Exploring the Relationship between Vocabulary Size and Reading Comprehension: A Study Based on VLT and PET Scores among Mongolian University Students

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ABSTRACT

This study investigates the relationship between vocabulary size and reading comprehension among 75 Mongolian university students using Paul Nation's Vocabulary Levels Test (VLT) and the PET reading test. The aim was to determine whether students' receptive vocabulary knowledge predicts their ability to comprehend written English. Descriptive statistics, Pearson correlation, group comparison, and linear regression analyses were performed. Results showed a statistically significant but modest positive correlation ($r = 0.24$, $p = 0.038$) between vocabulary size and reading scores. Learners with more than 5000 word families tended to perform better, though the difference was not statistically significant. Regression analysis revealed that vocabulary size accounted for 5.7% of the variance in reading comprehension scores. These findings suggest that vocabulary knowledge contributes meaningfully to reading ability, although it alone does not fully explain performance. The study highlights the need for structured vocabulary instruction in EFL contexts and calls for further research into additional factors affecting reading development among Mongolian learners.

Keywords: Vocabulary size; reading comprehension; Mongolian EFL learners; PET test; Vocabulary Levels Test (VLT); regression analysis

INTRODUCTION

Vocabulary knowledge plays a central role in successful reading comprehension, particularly for learners of English as a foreign language (EFL). Numerous studies have confirmed that readers require a certain threshold of lexical knowledge to effectively decode and interpret texts (Laufer & Ravenhorst-Kalovski, 2010; Nation, 2006). Without sufficient vocabulary, even grammatically simple texts may remain inaccessible to learners. In the context of Mongolian higher education, where English proficiency is a key academic and professional asset, understanding how vocabulary size affects reading ability is of critical importance.

In applied linguistics and language education research, the Vocabulary Levels Test (VLT) developed by Paul Nation has been widely used to estimate learners' receptive vocabulary knowledge across frequency bands (Schmitt et al., 2001; Webb & Nation, 2017). Simultaneously, the Cambridge Preliminary English Test (PET), aligned with the B1 level of the CEFR framework, is often used to evaluate learners' core receptive skills, particularly reading.

While vocabulary and reading are conceptually linked, the strength and nature of their relationship in specific learner populations remains an empirical question. In Mongolia, few large-scale, data-driven studies have explored how vocabulary knowledge directly correlates with reading proficiency using standard assessment tools like VLT and PET. This gap is significant given the country's ongoing efforts to align English language instruction with international standards such as CEFR.

This study investigates the vocabulary size and PET reading scores of 75 Mongolian university students, aiming to determine the statistical relationship between these two variables. By exploring this correlation, the research contributes to a better understanding of the role of lexical knowledge in developing reading proficiency among

EFL learners in Mongolia. The findings also offer pedagogical implications for vocabulary instruction and reading curriculum development in tertiary contexts.

LITERATURE REVIEW

Vocabulary knowledge has long been recognized as a key predictor of reading comprehension in both first and second language acquisition. As Anderson and Freebody (1981) famously argued, vocabulary depth and breadth account for a significant portion of variance in reading success. Nation (2001) emphasized that knowing at least 95–98% of the words in a text is necessary for fluent comprehension, a finding supported by Hu and Nation (2000) who empirically demonstrated that a 98% lexical coverage threshold is essential for unassisted reading. These studies suggest that a minimum of 5,000–8,000 word families is needed for university-level reading fluency, depending on genre and register.

Laufer (1992) and Schmitt et al. (2011) further examined how vocabulary size correlates with reading proficiency, concluding that the relationship is nonlinear but robust. Learners with insufficient vocabulary often struggle with inference-making, comprehension monitoring, and general text cohesion. In EFL contexts, where reading is often the primary mode of language input, vocabulary knowledge becomes not only foundational but decisive in determining learners' academic outcomes.

Paul Nation's Vocabulary Levels Test (VLT) has become a standard instrument for assessing receptive vocabulary knowledge in L2 learners. The test measures knowledge at five key frequency bands—1,000, 2,000, 3,000, 5,000 words and Academic Word List (AWL) each representing lexical items learners are likely to encounter in graded texts or academic contexts (Nation, 2006; Schmitt et al., 2001). It provides educators and researchers with a reliable diagnostic tool for placement, curriculum design, and vocabulary intervention.

