

## English Majors' Perceptions on General Pedagogical Knowledge (GPK) in Teaching Vocabulary Skills Through Gamification

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### Abstract

This study determined the perceptions of English major students at Divine Word College of Legazpi on general pedagogical knowledge (GPK) in teaching vocabulary through gamification. A descriptive research design with a qualitative approach was employed, utilizing a validated, researcher-made survey administered to 33 students during the first semester of the academic year 2024–2025. Statistical tools were used for data analysis, including frequency distributions, t-tests, and ANOVA.

The results indicated that most respondents were young adults aged 18–22, predominantly female, first-year, and regular students. Respondents strongly agreed on the effectiveness of gamification in enhancing vocabulary skills, particularly in context clues, collocations,

idiomatic expressions, and sentence usage. Despite demographic differences, no significant variations in perceptions were found, which underlines the universal applicability of gamified learning. As an output, the study proposed the Gamified Vocabulary Learning (GVL) Program, which integrates digital tools for interactive and personalized learning that offers real-time feedback and fosters motivation. In conclusion, gamification proved to be an effective and inclusive strategy for vocabulary acquisition that promotes deeper engagement and retention. Recommendations include expanding gamification to other subjects, fitting activities for diverse learner needs, and training educators to effectively implement gamified teaching strategies.

*Keywords: gamification, vocabulary acquisition, General Pedagogical Knowledge, interactive learning, student perception*

## I. INTRODUCTION

Vocabulary is understanding words and their meanings (Informed Literacy, 2024). It describes the terms people need to be familiar with to understand texts. This becomes a core competency in enhancing language literacy in different contexts and greatly enhances the practice of language proficiency for practical use, mostly among learners in their studies. Marpaung and Situmeang (2020) also regarded vocabulary as an essential component of other patterns of language acquisition. This is simple and at the same time the most important ability that has to be developed while learning any language – to be able to convey and receive information and at the same time comprehend the texts. Thus, if there are problems with vocabulary development, it is difficult to comply with certain academic learning demands

Research in international and national locales shows that learners have insufficient vocabulary skills throughout the education process, which affects language skills. Fithriani and Rahmah (2021) emphasized the need to address the problem of poor vocabulary among students at all year levels. They evaluated the necessity of mobile-assisted games to add high engagement to learning. As the results showed, the material was concluded efficient and effective at the same time due to the learning progress exhibited by the students after the implementation of the gamification. This corresponds with the study of Smiderle, R. et al. (2020) that there was a constructive impact of the utilization of gamification on students after the problem on learners' vocabulary skills was identified; facilitated enhanced learning among the students who were initially poor in word recognition and enhanced other skills of the learners in the learning of words.

Gamification has been accepted in education through the new digital platforms to appeal to the learners in elements and procedures that are similar to games without necessarily being a game to engage the learners to read the comprehension texts more in an enhanced manner. According to Li R. (2021), by participating in digital materials, learners' interest in learning is hugely enhanced. Thus, games can enhance the extent of attention and perseverance of learners in learning because of the characteristics of games and creativity. In addition, the development of vocabulary can be considered as an area where gamification can be used as an intervention as it has been presented by Ersoy and Berrin (2021) based on the EDU 324 course on integrating gamification activities in the teaching and learning process to learn English. Mirzoyeva and Kabdrgalinova (2021) further examined gamification in classroom discussions on vocabulary to unlock difficulty in evaluating the materials given to them. Together, the aforementioned research highlights a pressing issue with vocabulary acquisition in the international locale which affects other skills in language proficiency. Hence, it needs to be resolved with engaging and productive learning material anchored to the needs of the students.

In the Philippines, the results reported by the Program for International Student Assessment (PISA) in 2018 cited in the account of San Juan R. (2019) entail that the Philippines got 340 out of 487 points which was notably low out of 79 OECD countries which was caused by poor vocabulary skills. Also, Samartin (2020) noted that five percent of students in the Philippines use poor vocabulary which results in low-level compliance. This heightens through the 2022 PISA results, which show that Filipino learners rank 77th out of 81 in reading proficiency. These results are the basis of concern about the poor vocabulary skills of learners in the national

context. This seems that the students have less engagement with vocabulary-building activities or if they do, they have less mastery of the competencies expected of them to attain. As far as the results of the studies above are concerned, they imply the need to partake in creative modes of learning acquisition, most primarily vocabulary building as a pre-requisite skill in achieving other successful language skills.

Amidst these requires general pedagogical knowledge (GPK) in teaching practice. Brühwiler and Hollenstein (2024) define GPK as principles and strategies in classroom management and organization. In language teaching, GPK covers understanding effective language teaching methods and classroom management strategies for enhancing vocabulary skills. In the same way, GPK encompasses the utilization of the best use of effective methods of teaching and class management to improve one's vocabulary ability. Furthermore, with the GPK, language teachers can easily apply gamification to their teaching. Significantly, language teachers are pivotal in teaching and instruction. Their perception of GPK is beneficial in terms of the extent to which teaching methods, strategies, and techniques are used in enhancing the teaching and learning environment in the classroom.

The aforementioned indicators exemplify the definition of vocabulary, the relationship between gamification and language learning, the role that gamification plays in language acquisition, the concept of general pedagogical knowledge (GPK) in enhancing the use of gamification in teaching-learning, and the correlation of analyzing perceptions on the teaching of vocabulary using gamification. These usually come that specifically, vocabulary is one of the basic English skills that must be learned and systematically developed as and when required as it relates to other skills in the aforementioned field, which in diverse ways aids an understanding of matters of simple to complex nature in various contexts.

Given the persistent challenges of poor vocabulary skills that continue to affect learners' academic performance and language literacy, and the use of gamification has been a learning tool trend among learners in other countries and some in the Philippines, the researcher sees it as a potential decline to learners' academic success that can affect huge components of their language learning acquisition exclusively it continues to persist. In the same way, the researcher finds the problem of vocabulary skills downgrading to learners in their education, particularly in understanding simple to complex texts. These become the concluding reasons for the conduct of the study.

