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Effectiveness of Wordwall as An Interactive Digital Tool for Teaching Vocabulary to Enhance Writing Skills of First-Year Students

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Abstract

This study evaluates the effectiveness of Wordwall, a gamified digital platform for vocabulary learning, in improving vocabulary mastery and procedural-writing quality among first-year vocational students in a Karawitan (traditional arts) program. Using a quasi-experimental pre-test–post-test design, two intact classes received different instructional treatments across three meetings held over a two-week period, the experimental class completed Wordwall activities, whereas the control class followed conventional methods. After initial differences were controlled with ANCOVA, the experimental class showed a significantly larger vocabulary gain (partial $\eta^2 = 0.25$) and greater improvements in lexical variety and technical accuracy in writing than the control class. These findings indicate that integrating Wordwall boosts student engagement and successfully transfers technical vocabulary to procedural texts. Therefore, teachers can adopt vocationally themed Wordwall tasks to accelerate language learning, and policy-makers should provide training and digital infrastructure so that interactive tools like Wordwall can be implemented widely in vocational schools.

Keywords: Vocabulary Acquisition, Digital Learning Tools, Vocational Education, Wordwall, Interactive Learning, Writing Skills

Introduction

Vocabulary plays a central role in language acquisition, allowing students to comprehend texts, articulate ideas and construct coherent written communication. In writing, a strong command of vocabulary supports clarity, appropriate use of tone, and logical organization-especially in genres that demand technical precision, such as procedural texts (Nation, 2013). In the context of vocational education in Indonesia, vocabulary acquisition remains a major challenge. National data shows

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that Vocational High School (SMK) students consistently perform less optimally in English language learning compared to general education students.

This gap is evident in the national standardized assessment results (Ministry of Education and Culture, 2022). This condition is particularly concerning in specialized fields such as Karawitan, where students are expected to understand and accurately describe instruments, tools and performance procedures using domain-specific vocabulary. Several factors influence this condition. Vocabulary teaching in vocational schools tends to use traditional methods that are less relevant to students' professional fields, with approaches dominated by memorization and textbook-based exercises.

These methods lack active student engagement and do not support vocabulary transfer into productive skills such as writing Rosyada-AS & Apoko, (2023). In addition, there is a lack of digital resources that are easily accessible and tailored to the specific language needs of vocational learners Suci et al. (2021). This situation requires teachers to make various adjustments, especially in choosing learning media that suits the needs of students.

The development of educational technology provides innovative solutions, one of which is an interactive digital platform such as Wordwall. The use of Wordwall web platform has been proven to improve student learning achievement (Robin & Aziz, 2022). In addition, Wordwall presents a fun and interesting learning experience, so it can be an additional attraction for students, including at the junior high school level (Shabrina & Wahyu Taufiq, 2023).

Previous research explains that Wordwall for Education is a web-based digital platform that is very helpful for teachers in designing lessons Salmerón et al. (2023). With the various templates and features it offers, Wordwall allows teachers to create a fun learning atmosphere so that students remain interested and not bored with the material. In addition, Wordwall is also effectively used to design evaluations that measure students' understanding.

Interactive learning, in this context, involves Indonesian language teaching techniques where teachers encourage students to actively participate to answer questions as well as discuss, so that their critical thinking skills develop and have a positive impact on learning outcomes. Furthermore, Maisarah (2023) define interactive learning as a method that creates educational interactions between teachers and students, between students, and between students and learning resources, to optimally achieve learning objectives.

Previous research by Maisuroh et al. (2024) explains that Wordwall for Education is a web-based digital platform that is very helpful for teachers in designing learning. Previous research by Hidayaty et al. (2022) developed and tested Wordwall-based web media for learning to write procedural texts for junior high school students. In this R&D study involving 45 learners, activities such as matching exercises, label drills, and visual quizzes were designed according to the Indonesian language curriculum, and the results showed an increase in learning motivation by 32% and procedural writing scores that rose on average from 65 to

82 on a scale of 100.

Furthermore, Pradini & Adnyayanti (2022) conducted a quasi-experiment on 100 elementary school students in Saudi Arabia to assess the impact of Wordwall games on English vocabulary acquisition. The experimental group who played interactive quizzes and vocabulary games significantly scored a mean word retention score of 78, compared to 64 in the control group, confirming the effectiveness of Wordwall in improving lexical retention which has the potential to be applied at vocational levels such as vocational schools.