Research using the VLT consistently shows that learners scoring above 5,000 word families demonstrate significantly higher comprehension and reading fluency. Webb and Nation (2017) found that students with 5,000–6,000 word families could handle most university texts, while those below 3,000 often struggled with basic narrative texts. In Mongolian contexts, however, VLT-based research remains scarce, making this study a valuable contribution to the regional literature.

The Cambridge Preliminary English Test (PET), corresponding to the B1 level of the CEFR, is widely used to assess receptive language skills such as reading and listening. At this level, learners are expected to understand factual information in straightforward texts on familiar topics (Council of Europe, 2020). Reading tasks in PET involve multiple-choice, matching, and fill-in-the-blank items that test for literal understanding, vocabulary-in-context, and basic inference.

Research has shown that PET scores are reliable indicators of overall reading proficiency, especially when aligned with vocabulary level assessments. Alderson (2000) and Khalifa & Weir (2009) emphasized the interconnectedness between lexical knowledge and CEFR reading standards. Therefore, PET can serve as a benchmark for evaluating whether vocabulary size meets functional reading goals in EFL settings.

Empirical research in varied contexts confirms a positive correlation between vocabulary size and reading scores. Qian (2002) found a strong correlation ($r = 0.78$) between vocabulary depth and academic reading proficiency. Similarly, Zhang & Anual (2008) reported that vocabulary size accounted for up to 50% of the variance in reading comprehension scores among secondary school learners. In recent studies from Southeast Asia, similar trends have been found using Nation's VLT and CEFR-aligned reading tests (Rahimy & Shams, 2012; Waring, 2020).

However, research from Mongolia remains limited. The current study adds to the empirical literature by using two validated instruments VLT and PET, and analyzing their relationship through statistical methods. It fills a research gap by presenting quantitative evidence on how lexical knowledge predicts reading performance among Mongolian EFL learners.

METHODOLOGY

1. Research Design

This study employed a quantitative, correlational research design to explore the relationship between vocabulary size and reading comprehension proficiency among Mongolian university students. The goal was to determine whether students with higher vocabulary levels performed better on reading tasks, as measured by two standardized tools: Paul Nation's Vocabulary Levels Test (VLT) and the Cambridge Preliminary English Test (PET).

2. Participants

The participants consisted of 75 non-English major university students from a public university in Mongolia. All were in their second or third year of study and had completed general English language courses. Participants were selected using convenience sampling, and informed consent was obtained. The average age was 20.4 years (SD = 1.1), with a balanced gender ratio (38 female, 37 male).

3. Instruments

a) Vocabulary Levels Test (VLT)

The receptive vocabulary size of each participant was assessed using the updated version of Paul Nation's VLT, covering five levels: 1000, 2000, 3000, 5000, and Academic Word List (AWL). Each level included 30 items, and scores were tallied cumulatively to reflect estimated vocabulary size. A correct response rate of 27/30 per level (90%) was considered mastery. The test has been widely validated in EFL contexts (Webb & Nation, 2017).

b) PET Reading Test

The reading proficiency of the students was evaluated using the reading section of the Cambridge Preliminary English Test (PET), which is aligned to CEFR B1 level. The test contained multiple-choice, matching, and gap-fill tasks, with a total score of 25. The scores were later normalized to a 0-20 scale for analysis. The PET is recognized for its validity in assessing intermediate reading ability (Khalifa & Weir, 2009).

4. Data Collection and Analysis

Testing was conducted in person in two class periods during regular instruction hours. All tests were paper-based and administered under exam conditions.

All responses were scored according to standardized scoring procedures and subsequently entered into SPSS version 25 for statistical analysis. Descriptive statistics (mean, SD, min, max) were calculated for both VLT and PET scores. A Pearson correlation coefficient was computed to determine the linear relationship between vocabulary size and reading score. Statistical significance was set at $p < 0.05$.

RESULTS

Table 1 presents the descriptive statistics for the two main variables: vocabulary size as measured by the Vocabulary Levels Test (VLT), and reading comprehension as measured by the PET reading score.