With these challenges, determining English major students' perceptions of general pedagogical knowledge (GPK) in teaching vocabulary through gamification becomes vital in addressing these disparities in learners' poor vocabulary skills. By determining these perceptions, the study can identify as well how future language teachers view the integration of gamification in teaching vocabulary among learners in language classrooms. This essential element can bridge the gap between the theories and practical knowledge that allows future teachers to utilize technologically advanced methods to strengthen learners' learning engagement. Furthermore, in the reflection of the English major students of these educational areas, they may likewise identify key aspects to improve the use of gamification based on the learners' growing needs which will contribute to the general academic outcomes of language proficiency and language education.

With that said, the present study aimed to determine the perceptions of English major students at Divine Word College of Legazpi on general pedagogical knowledge (GPK) in teaching vocabulary through gamification. This significantly allowed the researcher to explore the general pedagogical knowledge (GPK) of English major students in understanding their roles as future teachers in teaching vocabulary through the use of gamification in their language classrooms.

Primarily, the study aimed to identify the demographic profile of the respondents in terms of age, sex, year level, and student type; the English majors' perceptions of general pedagogical knowledge (GPK) in teaching vocabulary skills through gamification in terms of context clues, collocations, idiomatic expressions, and sentence usage; the significant difference between the demographic profile of the respondents and the English majors' perceptions of general pedagogical knowledge (GPK) in teaching vocabulary skills through gamification; and a proposed output out of the findings of the study.

Through such stated, the study aimed to identify the perception of English major students regarding their pedagogical roles and their vision of future incorporation of gamification in their teaching practices. The study also examined the extent to which using gamification, as conceptualized by the learners, in teaching vocabulary can enhance creativity and effectiveness of teaching and learning as well as the possibility and potential creativity of teaching vocabulary as a process. Furthermore, the study also dug into specific components of teaching vocabulary such as context clues, collocations, idiomatic expressions, and sentence usage, to ensure the extent of gamification's impact in enhancing learners' application of these elements. Additionally, this assessed the significant difference between demographic factors like age, sex, year level, and student type and perceptions of GPK and the influence of these on teaching vocabulary through gamification. Eventually, with the possible findings derived from the findings of the study, this aimed to develop a specific output that addresses the challenges brought by the learners' poor vocabulary skills and low reading proficiency.

Nonetheless, by determining the perceptions of English major students at Divine Word College of Legazpi, this sought to ensure that future language teachers are well aware and well-equipped to teach vocabulary and help learners build sound vocabulary to improve their language competency; thereby responding to the increasing concern on literacy and academic performance in the Philippine educational system.

Primarily, the study aimed to determine the perceptions of the English major students at Divine Word College of Legazpi of general pedagogical knowledge (GPK) in teaching vocabulary through gamification. Specifically, it aimed to answer the following questions:

1. What is the demographic profile of the respondents in terms of:
  - 1.1. age;
  - 1.2. sex;
  - 1.3. year level; and
  - 1.4. student type?

2. What are the English majors' perceptions on general pedagogical knowledge (GPK) in teaching vocabulary skills through gamification in terms of:

2.1 context clues;

2.2 collocations;

2.3 idiomatic expressions; and

2.4 sentence usage?

3. Is there a significant difference between the demographic profile of the respondents and the English Majors' perceptions on general pedagogical knowledge (GPK) in teaching vocabulary skills through gamification?

4. From the findings of the study, what output may be proposed?

## II. METHODS

### Research Design

The study employed a descriptive research design that utilized a qualitative method. Also, a researcher-made survey was conducted to gather the primary data from the respondents. Specifically, frequency, percentage distributions, and rank were used to identify the demographic profile of the respondents and the Likert Scale to determine the perceptions of English majors on GPK in teaching vocabulary through gamification. Additionally, t-test and ANOVA were employed to identify the significant difference in the demographic profile, and the perceptions of the respondents, and a proposed output was identified as well from the latter tools and results.

### Population and Sampling Technique

The population of the study was composed of college students at Divine Word College of Legazpi. From there, the samples were formed through purposive sampling based on a specific criteria set which needed to be English major students in the specified institutions enrolled in the first semester of the academic year 2024-2025.

### Respondents of the Study

The respondents of this study were English major students at Divine Word College of Legazpi, specifically those enrolled in the first semester of the academic year 2024-2025. These participants were selected due to their relevance to the subject matter, as they are future language teachers to teach vocabulary. Based on the college registrar's data, there were 33 English major students enrolled in the present semester who took part in the study.

## Instrumentation

The researcher developed a researcher-made survey questionnaire to gather data from the respondents. The questionnaire focused on the demographic profiles of the respondents, considering age, sex, year level, and student type, their perceptions of general pedagogical knowledge (GPK) on teaching vocabulary skills through gamification in terms of context clues, collocations, idiomatic expressions, and sentence usage, as well as the significant difference between the demographic profile of the respondents and the English Majors' perceptions of general pedagogical knowledge (GPK) on teaching vocabulary skills through gamification. Once the responses were collected, the researcher analyzed the data through frequency, percentage distributions, rank, t-test, and ANOVA. From the analysis, the researcher proposed an output.

Nevertheless, the researcher, with the assistance of the adviser, drafted the survey questionnaire to address the various issues covered and the problems in the study. The drafted survey questionnaire was checked by three English professors for evaluation and critique and underwent revisions on the format and content before creating the final form copy. Based on the corrections, the preliminary copies were prepared through a Google Form document and once checked by the adviser to ensure validity and determine the accuracy and clarity of the instrument.

After this, the vague and unclear portions of the instrument were revised with the final approval of the adviser before it was distributed for the actual survey to the respondents of the study.

## Validation and Test of Reliability of Instrument

The study utilized a researcher-made survey questionnaire as the instrument to ascertain that the data accumulated provided the researcher with significant information about the problem of the study. Since the study used a researcher-made instrument, there were potential validity issues. To address these concerns, the instruments were subject to a content validity assessment. Three English professors were asked to assist the researcher in validating the tools and utilizing the instrument produced.

## Data Gathering Procedure

After subjecting the instrument to validation and finality, it was ready for administration. Before the administration, a letter of request was sent to the School President through the Dean of the School of Education, Arts, and Sciences and the Vice President for Academic Affairs for approval to conduct the study. The researcher administered the survey questionnaire through a Google Form document and sent it to the Messenger group chat with the researcher and all the respondents. Before administering the instrument, the researcher conducted a brief orientation about the survey and the study undertaking. The survey questionnaires were then sent by the



researcher to the identified respondents. Retrieval of the answered questionnaires was done a week after the administration. Afterward, the data gathered from the respondents were collated, tallied, and analyzed for statistical interpretation.