Based on this overview, the present study explore the effectiveness of Wordwall, a gamified digital tool that enables interactive vocabulary learning, in improving vocabulary acquisition and writing performance among first-year SMK students in Karawitan (traditional arts) program.

Method

2.1 Research Design

This study employed a quasi-experimental design, specifically the nonequivalent control group pretest-posttest design. This design is commonly used in educational settings where random assignment of subjects to experimental and control groups is not feasible due to administrative or ethical considerations (Creswell 2012). In this design, two pre-existing groups (experimental and control), which are not randomly assigned, are given a pretest before the intervention and a posttest after the intervention to measure the effect of the treatment.

The quasi-experimental design allows researchers to evaluate the effectiveness of an intervention scientifically, even in the absence of randomization. The nonequivalent control group pretest-posttest design is characterized by a comparison between two nonrandom groups, with measurements taken before and after the intervention (Fraenkel & Wallen, 2009). This design enables the analysis of within-group score changes as well as between-group comparisons, although initial differences between groups may exist.

2.2 Participants and Group Assignment

The participants were 40 first-year vocational students from SMKN 10 Bandung, all enrolled in the Karawitan (traditional arts) program. Two existing classes were selected for the study. Class X-SPK 2, with 20 students, was assigned as the experimental group, while Class X-SPK 1, also with 20 students, served as the control group. These groupings were determined by the school prior to the study and not randomized. Pretest results showed that the experimental group had a lower mean vocabulary score (M = 40.20) compared to the control group (M = 61.00). This initial difference was addressed using ANCOVA in the analysis.

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2.3 Intervention Procedure

The intervention took place over one week, with one 90 minute session each week. The experimental group used Wordwall-based activities, while the control group received traditional instruction. The topic of the intervention was "How to clean gamelan instruments from dust," and all materials were designed around this theme. In day 1, the experimental group engaged in interactive Wordwall quizzes that used images and key terms related to gamelan parts and cleaning tools, while the control group received a teacher-led explanation and completed worksheets.

In day 2, the experimental group played matching games to pair cleaning tools with their appropriate functions (e.g., cloth – wipe, brush – remove dust), whereas the control group completed vocabulary tasks using dictionaries and translation exercises. In day 3, the experimental group worked on sequencing and labeling cleaning steps using Wordwall templates, while the control group did fill-in-the-blank exercises and practiced writing procedural texts on paper. Students accessed the Wordwall activities using school-provided tablets or personal smartphones.

All activities emphasized vocabulary specific to gamelan instruments and Karawitan performance procedures.

2.4 Teacher Training

Before the intervention, the English teacher responsible for both groups participated in a three-hour training workshop. This session covered an introduction to Wordwall functions, strategies for designing gamified vocabulary tasks, and techniques for integrating these tools into the teaching of technical vocabulary relevant to Karawitan students.

2.5 Assessment Instruments

Two main assessment tools were used to measure the outcomes of the intervention. The first was a 25-item multiple-choice vocabulary test focused on terms related to cleaning gamelan instruments, such as cloth, brush, wipe, polish, and dust. The test items were validated by three experts in English for Specific Purposes (ESP), and internal consistency was high (Cronbach's $\alpha = 0.83$). The second instrument was a writing task in which students were asked to write a procedural text titled "How to Clean a Gamelan Instrument."

Students were required to use only the vocabulary they had learned during the lessons and were instructed not to use translation tools. Their writing was assessed using a four-dimension analytic rubric that measured lexical variety, word choice, technical accuracy, and cohesion. Each dimension was scored on a 10-point scale. Two independent raters evaluated the writing samples, and inter-rater agreement was substantial, with Cohen's kappa = 0.78.

2.6 Data Collection Procedure

Data were collected over a one week period. In day 1, both the vocabulary and writing pretests were administered. Day 2 were dedicated to the implementation

of the instructional intervention, using Wordwall for the experimental group and traditional methods for the control group. In day 3, the same vocabulary and writing tests were re-administered as posttests. All assessments were conducted in a consistent classroom environment for both groups to ensure uniformity in test administration.