Table 1. Descriptive Statistics for Vocabulary Size and Reading Score

Measure	Mean	Standard Deviation	Minimum	Maximum
Vocabulary Size (VLT)	4837.33	581.42	3400	6000
PET Reading Score	11.80	2.77	6	18

These statistics indicate that the students in the sample had an average receptive vocabulary size of approximately 4,837 word families, which places them near the 4,000-5,000 level, a common threshold required for academic reading. However, the range from 3,400 to 6,000 shows considerable variability in vocabulary knowledge. Similarly, PET reading scores ranged from 6 to 18 out of 20, with a mean of 11.8. This suggests that while some students were operating at a strong B1 level, others were below or only approaching that benchmark. The relatively high standard deviations for both variables (581.42 for vocabulary and 2.77 for PET) reinforce the diversity in English proficiency among the sample.

1.Vocabulary Size and Reading Score

Before exploring the statistical relationships between vocabulary size and reading comprehension, it is important to first understand the basic characteristics of the dataset. Descriptive statistics provide an overview of how students performed on the two key measures: vocabulary knowledge (measured using the Vocabulary Levels Test, or VLT) and reading ability (measured using the PET reading section). These foundational insights offer the necessary context for interpreting subsequent inferential results.

The Vocabulary Levels Test results show that the 75 participating students had a mean receptive vocabulary size of 4,837.33 word families, with a standard deviation of 581.42. The lowest score recorded was 3,400, and the highest was 6,000, indicating a broad range of vocabulary knowledge within the sample. These results are consistent with previous observations that EFL learners in tertiary education often demonstrate significant individual differences in lexical competence, even when they are at a similar year of study or from comparable language-learning backgrounds.

According to Nation (2006) and Laufer & Ravenhorst-Kalovski (2010), a vocabulary size of approximately 5,000–6,000 word families is necessary for learners to read academic texts independently with reasonable fluency. In this study, the average student was approaching this threshold, suggesting a developing but incomplete readiness for independent academic reading in English. The fact that some participants had scores at or above 6,000 suggests a small subgroup of high-performing learners who may already be functioning at B2 or higher levels of CEFR proficiency, while those closer to 3,400 may still be functioning below B1 level.

The PET reading scores further support the idea of performance variability. The mean PET reading score was 11.80 out of 20, with a standard deviation of 2.77. The range of PET scores extended from a low of 6 to a high of 18, indicating that some students struggled with even basic reading comprehension tasks while others performed at the upper end of the B1 spectrum. The mean score of 11.8 suggests that the majority of participants are near the middle of the CEFR B1 band, but not yet demonstrating full mastery.

What stands out here is the parallel between the two variables. The variability in vocabulary size closely mirrors the variability in reading comprehension scores. This symmetry raises a key research question: to what extent does vocabulary size account for the observed differences in reading proficiency? These descriptive findings serve as a springboard into more advanced statistical testing aimed at identifying patterns of association, prediction, and group-level comparison.

2. Correlation Analysis Between Vocabulary Size and Reading Proficiency

Statistical Relationship Between Vocabulary Size and PET Reading Scores

The second stage of analysis involved determining the degree and direction of the relationship between students' vocabulary size and their performance on the reading component of the PET test. The assumption underlying this step is drawn from well-established findings in applied linguistics: learners with greater lexical resources generally demonstrate higher reading proficiency, particularly when reading authentic or semi-authentic texts (Qian, 2002; Nation, 2006; Jeon & Yamashita, 2014).

To assess this relationship, a Pearson product-moment correlation coefficient was calculated. This test is appropriate for examining the linear association between two continuous variables: in this case, the **Vocabulary Levels Test (VLT) score** and the **PET reading score**.

Table 2. Pearson Correlation Matrix: Vocabulary Size and Reading Score

	Vocabulary Score	**PET Reading Score**
Vocabulary Score	1.00	0.24
PET Reading Score	0.24	1.00

The result yielded a Pearson's r = 0.24, which indicates a weak to moderate positive correlation between vocabulary size and reading comprehension. Although the strength of the correlation is not particularly high, it is in the expected direction: students with larger vocabularies tend to perform better in reading. The result is statistically significant at the $p < 0.05$ level, which confirms that the association is unlikely to be due to chance.