### Statistical Treatment of Data

Statistical tools were utilized to analyze the data gathered from the respondents. The use of statistical tools depended on the nature of the data. In the study, the data gathered by the researcher were analyzed through frequency, percentage distributions, and rank to determine the demographic profile of the respondents and their perceptions of General Pedagogical Knowledge (GPK) in teaching vocabulary through gamification. The Likert Scale was used to determine the perceptions of English majors on General Pedagogical Knowledge (GPK) in teaching vocabulary through gamification. Moreover, t-test and ANOVA were employed to identify the significant difference between the demographic profile and the perceptions of the respondents. Furthermore, proposed output was identified from the tools and results.

### Ethical Considerations

In compliance with RA 10173 or the Data Privacy Act of 2021, the researcher asked for consent from the respondents to participate in the study. Moreover, participants were assured that their records and personal information would remain confidential.

## III. RESULTS AND DISCUSSIONS

### 1. Demographic Profile (Age, Sex, Year Level, and Student Type)

This section presents the demographic profile of the respondents in terms of age, sex, year level, and student type.

Table 1 shows the demographic profile of the respondents specifically in age which reveals that the majority, 28 respondents, or 84.85%, are 18-22 years which ranks 1st, followed by 5 respondents, or 15.15% who are over 22 years old which ranks 2nd, while no respondents, or 0%, fall below 18 years, which ranks 3rd. In terms of sex, most participants are female, with 21 respondents or 63.64% which ranks 1st, followed by males with 10 respondents or 30.30% which ranks 2nd, and a smaller group of 2 respondents, or 6.06% who preferred not to disclose their sex which ranks 3rd. Regarding year level, first-year students represent the largest group with 13 respondents or 39.39% which ranks 1st, followed by both second-year and third-year students with 7 respondents or 21.21% each which ranks 2, and fourth-year students with 6 respondents or 18.18%, which ranks 3rd, while no respondents are fifth-year students which rank 4th. Additionally, regular students constitute the majority, with 26 respondents or 78.79% which ranks 1st, while irregular students account for 7 respondents or 21.21% which ranks 2nd.

These findings indicate that the common respondent is an 18-22-year-old female, first-year, and regular student who provides a clear demographic profile for the study.

The results indicate that the majority of respondents are within the typical college-age bracket of 18-22 years, which suggests that the findings of the study are evident in the perceptions and experiences of young adult learners. The majority of female participants highlight potential gendered perspectives that may influence attitudes or engagement with the subject matter. The high number of first-year students suggests that the outcomes of the study may be more relevant to those in the early stages of their academic journey which emphasizes the need for necessary interventions or programs suitable for this demographic. Furthermore, the prevalence of regular students implies that the study primarily gains the experiences of those following a standard academic trajectory, which may exclude insights from students with irregular academic patterns. These implications should be considered in the interpretation of results and the formulation of recommendations to ensure they address the needs of diverse learner groups effectively.

The findings stated link to the study of Azizah, B. S. H., et. al (2023), which adapted a systematic literature review on the impact of gamification in vocabulary learning through learners' demographics. It emphasized the possible variations of demographics to the result of the impact, but did not necessitate a common result in other areas. This is relative to the study of Tamtama, G. I. W, Suryanto, P., & Suyoto, S. (2020), which stresses that the utilization of gamification in varied contexts is more concerning than the varied demographics. This simply implies that the application of gamification matters beyond other factors.

**Table 1: Demographic Profile of the Respondents**

Demographic Profile	Number	Percentage	Rank
<b>Age</b>			
Below 18	0	0%	3
18-22	28	84.85%	1
Over 22	5	15.15%	2
<b>Total</b>	<b>33</b>	<b>100%</b>	
<b>Sex</b>			
Male	10	30.30%	2



Female	21	63.64%	1
Prefer not to say	2	6.06%	3
<b>Total</b>	<b>33</b>	<b>100%</b>	

## Year Level

1 <sup>st</sup>	13	39.39%	1
2 <sup>nd</sup>	7	21.21%	2
3 <sup>rd</sup>	7	21.21%	2
4 <sup>th</sup>	6	18.18%	3
5 <sup>th</sup>	0	0%	4
<b>Total</b>	<b>33</b>	<b>100%</b>	

## Student Type

Regular	26	78.79%	1
Irregular	7	21.21	2
<b>Total</b>	<b>33</b>	<b>100%</b>	

## 2. Perceptions on General Pedagogical Knowledge in Teaching Vocabulary through Gamification

This section presents the perceptions of the respondents on General Pedagogical Knowledge in teaching vocabulary through gamification.

Table 2 shows that the respondents perceive gamification as highly effective in enhancing their ability to use context clues in teaching vocabulary, with weighted means ranging from 3.40 to 3.55, all interpreted as *"Strongly Agree."* The highest mean of 3.55 indicates that gamified activities help respondents connect context clues more easily to unfamiliar words, while the lowest mean of 3.40 reflects the role of gamification in encouraging learners to actively search for context clues during reading. These results highlight the strong impact of gamification on improving comprehension and practical application of context clues.

This finding suggests that while gamification effectively supports contextual vocabulary learning, variations in engagement levels may exist based on the nature of the activity or learner preferences. Generally, the results feature the strong impact of gamification on improving vocabulary acquisition by fostering an interactive and context-driven learning

environment. The consistently high ratings affirm that integrating gamified strategies into vocabulary instruction enhances both comprehension and practical application, making the learning process more engaging and effective.

**Table 2. Perceptions on General Pedagogical Knowledge in Teaching Vocabulary through Gamification (Context Clues)**

Vocabulary Learning Strategies	Weighted Mean	Verbal Interpretation
Context Clues		
1. Gamification enhances my ability to determine word meanings using context clues.	3.47	Strongly Agree
2. Gamified activities help me apply context clues in practical situations.	3.47	Strongly Agree
3. Gamified lessons improve my comprehension skills by emphasizing context clues.	3.5	Strongly Agree
4. Gamification encourages me to search for context clues while reading.	3.4	Strongly Agree
5. Gamified activities help me connect context clues easier to unfamiliar words through gamified activities.	3.55	Strongly Agree
<b>Average</b>	<b>3.48</b>	<b>Strongly Agree</b>

*Legend: 1.00-1.75= Strongly Disagree, 1.76-2.50= Disagree, 2.51-3.25= Agree, 3.26-4.00= Strongly Agree*

Table 3 reveals that gamification also significantly enhances understanding and use of collocations, with weighted means ranging from 3.23 to 3.42, all verbally interpreted as *"Strongly Agree."* The highest mean of 3.42 shows that interactive gamified exercises effectively teach collocations, while the lowest mean of 3.23 indicates that gamification helps learners distinguish between commonly confused collocations and provides examples of proper word pairings. These findings suggest that gamified approaches aid in building confidence and practical skills in using collocations.