2.7 Data Analysis Techniques

Quantitative data were analyzed using SPSS version 27. To ensure statistical validity, the Shapiro-Wilk test was conducted to check for data normality, and Levene's test was used to assess homogeneity of variance. Independent samples t-tests were used to compare pretest and posttest scores between groups. ANCOVA was employed to control for differences in initial vocabulary proficiency. Effect sizes were calculated using Cohen's d and partial eta squared (η^2).

Additionally, qualitative analysis was performed on students' writing samples to observe how students incorporated newly learned vocabulary into their procedural texts and to identify common patterns in sentence structure and task sequencing relevant to their vocational background.

Results

3.1 Vocabulary Test Results

At the pretest stage, there was a substantial difference in vocabulary scores between the two groups. The control group scored significantly higher, with a mean of 61.00 (SD = 13.90), compared to the experimental group's mean of 40.20 (SD = 13.46). The vocabulary test consisted of 25 multiple-choice items focused on technical terms related to the procedural text "How to clean gamelan instruments from dust." These terms included names of tools such as cloth and brush, actions like wiping and cleaning, and related objects like gong and saron.

To address the initial imbalance in vocabulary ability, ANCOVA was applied by controlling pretest scores, ensuring a fair comparison of posttest results. After the intervention, the experimental group showed a significant improvement, with a posttest mean score of 82.80 (SD = 8.92), an increase of 42.60 points or 71.2%. In contrast, the control group increased by 15.90 points or 40.8%, from 61.00 to 76.90 (SD = 19.03). The ANCOVA results indicated a significant effect of the intervention on vocabulary acquisition, $F(1, 37) = 12.36$, $p = 0.001$, with a large effect size (partial $\eta^2 = 0.248$), demonstrating that the Wordwall intervention had a strong impact on vocabulary mastery.

Table 3. Vocabulary Test Scores and Improvement

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Group	Pretest Mean (SD)	Posttest Mean (SD)	Gain Score	Relative Improvement	Cohen's d
Control	61.00 (13.90)	76.90 (19.03)	15.90	40.8%	0.67
Experimental	40.20 (13.46)	82.80 (8.92)	42.60	71.2%	1.97

3.2 Writing Performance Results

In addition to vocabulary tests, students' writing ability was assessed using a rubric covering four components: lexical variety, word choice, technical accuracy, and cohesion. The experimental group showed greater improvements across all these areas compared to the control group.

Table 4. Writing Assessment Gains and Effect Sizes

Writing Dimension	Group	Pretest Mean	Posttest Mean	Gain (%)	Cohen's d
Lexical Variety	Control	5.6	6.4	14.2%	0.52
	Experimental	5.2	7.2	38.5%	1.25
Word Choice	Control	5.3	6.1	15.1%	0.55
	Experimental	4.8	6.9	43.8%	1.42
Technical Accuracy	Control	4.9	5.8	18.5%	0.63
	Experimental	4.2	6.1	45.2%	1.52
Cohesion	Control	5.0	5.7	14.0%	0.50
	Experimental	4.5	6.2	37.8%	1.14

For example, lexical variety increased by 38.5% in the experimental group, rising from a mean score of 5.2 to 7.2, while the control group showed a smaller improvement of 14.2%, increasing from 5.6 to 6.4. Similarly, word choice improved substantially by 43.8% in the experimental group compared to 15.1% in the control group. Technical accuracy showed the greatest gain, increasing by 45.2% in the experimental group versus 18.5% in the control group. Cohesion also improved markedly, with a 37.8% increase for the experimental group compared to 14.0% for the control group.

The effect sizes (Cohen's d) for the experimental group ranged from moderate to large 1.14 for cohesion, 1.25 for lexical variety, 1.42 for word choice, and 1.52 for technical accuracy, indicating a strong impact of the Wordwall intervention on students' writing skills. These results suggest that the use of Wordwall not only enhanced students' vocabulary acquisition but also contributed to producing procedural texts that were more lexically diverse, accurate, and cohesively organized, particularly relevant to their vocational field.

3.3 Qualitative Examples of Student Writing

To further illustrate the impact, sample texts from both groups are presented. Students were instructed to write procedural texts without using translation tools and only using vocabulary taught during the intervention.