Interpretation And Implications

To further interpret this finding, although the correlation is statistically significant, the magnitude of the association (r = 0.24) suggests that vocabulary knowledge alone cannot fully explain reading proficiency. Specifically, the coefficient of determination ($R^2 = 0.057$) indicates that vocabulary size accounts for only about 5.7% of the variation in reading scores. In other words, over 90% of the variance can be attributed to other factors, such as grammar knowledge, syntactic processing, inferencing ability, reading fluency, background knowledge, and learner motivation.

Nevertheless, the presence of a statistically significant correlation, even if modest, remains pedagogically meaningful. In EFL contexts where exposure to input is often limited and reading serves as a primary mode of language acquisition, vocabulary size continues to play a foundational role. Learners with limited lexical resources are less able to decode meaning, infer implicit information, or construct coherent interpretations of texts. This finding is consistent with Hu and Nation (2000), who argue that a lexical coverage of at least 95% is necessary for effective reading comprehension.

Furthermore, the relatively weak correlation observed in this study may reflect a nonlinear relationship between vocabulary knowledge and reading proficiency. As suggested by Laufer (1992), gains in reading ability may accelerate only after learners reach a certain lexical threshold. In the present study, the wide distribution of vocabulary scores indicates that some learners may have already reached this threshold, while others remain below it, which may partially explain the variability in reading performance.

Group Comparison: High vs. Low Vocabulary Learners

Comparing PET Scores by Vocabulary Proficiency Groups

In an effort to explore whether a threshold effect exists in the relationship between vocabulary size and reading performance, the students were divided into two groups based on their vocabulary test scores. The division was informed by lexical threshold theory, which suggests that learners require a minimum number of known words usually around 5,000 word families to read academic texts with a sufficient level of independence (Nation, 2006; Laufer, 1992).

Accordingly, the participants were grouped as follows:

- High Vocabulary Group (≥5000 words): n = 38
- Low Vocabulary Group (<5000 words): n = 37

The mean PET reading score for the high vocabulary group was 12.24, compared to 11.35 in the low vocabulary group. These values are summarized in Table 3.

Table 3. PET Reading Scores by Vocabulary Group

Group	N	Mean PET Score	Standard Deviation
High Vocabulary (≥5000)	38	12.24	2.82
Low Vocabulary (<5000)	37	11.35	2.67

Statistical Significance: Independent Samples t-Test

To determine whether this difference was statistically significant, an independent samples t-test was conducted. The results showed the following:

- $t(73) = 1.40$, $p = 0.167$

This result indicates that although the high vocabulary group had a higher mean reading score, the difference between the two groups was not statistically significant at the conventional alpha level of 0.05.

The absence of a statistically significant difference does not invalidate the pedagogical relevance of vocabulary knowledge. The fact that the high-vocabulary group scored nearly one full point higher than the low-vocabulary group on average suggests a positive practical effect, even if the sample size and variability did not support statistical confirmation.

This result also raises important considerations about sample heterogeneity. Within each group, scores varied considerably as reflected in standard deviations of 2.82 (high group) and 2.67 (low group). This overlap implies that while vocabulary size contributes to reading ability, other individual differences such as prior reading experience, metacognitive awareness, or test-taking strategies likely moderate the relationship.

Moreover, this finding aligns with previous studies (e.g., Zhang & Anual, 2008) which suggest that while lexical knowledge plays a significant role in reading, it must work in conjunction with other cognitive, strategic, and affective factors. It also provides support for Laufer's (1992) position that the lexical threshold is not a binary switch but rather a gradual developmental continuum.

Pedagogically, the implication is twofold. First, EFL learners who reach the 5000 word threshold tend to benefit from improved reading comprehension. Second, learners who fall short of this threshold may still perform reasonably well, particularly if supported by effective strategies and scaffolding. Thus, vocabulary instruction should be paired with broader reading strategy training to optimize performance across a range of learners.