These results highlight the role of gamification in reinforcing natural language use by promoting repeated exposure to word pairings in meaningful contexts. Through engaging activities such as matching games, interactive quizzes, and real-life simulations, learners can internalize collocations more effectively, leading to improved fluency and accuracy in their vocabulary use. Given the importance of collocations in language proficiency, integrating gamified strategies in vocabulary instruction may serve as a valuable tool for enhancing both comprehension and long-term retention.

Moreover, the interactive nature of gamification fosters a more learner-centered approach that encourages students to take an active role in their vocabulary development. Unlike traditional rote memorization techniques, gamified learning environments provide immediate feedback, allowing learners to recognize errors and make necessary adjustments in real-time. This adaptive learning process enhances engagement and promotes deeper cognitive processing, which is essential for mastering collocations.

**Table 3. Perceptions on General Pedagogical Knowledge in Teaching Vocabulary through Gamification (Collocations)**

Vocabulary Learning Strategies	Weighted Mean	Verbal Interpretation
Collocations		
1. Gamification enhances my understanding of collocations through interactive exercises.	3.42	Strongly Agree
2. Learning collocations through games improves my writing and speaking skills.	3.32	Strongly Agree
3. Gamified tasks provide clear examples of proper word pairings (collocations).	3.23	Strongly Agree
4. Gamified lessons make me confident to distinguish between commonly confused collocations after gamified lessons.	3.23	Strongly Agree

5. Activities such as matching collocations in games help me understand word pairings effectively. 3.38 Strongly Agree

<b>Average</b>	<b>3.32</b>	<b>Strongly Agree</b>
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Legend: 1.00-1.75= Strongly Disagree, 1.76-2.50= Disagree, 2.51-3.25= Agree, 3.26-4.00= Strongly Agree

Table 4 presents that the respondents find gamified activities helpful for learning idiomatic expressions, as reflected by weighted means between 3.27 and 3.39, all interpreted as "Strongly Agree." The highest mean of 3.39 reveals that gamification helps learners understand idiomatic expressions within their cultural context, while the lowest mean of 3.27 indicates its role in facilitating the natural application of idioms. This suggests that gamification effectively supports both comprehension and usage of idiomatic expressions.

Beyond improving comprehension, gamified activities also provide learners with opportunities for contextualized practice that allow them to encounter idiomatic expressions in simulated real-world scenarios. This hands-on approach reduces the risk of memorization without understanding, as students actively engage with idioms in meaningful conversations and interactive tasks. By integrating idioms into storytelling, role-playing games, and problem-solving exercises, gamification enables learners to grasp both the literal and figurative meanings of expressions, making their usage more intuitive and natural.

Moreover, the findings highlight the importance of cultural awareness in language learning, as idiomatic expressions are often deeply rooted in cultural contexts. Gamification allows educators to present idioms alongside visual, auditory, and situational cues that reflect their authentic usage. This approach enhances linguistic competence and intercultural communication skills, as learners become more adept at interpreting and using idioms appropriately in different social and cultural settings. Generally, this proves that gamification influences idiomatic expression retention over time and its applicability in diverse linguistic backgrounds.

**Table 4. Perceptions on General Pedagogical Knowledge in Teaching Vocabulary through Gamification (Idiomatic Expressions)**

Vocabulary Learning Strategies	Weighted Mean	Verbal Interpretation
Idiomatic Expressions		

1. Gamified activities make it easier to learn and recall idiomatic expressions.	3.33	Strongly Agree
2. Gamification helps me understand idiomatic expressions in their cultural context.	3.39	Strongly Agree
3. Gamified lessons help me become more confident in using idiomatic expressions.	3.31	Strongly Agree
4. Games improve my ability to identify idiomatic expressions in conversations and texts.	3.31	Strongly Agree
5. Gamification allows me better apply idiomatic expressions naturally.	3.27	Strongly Agree

<b>Average</b>	<b>3.32</b>	<b>Strongly Agree</b>
<i>Legend: 1.00-1.75= Strongly Disagree, 1.76-2.50= Disagree, 2.51-3.25= Agree, 3.26-4.00= Strongly Agree</i>		

Table 5 displays that in terms of sentence usage, gamification is perceived to improve vocabulary application and grammar understanding, with weighted means ranging from 3.30 to 3.43, all interpreted as "Strongly Agree." The highest mean of 3.43 highlights that gamified activities boost learners' confidence in constructing sentences, while the lowest mean of 3.30 reflects its role in improving vocabulary use across various contexts. These findings indicate that gamification improves both linguistic accuracy and flexibility in sentence construction.

Beyond enhancing confidence, gamification encourages active experimentation with sentence structures that allow learners to apply new vocabulary and grammatical rules in engaging, low-stakes environments. Through interactive exercises such as sentence-building games, timed challenges, and collaborative storytelling, students can refine their language skills while receiving instant feedback. This iterative learning process helps them identify and correct errors in real-time, reinforcing proper sentence construction and deepening their understanding of grammar and syntax.

Additionally, the results emphasize the adaptability of gamified learning to various proficiency levels, as gamification can scaffold sentence construction exercises to match learners' linguistic competencies. By gradually increasing complexity—from simple sentence formation to more advanced syntactic patterns—gamified activities cater to both beginner and advanced learners, ensuring a more personalized and effective learning experience. .