Experimental Group – Student E11

Pretest:

"To clean gamelan, we take cloth and wipe it. Clean the gamelan because it has dust. Use hand to wipe."

Posttest:

"To clean a gamelan instrument, prepare a soft cloth and a brush. First, use the brush to remove dust from the gong and saron. Then wipe the instrument gently with the cloth. Do not use water to avoid damage. Finally, return the gamelan to a dry place."

Control Group – Student C05

Pretest:

"Cleaning gamelan use cloth. We wipe the gamelan."

Posttest:

"To clean gamelan, take cloth. Wipe it slowly. After that, finish."

The experimental group used domain-specific vocabulary and structured sequencing, while the control group showed limited progress in both vocabulary range and procedural clarity.

3.4 Vocabulary Improvement by Word Type

To assess vocabulary development more specifically, gains were analyzed by word category nouns and verbs both essential in procedural writing. The experimental group showed high improvement in both categories, with balanced development, while the control group demonstrated lower and uneven gains.

Table 5. Vocabulary Gains by Word Type

Group	Noun Gain	Verb Gain	Total Gain	Cohen's d (Nouns)	Cohen's d (Verbs)
Control	18.25	13.55	15.90	0.81	0.67
Experimental	44.75	40.45	42.60	1.86	1.72

A more detailed analysis by word type was also conducted to determine if vocabulary gains were balanced between nouns and verbs, both critical for procedural writing. The experimental group demonstrated substantial improvement in both categories, with noun gains of 44.75 points and verb gains of 40.45 points, compared to the control group's smaller gains of 18.25 points for

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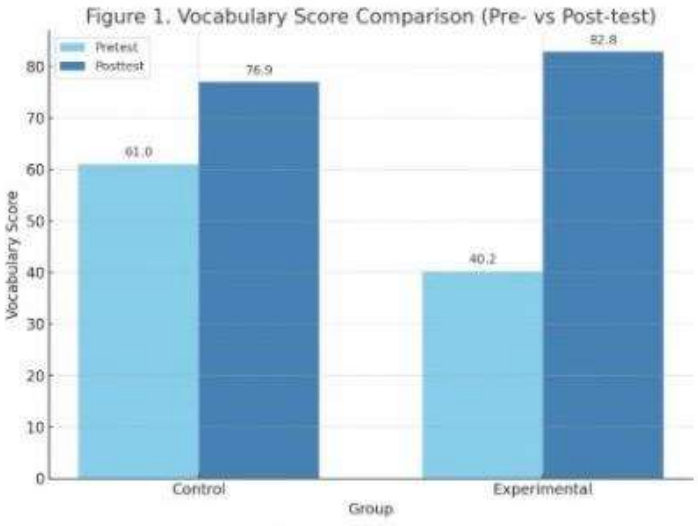
nouns and 13.55 points for verbs. The effect sizes were large for the experimental group, with Cohen's d values of 1.86 for nouns and 1.72 for verbs, indicating a strong practical impact of the intervention. In contrast, the control group showed moderate effect sizes (Cohen's d = 0.81 for nouns and 0.67 for verbs). The ANCOVA results confirmed significant differences between groups, with partial eta squared (η^2) values of 0.32 for nouns and 0.29 for verbs, demonstrating that the Wordwall-based intervention effectively helped students develop relevant vocabulary evenly for both objects and actions essential to procedural texts.

3.5 Visualization of Vocabulary Score Changes

Figure 1. Vocabulary Score Comparison (Pre- vs Post-test)



This chart shows the difference in vocabulary scores before and after the intervention. Despite starting with lower vocabulary proficiency, the experimental group experienced a steep increase and surpassed the control group in the posttest. Figure 1 illustrates the comparison of vocabulary scores between the pre-test and post-test for both the control and experimental groups. In the control group, the vocabulary score increased from 61.0 in the pre-test to 76.9 in the post-test, indicating a moderate improvement. However, a more substantial increase was observed in the experimental group, where the average score rose significantly from 40.2 to 82.8. This suggests that the treatment applied to the experimental group had a strong positive impact on vocabulary acquisition compared to the control group.