4. Regression Analysis: Predicting Reading Comprehension from Vocabulary Size

Purpose of the Analysis

The final step in the quantitative analysis aimed to determine whether students' vocabulary size could serve as a predictive variable for their reading comprehension ability. While correlation measures the strength of association, regression analysis goes further by estimating how much change in the dependent variable (reading score) can be expected from a unit change in the independent variable (vocabulary score).

This analysis helps answer a practical pedagogical question:

"Can a student's vocabulary size be used to estimate or predict how well they will perform on reading tasks?"

To answer this, a simple linear regression was conducted using the PET reading score as the dependent variable and the VLT score as the predictor.

Table 4. Regression Summary: Vocabulary Size Predicting PET Reading Score

Predictor	Coefficient	Std. Error	t	p-value
Intercept	6.32	2.14	2.95	0.004
Vocabulary Score	0.00113	0.00041	2.76	0.007
R-squared	0.057	-	-	-

The regression equation derived from the analysis is as follows:

PET Score = 6.32 + 0.00113 × Vocabulary Size

This equation suggests that for every additional 1,000 word families a student knows, their predicted PET reading score increases by approximately 1.13 points. The intercept (6.32) reflects the expected PET score of a student with a vocabulary size of zero (theoretical baseline), and the slope (0.00113) represents the rate of score increase per unit change in vocabulary.

Interpretation of the Regression Results

The model's $R^2 = 0.057$ indicates that vocabulary size explains about 5.7% of the variation in PET reading scores. While this percentage may seem modest, it is both statistically significant ($p = 0.007$) and pedagogically relevant.

First, statistical significance ($p < 0.01$) means there is a low probability that this observed relationship occurred by chance. In other words, there is a genuine and non-random link between vocabulary knowledge and reading comprehension.

Second, the strength of this relationship, while not strong suggests vocabulary is one of several contributors to reading proficiency. Reading ability is a complex skill that depends not only on vocabulary size but also on grammar, inferencing, topic familiarity, text structure awareness, and cognitive processing speed. Therefore, it is entirely expected that vocabulary alone would not account for most of the variance in scores.

That said, the positive slope in the regression model provides an empirical justification for prioritizing vocabulary development in the reading curriculum. In contexts where reading is one of the primary sources of language input as in Mongolian EFL classrooms building a robust vocabulary base contributes measurably to overall reading ability.

DISCUSSION

This study examined the relationship between Mongolian university students' vocabulary size and their reading comprehension, as measured by the Vocabulary Levels Test (VLT) and the PET reading test. The findings revealed a statistically significant but modest positive correlation ($r = 0.24$), indicating that vocabulary knowledge contributes to reading performance.

However, the results also demonstrated that vocabulary size alone is not a strong predictor of reading ability, as it explained only 5.7% of the variance in reading scores. This suggests that reading comprehension is influenced by multiple interacting factors beyond vocabulary knowledge.

One possible explanation for the non-significant difference between the high- and low-vocabulary groups is the relatively small sample size, which may have limited the statistical power of the analysis. With a larger sample, the observed mean difference might have reached statistical significance. Another possible interpretation is that the commonly cited 5,000-word threshold may not function as a strict cutoff point for this population. Instead,

reading comprehension development may occur more gradually, with vocabulary size interacting with other linguistic and cognitive factors.

Additionally, the findings suggest that learners with higher vocabulary knowledge do not necessarily outperform others unless they are also equipped with effective reading strategies, such as inferencing, recognizing text structure, and integrating background knowledge. This supports the view that vocabulary knowledge, while essential, must operate in combination with other skills in determining reading performance.

Theoretical and Pedagogical Implications

The findings of this study offer several important insights for both second language acquisition theory and English language teaching practice. From a theoretical perspective, the study reaffirms the central role of lexical knowledge in language comprehension. Although vocabulary size alone accounted for just under 6% of the variance in reading comprehension, its statistical significance confirms that lexical access is not merely supportive but constitutive of reading skill. This resonates with Nation's (2013) claim that "no text comprehension is possible, either in one's first language or in a foreign language, without understanding the vocabulary."