**Table 5. Perceptions on General Pedagogical Knowledge in Teaching Vocabulary through Gamification (Sentence Usage)**

Vocabulary Learning Strategies	Weighted Mean	Verbal Interpretation
Sentence Usage		
1. Gamified improves my ability to use new vocabulary in formal and informal contexts.	3.30	Strongly Agree
2. Gamified learning activities allow me to construct sentences more confidently.	3.43	Strongly Agree
3. Gamified exercises help me understand grammar and sentence structure better.	3.42	Strongly Agree



4. Games motivate me to use new vocabulary in different sentence types. 3.42 Strongly Agree

5. Gamified activities allow me to identify and correct sentence errors effectively. 3.40 Strongly Agree

Average	3.40	Strongly Agree
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*Legend: 1.00-1.75= Strongly Disagree, 1.76-2.50= Disagree, 2.51-3.25= Agree, 3.26-4.00= Strongly Agree*

The data suggests that gamification is a highly effective strategy for enhancing various aspects of vocabulary learning, including context clues, collocations, idiomatic expressions, and sentence usage. The consistently high-weighted means demonstrate strong positive perceptions of gamification as a learning strategy to improve vocabulary skills. These findings imply that incorporating gamified approaches into teaching methods can significantly enhance students' engagement and mastery of vocabulary in practical and meaningful ways.

The findings stated link to the study of Mubarak, A. (2023), which found the high potential of the effectiveness of gamification in classrooms through technological platforms that largely affected learners' academic success. Similarly, Tumsky (2019) highlights the learners' perception of gamification as advancing learning competencies that led to providing developed courses focusing

### 3. Significant Differences between the Demographic Profile of the Respondents and Their Perceptions on General Pedagogical Knowledge in Teaching Vocabulary through Gamification

The analysis revealed no statistically significant differences between the demographic profiles of the respondents and their perceptions of general pedagogical knowledge in teaching vocabulary through gamification. Specifically, the p-values for age (.562), sex (.519), year level (.222), and student type (.131) were all greater than the significance level of .05, failing to reject the null hypothesis in all cases. This indicates that age, sex, year level, and student type do not significantly influence how respondents perceive general pedagogical knowledge. The use of t-tests and ANOVA further confirmed the consistency of perceptions across these

demographic variables which demonstrates that the respondents' perceptions are not shaped by their demographic differences.

The findings imply that the effectiveness and perceptions on general pedagogical knowledge in teaching vocabulary through gamification may be universally applicable to diverse student demographics. This uniformity suggests that gamified pedagogical approaches could be implemented without the need for significant demographic-based customization to account for inclusivity and broad applicability. Moreover, the results support the idea that demographic factors such as age, sex, year level, and student type may not hinder the acceptability or understanding of gamified teaching strategies which potentially makes these methods adaptable for various student groups in educational settings. These findings emphasize the potential of gamification as an equitable teaching tool in vocabulary development.

The findings stated link to the study of Heilman, M. Collins-Thompson, K., Callan, J., Eskenazi, M. Juffs, A., & Wilson, L. (2023), which discusses that regardless of the significant differences, whether with or without, in the demographic profile of learners with the effectiveness of gamification in education, it will always consider the benefits of vocabulary practice based on the learners' primary experiences more than the specific demographics. This is supported by the study of Sural U. & Saglik Z., which emphasizes the impact of gamification on learners' language learning engagement and vocabulary engagement with no consideration of their demographics.

**Table 6: Significant Differences between the Demographic Profile of the Respondents and Their Perceptions on General Pedagogical Knowledge in Teaching Vocabulary through Gamification**

Demographic Profile	<i>p-value</i> (Significance)	Ho	VI	Statistical Test
Age	.562	FA	NS	t-test
Sex	.519	FA	NS	ANOVA
Year Level	.222	FA	NS	ANOVA
Student Type	.131	FA	NS	t-test

*Legend: Ho= Null Hypothesis, Vi=Verbal Interpretation, FR= Failed to Reject, NS=Not Significant*

#### 4. Proposed Output

## Action Plan on Gamified Vocabulary Learning (GVL) Program for College Students

Key Result Areas (KRAs)	Objectives	Activities	Persons Involved	Budgetary Requirements	Time Frame	Expected Outcome
<b>W.I.N.</b> - Words In New Ways: Interactive Vocabulary Games	-To design engaging activities focusing on specific vocabulary skills.	- Context clues: Hunts and puzzles. - Collocations: Matching games. - Idiomatic expressions: Role-playing tasks. - Sentence usage: Grammar challenges.	Teachers, Students, IT Staff	Php 25,000	August-September 2025	Students gain proficiency in context-based vocabulary usage and improve adaptability.
<b>T.E.C.H.</b> - Teaching, Engaging, and Creating through Hacks: Technology Integration	-To integrate gamification on platforms for real-time feedback and tracking.	- Use digital tools (e.g., Kahoot, Quizizz). - Develop a custom feedback app to monitor student progress.	Teachers, IT Staff	Php 50,000	September-October 2025	Real-time monitoring of progress and personalized learning paths for students.

<b>C.A.R.E.</b> - Customizing And Reinforcing Education: Customization & Inclusivity	-To reinforce gamified activities for diverse student needs and preferences.	-Adapt difficulty levels and themes.  -Create culturally relevant idiomatic expression modules.	Teachers, Curriculum Designers	Php 25,000	October-November	Improved engagement and accessibility for students of all backgrounds.
<b>T.R.A.I.N.</b> - Teaching Resources And Innovative Narratives: Training for Educators	-To train English educators with gamification techniques and tools.	- Conduct workshops on gamified teaching strategies.  -Provide manuals and demo sessions.	Educators, Resource Persons	Php 50,000	November-December 2025	Educators effectively integrate gamification into their teaching practices.
<b>R.E.W.A.R.D.</b> - Recognition Elevates With Achievements and Rewarding Development: Recognition & Motivation	-To encourage participation and sustained engagement.	- Implement leaderboards and reward systems.  -Organize monthly recognition for top performers.	Teachers, Students	Php 25,000	December 2025	Increased motivation and participation among students.

The proposed action plan for the Gamified Vocabulary Learning (GVL) Program, built around the key result areas of W.I.N., T.E.C.H., C.A.R.E., T.R.A.I.N., and R.E.W.A.R.D. which focuses on creating an engaging, inclusive, and effective vocabulary learning environment for learners. Each key result area (KRA) is designed to address specific challenges and

opportunities in vocabulary acquisition, integrating technology, customization, and recognition to optimize learning outcomes.

The W.I.N. KRA focuses in designing interactive vocabulary games that promote the application of vocabulary through context-based activities. The activities include scavenger hunts and puzzles for context clues, matching games for collocations, role-playing tasks for idiomatic expressions, and grammar challenges for sentence usage. These games encourage active participation, making vocabulary learning more dynamic and enjoyable.

