiple structured opportunities for meaningful vocabulary retrieval. This interpretation is further supported by Lei & Reynolds (2022), Pikhart et al. (2023), and Ruth & Saragih (2023), who found that word card-based instruction effectively enhances both receptive and productive vocabulary knowledge, collectively underscoring the value of word cards as a non-digital instructional medium that significantly improves vocational student vocabulary mastery. In light of these findings, the first research question of this study has been addressed.

With regard to addressing the second research question, the descriptive statistical analysis revealed a fluctuating pattern of daily test score achievement across the four gamified word cards treatment sessions, with mean scores ranging from 66.15 in Daily Test 1 to 86.15 in Daily Test 3, reflecting an initial difference of 20.00 points between the lowest and highest-performing sessions. Daily Test 3, which employed the Showdown! game in a large group collaborative format, recorded the highest mean score among all treatment sessions ($M = 86.15$), providing a descriptive answer to the first research question of this study. This variation in daily test scores across the four sessions can be understood through Prensky (2001) game-based learning theory, which posited that different game designs and activity formats significantly influence learners' interests and achievement.

The considerably higher mean score recorded in Daily Test 3 suggests that the large group collaborative format of the Showdown! game was particularly effective in promoting students' vocabulary mastery. Unlike the other activity formats, Showdown! required students to discuss, negotiate, and justify their answers before reaching a group consensus, allowing them to actively process vocabulary through repeated retrieval and peer explanation. This collaborative structure promoted greater peer interaction and cooperative vocabulary practice, which likely enhanced vocabulary retention by providing immediate feedback, reducing misunderstandings, and enabling learners to learn from one another, which supported greater vocabulary mastery. These findings theoretically contribute to the existing gamification literature by demonstrating that the effectiveness of

gamified activities is enhanced not purely from their entertaining nature, but from the interaction among social collaboration, motivational mechanisms, and cognitive engagement. It should be acknowledged, however, that these findings are descriptive in nature and do not constitute a definitive conclusion regarding the superiority of one game activity over another.

CONCLUSION

This study investigated the effect of gamified word cards on the vocabulary mastery of vocational school students majoring in automotive technology and examined the distribution of students' daily test scores across four gamified word cards activity treatment sessions. Concerning the first research question, the Wilcoxon Signed-Rank Test confirmed a statistically significant improvement in vocabulary mastery following the treatment ($Z = -4.200$, $p < .001$), with participants recording a substantially higher post-test mean score ($M = 72.88$) compared to the pre-test mean score ($M = 27.31$), indicating that the use of gamified word cards significantly improved students' vocabulary mastery. About the second research question, the descriptive statistical analysis revealed a fluctuating pattern of daily test score achievement across the four treatment sessions, with the Showdown! game administered in the third session recording the highest mean score ($M = 86.15$), followed by Daily Test 4 ($M = 72.31$), Daily Test 2 ($M = 67.69$), and Daily Test 1 ($M = 66.15$). In light of these findings, teachers can implement gamified word cards as an effective instructional medium for improving vocabulary mastery among vocational school students to promote active and meaningful vocabulary learning. The present study was limited by its pre-experimental design and the implementation at a single vocational school, which may limit the generalizability of the findings. To extend the findings of the present study, future researchers are suggested to implement a quasi-experimental or mixed-method design and incorporate several schools. Longitudinal studies are also recommended to examine whether the effectiveness of these gamified activities is sustained over time and contributes to long-term vocabulary retention.

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