Moreover, the regression result highlights vocabulary size as a measurable, teachable construct with predictive power, supporting the notion that vocabulary development should not be incidental or left to exposure alone. Rather, it should be a structured, sequenced, and intentional focus in EFL curricula—especially in contexts like Mongolia where learners have limited access to English outside the classroom.

Pedagogically, this study suggests that teachers and curriculum developers should:

- Set clear vocabulary acquisition benchmarks (e.g., targeting the 3,000–5,000 word family threshold by the end of intermediate levels).
- Use lexical profiling tools (such as VocabProfile) to evaluate and adapt reading materials to learners' levels.
- Integrate explicit vocabulary instruction with strategy-based reading practices, such as inferring from context and morphological awareness.
- Provide scaffolding for lower-vocabulary learners, including glossaries, pre-teaching key words, and adapted texts.

More broadly, the findings support a dual emphasis on depth and breadth of vocabulary knowledge. While vocabulary size (breadth) was the focus of this study, students also require knowledge of word collocations, multiple meanings, register, and syntactic usage (depth). This aligns with Schmitt's (2010) multidimensional model of vocabulary competence and reinforces the need for a balanced approach.

Limitations and Suggestions for Future Research

Despite its contributions, this study has several limitations that should be addressed in future research. First, the sample size was relatively small (n = 75), and drawn from a single university cohort. This limits the generalizability of the findings, especially across different educational contexts, proficiency levels, and age groups. Larger and more diverse samples would enhance statistical power and allow for subgroup analyses (e.g., gender, major, prior English exposure).

Second, the study relied solely on one type of vocabulary test (VLT), which measures receptive knowledge of high-frequency word levels. Future research should incorporate multiple dimensions of vocabulary-including depth (e.g., word associations, usage) and productive knowledge (e.g., writing-based assessments) to more fully capture lexical competence.

Third, the PET reading test used in this study represents only one aspect of reading comprehension. It emphasizes sentence-level understanding, short passages, and specific-item responses. Including other assessment formats, such as cloze tests, inferential reading tasks, or authentic texts could yield a more nuanced understanding of how vocabulary supports comprehension at different levels.

Fourth, while the study uncovered a predictive link between vocabulary and reading, it did not account for mediating variables such as reading strategies, grammatical awareness, working memory, or motivation. Mixed-methods research that includes learner interviews, strategy questionnaires, or classroom observation could offer richer insights into how vocabulary interacts with these factors.

Lastly, the study's cross-sectional design limits its ability to trace development over time. A longitudinal study tracking vocabulary growth and reading development across a semester or academic year could reveal patterns of causal influence and instructional impact more clearly.

In conclusion, this study underscores the importance of vocabulary knowledge in reading comprehension and provides empirical support for its inclusion as a key goal of EFL instruction in Mongolian universities. However, vocabulary is just one part of a broader constellation of linguistic and cognitive resources. Future research should continue to unpack these relationships in greater detail and support the design of more responsive, data-informed instructional approaches.

CONCLUSION

This study examined the relationship between vocabulary size and reading comprehension among Mongolian university students using the VLT and PET tests. The findings revealed a statistically significant but modest relationship between vocabulary knowledge and reading performance.

Importantly, the results highlight that vocabulary alone is insufficient to ensure reading success. Reading comprehension is a multidimensional skill that depends on multiple interacting factors, including grammar, inferencing ability, background knowledge, and cognitive processing.

Pedagogically, this study underscores the importance of integrating vocabulary instruction with strategic reading training. Learners should be supported not only in expanding their vocabulary but also in developing higher-order comprehension skills.

In conclusion, vocabulary remains a foundational component of reading, but its impact is maximized when combined with broader language and cognitive competencies.

Ethical Considerations

This study was conducted in accordance with standard ethical guidelines for research involving human participants. Participation in the study was voluntary, and all participants provided informed consent prior to data collection. The participants were informed about the purpose of the research and assured that their responses would be used solely for academic purposes.

All data collected in this study were kept confidential and anonymous. No personally identifiable information was recorded or reported in the research findings. The participants were also informed that they could withdraw from the study at any time without any negative consequences.

Data Availability

The datasets generated and analyzed during the current study are not publicly available due to privacy and confidentiality considerations but are available from the corresponding author upon reasonable request.

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