This area aims to enhance learners' ability to use new words appropriately within different contexts, helping them gain proficiency in vocabulary usage. These games are expected to boost students' adaptability, allowing them to apply their vocabulary knowledge in real-life situations. With a budget of Php 25,000 allocated for resources and game development, this KRA will run from August to September 2025.

To complement the interactive games, the T.E.C.H. KRA focuses on integrating gamification platforms such as Kahoot and Quizizz into the learning process for real-time feedback and tracking of student progress. By leveraging digital tools, students can engage in immediate assessments and receive personalized feedback that aligns with their learning pace.

In addition, a custom feedback app will be developed to monitor learner progress in a more detailed and individualized manner. This technological integration aims to adopt personalized learning paths for each learner which ensures that no learner is left behind. The program will run from September to October 2025, with a budget of Php 50,000 to cover the costs of digital tools and app development. The anticipated result is that real-time monitoring will enable teachers to adjust instruction as needed.

The C.A.R.E. KRA emphasizes customization and inclusivity that reinforces gamified activities that cater to diverse student needs and preferences. This KRA will involve adapting the difficulty levels of games and activities, as well as designing culturally relevant idiomatic expression modules that reflect students' backgrounds and experiences.

This area aims to improve engagement by ensuring that the content resonates with all students, regardless of cultural background or learning style. Customization helps make learning more accessible and meaningful, enhancing overall student engagement. The budget for this initiative is Php 25,000, and it will take place from October to November 2025. The expected outcome is an increase in student participation and improved learning outcomes for students from diverse backgrounds.

Effective implementation of gamification strategies requires well-trained educators. The T.R.A.I.N. KRA aims to equip English educators with the skills and knowledge necessary to integrate gamification techniques into their teaching practices. This will be achieved through workshops on gamified teaching strategies and providing educators with manuals and demo sessions to guide them in applying these tools effectively.

By enhancing educators' competency in gamified teaching, this KRA supports long-term sustainability of the program. The initiative will run from November to December 2025, with a budget of Php 50,000 allocated for workshop expenses and resource materials. This opts to

equip educators to use gamification in their classrooms and lead them to more engaging and effective vocabulary instruction.

To maintain high levels of student participation and motivation, the R.E.W.A.R.D. KRA focuses on recognizing and rewarding students' achievements. The program will feature leaderboards, reward systems, and monthly recognition events for top performers. This continuous recognition provides a competitive yet supportive learning environment that motivates students to stay engaged and improve their vocabulary skills.

By acknowledging students' efforts and progress, the program encourages ongoing participation and achievement. With a budget of Php 25,000, the recognition activities will take place throughout December 2025, creating an exciting and motivating environment for students. The expected outcome is a significant increase in student motivation and sustained engagement throughout the learning process.

This action plan addresses key aspects of vocabulary learning, from interactive game-based activities to personalized feedback and educator training, all while emphasizing inclusivity and motivation. By integrating these elements, the program aims to create a holistic and engaging learning environment that enhances students' vocabulary acquisition and supports their academic growth. The outlined activities and expected outcomes, along with the budget and timeframes, ensure a structured and sustainable approach to achieving the goals of the gamified vocabulary learning program.

This is aligned with the Scaffolding-Based Mindful Theory for Gamified Learning Classrooms as cited in the study by Chen Y., Hou H., & Wu C., (2022). The program considers gamified approaches where scaffolding is vital in the instructional design similar to the stated theory. It points out the guides for creating and implementing gamified learning interventions that aim to improve vocabulary skills through effective teaching strategies. This sums up the notion that through gamification interventions, learners participate and learn more effectively out of the systematic learning approaches as probed by Criollo-C S., Guerreto-Arias, A. Jaramillo-Alcazar A., & Lujan-Mora S. (2021).

## SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

### FINDINGS

Based on the analysis and interpretation of the data, the following findings were revealed:

1. The majority of respondents are 18-22 years old (84.85%), female (63.64%), first-year students (39.39%), and regular students (78.79%). This demographic profile indicates that the study predominantly represents young adult learners, especially those in the early stages of their academic journey, with a higher proportion of females and regular students.



2. The respondents perceived gamification as highly effective with a verbal interpretation of *“Strongly Agree”* in improving vocabulary skills, particularly in areas such as context clues (mean: 3.55), collocations (mean: 3.42), idiomatic expressions (mean: 3.39), and sentence usage (mean: 3.43). These findings show that gamification plays a significant role in enhancing vocabulary acquisition which helps learners grasp complex vocabulary concepts more interactively and engagingly.
3. The study revealed no significant differences in the perceptions of gamification based on demographic factors such as age, sex, year level, or student type. The p-values for these categories were all greater than 0.05 which indicates that gamification is equally effective for all students, regardless of these demographic variables. This reveals a universal appeal and effectiveness of gamification in vocabulary instruction across different student groups.
4. The proposed Gamified Vocabulary Learning (GVL) Program highlighted the integration of key result areas that largely integrate digital learning tools for real-time feedback and personalized learning experiences. These technological tools make learning more engaging, which helps learners stay motivated and actively participate in vocabulary learning while receiving immediate feedback on their progress.

## CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. The findings reflect a homogeneous group of participants that focuses on young adult learners, predominantly female, first-year students, and regular students. This demographic profile indicates that the study's outcomes may be more applicable to this specific group, which could influence the interpretation of results and the design of future interventions or educational programs targeting this learner profile.
2. The positive feedback from the English major students on gamification's impact in areas such as context clues, collocations, idiomatic expressions, and sentence usage implies that gamification is an effective method for enhancing vocabulary learning. The interactive nature of gamified activities promotes deeper engagement, which in turn leads to better vocabulary retention and application.
3. Since there were no significant differences in the perceptions of gamification based on demographic factors, it can be concluded that gamification is universally applicable and beneficial for all student groups. This means that gamified approaches to teaching vocabulary can be widely implemented without needing to associate them with specific demographic categories.
4. The use of an educational program for vocabulary learning through the integration of digital learning platforms may enhance the effectiveness of gamified learning. This provides real-time feedback and creates personalized learning accessibility for learners, which increases engagement and makes vocabulary learning more interactive. The integration of technology in gamification is essential for maximizing its potential benefits.