Discussion

The findings clearly indicate that Wordwall significantly enhances vocabulary acquisition among vocational students. The experimental group, which engaged in digital, gamified vocabulary learning through Wordwall activities centered on procedural tasks such as cleaning gamelan instruments, demonstrated a remarkable improvement in vocabulary scores with a gain of 42.60 points. In

contrast, the control group, which received traditional instruction, showed a gain of only 15.90 points. This result was statistically significant after adjusting for initial differences through ANCOVA.

These outcomes align with Nation's (2013) Involvement Load Hypothesis, which emphasizes that vocabulary retention is more effective when learning activities involve cognitive processes such as need, search, and evaluation. Wordwall's interactive features like labeling tools, matching games, and image-based quizzes encouraged learners to repeatedly engage with vocabulary in meaningful and relevant procedural contexts. In this study, the tasks were grounded in real vocational practice, such as sequencing steps and identifying tools used in cleaning gamelan instruments.

The results also support prior studies by Yu, (2023) and Sukmawati et al. (2023) who emphasized the motivational benefits of gamified language learning. In this intervention, student engagement was consistently high, particularly among those with initially lower language proficiency. The integration of culturally and vocationally relevant content likely contributed to the increase in motivation and vocabulary retention.

The improvement in vocabulary knowledge clearly contributed to better writing performance in the experimental group. This group significantly outperformed the control group in all four dimensions of writing assessment lexical variety, word choice, technical accuracy, and cohesion with large effect sizes (Cohen's $d > 1.14$). These gains reflect not only increased vocabulary knowledge but also improved ability to use the vocabulary accurately and contextually in writing.

The writing task required students to produce a procedural text related to their vocational field, such as "How to Clean Gamelan Instruments." Students in the experimental group were better able to apply specific vocabulary (e.g., *pengrawit*, *tabuh*, *kendhang*, *saron*, *irama*, *lap kain*, *semprotan*, *debu halus*) in structured and logically sequenced writing. This finding aligns with Nuriyah and Hanafi (2024), who highlighted the strong connection between vocabulary mastery and procedural writing competence. The use of vocabulary in a semantically integrated and syntactically correct manner indicates an advancement from memorization to productive language use in a functional vocational context.

The findings of this study yield several pedagogical implications for vocational English instruction. For teachers, Wordwall presents a flexible and engaging platform to create customized vocabulary activities that align with students' technical majors. The activities can be directly integrated with writing tasks such as procedural texts, reinforcing vocabulary through repeated and contextualized use.

For instructional designers, the use of digital tools like Wordwall supports the development of authentic, field relevant learning experiences. Embedding digital

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literacy and content-specific language learning into the curriculum can make English instruction more meaningful and skills oriented for vocational learners. At the policy and administrative level, the results support the need to provide schools with sufficient digital infrastructure and training in gamified instruction. Investing in such resources may help address long-standing disparities in English proficiency between vocational and general education tracks.

These conclusions align with Ellis (2009), who asserted that connecting classroom activities with learners' background knowledge and real-world applications enhances learning particularly in career-focused education.

4.1 Vocabulary Acquisition through Wordwall

The results of this study demonstrate that Wordwall significantly improved vocabulary acquisition among vocational students. The experimental group, which participated in interactive Wordwall activities focused on procedural content such as cleaning gamelan instruments, showed a substantial increase in vocabulary test scores. These gains were statistically significant and supported by a large effect size. This finding addresses the first research question and supports the argument that gamified digital tools can effectively enhance technical vocabulary learning.

The results align with Nation's (2013) Involvement Load Hypothesis, as the Wordwall tasks encouraged students to engage with vocabulary through meaningful, repeated use that required attention, decision-making, and contextual evaluation. The use of images, categorization, and sequencing tasks also aligns with Mayer's (2010) Cognitive Theory of Multimedia Learning, demonstrating that visual-verbal integration supports vocabulary retention. For vocational learners, particularly those in performance-based fields like Karawitan, these visual and context-rich tools appear especially beneficial.