## RECOMMENDATIONS

Based on the conclusions of the study, the following recommendations were considered:

1. Future studies or programs may consider diversifying their participant group to include a broader range of age groups, gender distributions, year levels, and student types. This would ensure that the findings are more representative of the wider student population and provide insights that apply to various learner demographics, including those with irregular academic paths or different year levels.
2. Based on the positive perceptions of gamification in vocabulary learning, educational institutions, especially Higher Educational Institutions (HEIs), must broaden the use of gamified learning strategies across other courses. By integrating gamification into various subjects, students can experience its benefits in multiple contexts, improving their engagement and vocabulary acquisition in a variety of academic settings.
3. Although the study found no significant demographic differences in perceptions, educators should still customize gamified activities to cater to diverse learning preferences. Adapting game difficulty levels, incorporating relevant themes, and ensuring cultural relevance can further enhance engagement and make learning more accessible for all students.
4. To effectively implement gamification programs, it is essential to equip educators with the necessary skills and knowledge to integrate gamified strategies into their teaching. Professional development programs, such as the Gamified Vocabulary Learning (GVL) Program with digital technology tools, should be provided to ensure that educators can effectively engage students and create meaningful and effective learning experiences.

## REFERENCES

- Alessa I. & Hussein S. (2023). Using Traditional and Modern Teaching Methods on the Teaching Process from Teachers' Own Perspective. [https://www.ressjournal.com/Makaleler/1261510042\\_4.pdf](https://www.ressjournal.com/Makaleler/1261510042_4.pdf)
- Amos N., & Abas I. (2021). An Investigation on the Comprehension of English Idioms Among Moi Primary School Children in Nairobi. <https://files.eric.ed.gov/fulltext/EJ1316240.pdf>
- Azizah, B. S. H., et al. (2023). Systematic Literature Review: The Impact of Vocabulary Games Improving Students' Vocabulary. Azizah | Seminar Nasional Paedagogia. <https://journal.ummat.ac.id/index.php/fkip/article/view/16308>

Belet Boyacı, Ş. D. & Genç Ersoy, B. (2021). Devising Gamification for Vocabulary Development and Motivation: An Experimental, Mixed-Model Study . International Technology and Education Journal , 5 (1) , 32-49 .  
<https://dergipark.org.tr/en/pub/itej/issue/75132/1233241>

Boyinbode, O. & Tiamiyu A. (2022). A Mobile Gamification English Vocabulary Learning System for Motivating English Learning. <https://www.iosrjournals.org/iosr-jmca/papers/Vol7-Issue6/Series-1/E07062843.pdf>

Brühwiler C. & Hollenstein L. (2024) The importance of teachers' pedagogical-psychological teaching knowledge for successful teaching and learning, Journal of Curriculum Studies, 56:4, 480-495. DOI: 10.1080/00220272.2024.2328042

Bui, L. (2021). The Role of Collocations in the English Teaching and Learning.  
<https://eoi.citefactor.org/10.11250/ijte.01.02.006>

Castillo-Cuesta, L. (2020). Using Digital Games for Enhancing EFL Grammar and Vocabulary in Higher Education. International Journal of Emerging Technologies in Learning (iJET), 15(20), 116-129. Kassel, Germany: International Journal of Emerging Technology in Learning.  
<https://www.learntechlib.org/p/218312/>.

Criollo-C, S., Guerrero-Arias, A., Jaramillo-Alcázar, Á., & Luján-Mora, S. (2021). Mobile learning Technologies for Education: benefits and pending issues. Applied Sciences, 11(9), 4111. <https://doi.org/10.3390/app11094111>

Education GPS, OECD . (2024). Student Performance (PISA 2022).  
<http://gpseducation.oecd.org>

Elleman, A. M., Lindo, E. J., Morphy, P., & Compton, D. L. (2019). The Impact of Vocabulary instruction on Passage-Level Comprehension of School-Age Children: A Meta-Analysis. Journal of Research on Educational Effectiveness, 2(1), 1–44.  
<https://doi.org/10.1080/19345740802539200>

Ersoy G., Berrin, Boyaci B., and Dilek (2021). Devising Gamification for Vocabulary Development and Motivation: An Experimental, Mixed-Model Study. <https://eric.ed.gov/?q=Use%20of%20gamification%20tonimprove%20english%20vocabulary&id=EJ1312889&fbclid=IwAR3ZUVOMpWLTZKsN30UsdiFoA05KKsBYcTxX7iwuNvfNVnroM0afu-EGnHc>

Fithriani, R. (2021). The Utilization of Mobile-assisted Gamification for Vocabulary Learning; Its' Efficacy and Perceived Benefits. [http://callej.org/journal/22-3/Fithriani2021.pdf?fbclid=IwAR2O3-DbveZJ6CtmOlBDLilbk3VxB6xrq\\_qRa2B3BPWynig4SbICNxbWTU](http://callej.org/journal/22-3/Fithriani2021.pdf?fbclid=IwAR2O3-DbveZJ6CtmOlBDLilbk3VxB6xrq_qRa2B3BPWynig4SbICNxbWTU)

Fultz C. (2021). Vocabulary Knowledge - Informed literacy. <https://informedliteracy.com/vocabulary-knowledge/>

Hazar E. (2020). Use of Digital Games in Teaching Vocabulary to Young Learners. <https://files.eric.ed.gov/fulltext/ED616041.pdf>

Heilman, M., Collins-Thompson, K., Callan, J., Eskénazi, M., Juffs, A., & Wilson, L. (2023). Personalization of reading passages improves vocabulary acquisition. *Artificial Intelligence in Education*, 20(1), 73–98. <https://doi.org/10.3233/jai-2010-0003>

Jurado J. & Ponce E. (2021). If you Say that Idioms Should be Learned, then Why don't you Teach them? A Case Study of In-service EFL Teachers. [https://www.mextesol.net/journal/index.php?page=journal&id\\_article=25316](https://www.mextesol.net/journal/index.php?page=journal&id_article=25316)

Lawrence J., Knoph R., McIlraith A., Kulez P., & Francis D. (2021). Reading Comprehension and Academic Vocabulary: Exploring Relations of Item Features and Reading Proficiency. <https://files.eric.ed.gov/fulltext/ED642552.pdf>

Li, R. (2021). Does Game-Based Vocabulary Learning APP influence Chinese EFL learners' vocabulary achievement, motivation, and Self-Confidence? *SAGE Open*, 11(1), 215824402110030. <https://doi.org/10.1177/21582440211003092>

Ling, N. & Abdul A. (2022). The Effectiveness of Game-based Learning Strategies on Primary ESL Learners' Vocabulary Learning. *International Journal of Academic Research in Progressive Education and Development*. 11. 10.6007/IJARPED/v11-i2/13266.

Mauliza, R. Samad, I. & Erdiana, N. (2019). The implementation of context Clues strategy in inferring the meaning of unknown vocabulary to improve reading skill. Mauliza | Research in English and Education Journal. <https://jim.usk.ac.id/READ/article/view/12274>

Marpaung M. & Situmeang H. (2020). Enhancing Students' Vocabulary through Authentic Materials and Multimedia. <https://files.eric.ed.gov/fulltext/EJ1297686.pdf>

Mirzoyeva L., and Kabdrgalinova S. (2021) Use of Online Gamification Platform in Vocabulary Learning. [https://dl.acm.org/doi/fullHtml/10.1145/3492547.3492646?fbclid=IwAR0hKu7Ok7mNLsFkCPB0NuCPDD3GbOZv0kuUkbm4azOhgE\\_oj6jokJLX5t0](https://dl.acm.org/doi/fullHtml/10.1145/3492547.3492646?fbclid=IwAR0hKu7Ok7mNLsFkCPB0NuCPDD3GbOZv0kuUkbm4azOhgE_oj6jokJLX5t0)

Moon Y. & Kang Y. (2022). Does Reading Mediate the Relation Between Productive Vocabulary and Writing or Is It the Other Way Around? [http://journal.kate.or.kr/wp-content/uploads/2023/12/78\\_4\\_10.pdf](http://journal.kate.or.kr/wp-content/uploads/2023/12/78_4_10.pdf)

Mubarak, A. (2023) Using Story Driven Game to Improve Students' Vocabulary Mastery. <http://repository.ar-raniry.ac.id>

Pascual L., Dionisio G., & Ilustre R. (2022). Vocabulary Acquisition and Learning Strategies in Second Language Learning: A Review Paper. [https://www.researchgate.net/publication/362036405\\_Vocabulary\\_Acquisition\\_and\\_Learning\\_Strategies\\_in\\_Second\\_Language\\_Learning\\_A\\_Review\\_Paper/references](https://www.researchgate.net/publication/362036405_Vocabulary_Acquisition_and_Learning_Strategies_in_Second_Language_Learning_A_Review_Paper/references)

Rachman, A. et al. (2024). Exploring The Potential Of Mobile-Assisted Language Learning (Mall) Applications In Developing English Vocabulary Skills. *Journal on Education*. 01. 4467-4474.

Rafatbakhsh, E., & Ahmadi, A. (2019). A thematic corpus-based study of idioms in the Corpus of Contemporary American English. *Asian-Pacific Journal of Second and Foreign Language Education*, 4(1). <https://doi.org/10.1186/s40862-019-0076-4>

Rafique, S., Waqas, A. & Shahid, C. (2023). The Correlation between Vocabulary Knowledge and English Language Proficiency at Undergraduate Level. *Pakistan Journal of Humanities and Social Sciences*. 11. 10.52131/pjhss.2023.1102.0422.

San Juan, R. (2019). DepEd welcomes PISA results, recognizes “gaps” in education quality. *Philstar.com*. <https://www.philstar.com/headlines/2019/12/04/1974229/depd-welcomes-pisa-results-recognizes-gaps-education-quality>

Samortin M. (2020). Effects of Gamified Learning Activities in Enhancing Junior High School Students' English Vocabulary Retention. <https://www.feu.edu.ph/index.php/institutes/institute-of-education/asian-journal-on-perspectives-in-education/ajpe-volume-1-issue-1/effects-of-gamified-learning-activities-in-enhancing-junior-high-school-students-english-vocabulary-retention/>

Smiderle, R., Rigo, S.J., Marques, L.B. et al. The impact of gamification on students' learning, engagement and behavior based on their personality traits. *Smart Learn. Environ.* 7, 3 (2020). <https://doi.org/10.1186/s40561-019-0098-x>

Seranmadevi, R. (2019). Gamification – An Innovative Business Strategy. *Think India Journal - Vichar Nyas Foundation*. <https://thinkindiaquarterly.org/index.php/think-india/article/view/11344>

Sural, Ü. Ç., & Sağlık, Z. Y. (2024). Next-generation learning experience: The effect of technology-assisted and printed context-based vocabulary activities on vocabulary knowledge and learning motivation. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-024-12688-x>

Tamtama, G. I. W., Suryanto, P., & Suyoto, S. (2020). Design of English Vocabulary Mobile Apps using Gamification: An Indonesian case study for Kindergarten. *International Journal of Engineering Pedagogy (iJEP)*, 10(1), 150. <https://doi.org/10.3991/ijep.v10i1.11551>



Thiagarajah, K., Ng, M. M., Jeyaraja, S. S. B., Gunasehgaran, V., & Maniam, M. (2022). Effectiveness of gamification tool in teaching vocabulary. *International Journal of Academic Research in Business & Social Sciences*, 12(9). <https://doi.org/10.6007/ijarbss/v12-i9/14604>

Tumskiy, S. (2019). THE USE OF LEARNING MANAGEMENT SYSTEMS IN THE TEACHING OF ENGLISH TO HIGH-LEVEL LEARNERS AT TERTIARY LEVEL. *INTED Proceedings*. <https://doi.org/10.21125/inted.2019.0915>

Waluyo, B., and Bakoko R. (2021) Vocabulary List Learning Supported by Gamification: Classroom Action Research Using Quizlet. [https://www.academia.edu/45661115/Vocabulary\\_List\\_Learning\\_Supported\\_by\\_Gamification\\_Classroom\\_Action\\_Research\\_Using\\_Quizlet](https://www.academia.edu/45661115/Vocabulary_List_Learning_Supported_by_Gamification_Classroom_Action_Research_Using_Quizlet)

Xi, N., & Hamari, J. (2019). Does gamification satisfy needs? A study on the relationship between gamification features and intrinsic need satisfaction. *International Journal of Information Management*, 46, 210–221. <https://doi.org/10.1016/j.ijinfomgt.2018.12.002>

Zhang L. (2020). The Significance of Collocational Knowledge for Learners of English and Teaching Implications. 10.2991/assehr.k.201127.048.