4.2 Transfer of Vocabulary Knowledge to Writing Skills

The second research question explored how improved vocabulary knowledge influenced students' writing performance. The findings reveal that students in the experimental group were better able to apply newly acquired vocabulary in composing procedural texts. They demonstrated significant improvement across all writing dimensions lexical variety, word choice, technical accuracy, and cohesion. These results suggest that vocabulary knowledge gained through Wordwall was not limited to recognition or recall but extended to productive language use in authentic written tasks.

Writing samples from the experimental group illustrate this transfer, showing improved clarity, task sequencing, and incorporation of domain-specific terms such as "soft cloth," "remove dust," and "do not use water." These improvements highlight the importance of integrating vocabulary instruction with writing practice. The results reinforce the argument by Nuriyah and Hanafi (2024) that vocabulary mastery directly supports procedural writing competence in vocational contexts.

4.3 Pedagogical Implications for Vocational Language Instruction

The third research question addressed the pedagogical implications of using Wordwall in vocational English education. The findings suggest that digital platforms like Wordwall can play a central role in bridging the gap between abstract language learning and real-world vocational communication. For educators, Wordwall provides a flexible framework for creating engaging vocabulary tasks tailored to specific technical content, such as instrument maintenance in Karawitan.

These tools not only increase motivation and participation but also make language instruction more relevant and meaningful for vocational learners. From a curriculum design perspective, Wordwall can be integrated into English for Specific Purposes (ESP) modules as a core component of vocabulary instruction, particularly when combined with task-based writing exercises. A blended learning model that incorporates both traditional instruction and interactive digital tools may offer an optimal balance of depth and engagement.

Additionally, these findings underscore the importance of teacher training in digital pedagogy to ensure effective implementation of gamified learning strategies in the classroom.

4.4 Limitations

Despite its promising results, this study has several limitations that must be acknowledged. First, the initial vocabulary proficiency between the experimental and control groups was significantly different. Although ANCOVA was used to control for this discrepancy, it remains a potential source of bias. Second, the relatively short duration of the intervention only three sessions over three weeks limits the ability to assess long-term vocabulary retention and writing development. A longer intervention might yield more comprehensive insights into sustained learning outcomes.

Third, the study was conducted in a single vocational field (Karawitan) with a small sample size of 40 students, which restricts the generalizability of the findings to other vocational areas. Fourth, students' prior experience with digital learning tools was not measured, and differences in digital literacy may have influenced how effectively students engaged with the Wordwall platform. Finally, the role of the teacher cannot be overlooked; teacher enthusiasm and familiarity with the digital tool may have positively impacted student motivation and classroom dynamics, potentially contributing to the improved performance observed in the experimental group.

4.5 Alternative Explanations

It is also important to consider alternative explanations for the observed outcomes. The novelty of the digital tool and the attention given to the experimental group could have resulted in a Hawthorne effect, where students perform better simply because they feel they are part of a special program.

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Additionally, peer-assisted learning may have occurred more frequently in the experimental group due to the interactive and collaborative nature of Wordwall activities. Informal support among students could have contributed to increased vocabulary acquisition and writing performance. These factors, while outside the primary scope of this study, warrant consideration in future research designs to better isolate the impact of digital tools from other contextual influences.

4.6 Recommendations for Curriculum Integration

Based on the findings of this study, several recommendations can be made to enhance curriculum development in vocational English education. First, vocabulary instruction should be closely integrated with writing tasks that reflect authentic professional communication, such as procedural and instructional texts. Wordwall and similar platforms can be used to introduce and reinforce technical vocabulary in ways that are engaging, context-specific, and accessible. Second, digital tools should be embedded within ESP modules and aligned with students' vocational domains to increase relevance and motivation.

Third, professional development programs should be offered to train teachers in designing and implementing gamified vocabulary tasks that promote active learning and language production. Lastly, policy-level support is needed to ensure equitable access to digital resources in vocational schools, including hardware, internet connectivity, and instructional materials. By adopting these strategies, vocational education systems can modernize language instruction and better prepare students for communication in their future careers.

Conclusion

This study provides empirical evidence that Wordwall significantly enhances both vocabulary acquisition and writing performance among vocational students. The results underscore the value of integrating interactive digital tools into vocational language curricula. Educators are encouraged to leverage platforms like Wordwall to support domain-specific vocabulary learning and writing instruction. Future research could explore long-term impacts and the tool's application in other vocational disciplines.

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