



Effects of Vocabulary Match and Word Puzzle Games on Senior Secondary School Students' Achievement in English Language Vocabulary in Enugu Education Zone

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Abstract

This study investigated the effects of Vocabulary Match and Word Puzzle on Senior Secondary School Two (SS2) students' achievement in English language vocabulary in Enugu Education Zone. Three specific purposes, three research questions, three null hypotheses guided the study. A quasi-experimental, pre-test, post-test, non-equivalent control group design was adopted. The population comprised 4,578 SS2 students in 33 public secondary schools, from which a sample of 154 students (71 males and 83 females) was drawn using a multistage sampling technique. The instruments for data collection was English Language Vocabulary Achievement Test (ELVAT). The instrument were validated and trial-tested, with reliability index of 0.72 obtained using KR-20. The experimental procedure spanned 7 weeks, covering training of research assistants, administration of pretest instruments, instructional phase for the two experimental groups and administration of post-test instruments. Collected data were analyzed using mean, standard deviation and ANCOVA statistic in SPSS v.25. The findings revealed that students taught using Vocabulary Match had significantly higher posttest mean achievement scores than those taught using Word Puzzle. Gender had no significant effect on either achievement, and there was no significant interaction between instructional strategy and gender for achievement. The study concluded that Vocabulary Match is more effective in improving students' achievement in English language vocabulary. It is recommended that English language teachers integrate interactive card-game strategies, particularly Vocabulary Match, into their teaching to foster vocabulary learning.

Keywords: Vocabulary Match, Word Puzzle, Card Games, Academic Achievement, English Language Vocabulary

Introduction

English language plays an important role in education, communication and access to knowledge, making proficiency in the language an essential requirement for students at the secondary school level. Students are expected to develop competence in listening, speaking, reading and writing, all of which depend substantially on their knowledge of vocabulary. However, learning English involves more than memorising words; students must understand their meanings, recognise their appropriate usage and apply them effectively in different contexts. Vocabulary therefore constitutes a fundamental component of language learning, as inadequate knowledge of words can limit students' comprehension and their ability to communicate effectively (Schmitt & Schmitt, 2020). Consequently, the development of students'

vocabulary knowledge remains an important concern in English language education.

English language vocabulary refers to the words and expressions that learners understand and use in communication. Vocabulary knowledge involves recognising word forms, understanding meanings, identifying relationships among words and applying them appropriately in different contexts. Schmitt (2019) explained that vocabulary acquisition involves several interconnected processes, including the development of receptive and productive knowledge. Receptive vocabulary knowledge enables learners to recognise and understand words when reading or listening, while productive vocabulary knowledge enables them to use words appropriately when speaking or writing. Students therefore require more than the ability to

memorise definitions; they need sufficient opportunities to practise recognising, understanding and using words. Inadequate vocabulary knowledge can consequently affect reading comprehension, written expression and overall academic achievement in English language.

Despite its importance, vocabulary acquisition presents considerable challenges to many learners of English as a second or foreign language. Learning unfamiliar words requires repeated exposure, meaningful practice and opportunities to establish connections between words and their meanings. Students may encounter difficulties remembering newly learnt vocabulary, distinguishing between words with similar meanings and applying unfamiliar words correctly. These challenges can become more pronounced when vocabulary instruction relies heavily on memorisation and explanations without providing sufficient opportunities for active practice. Schmitt and Schmitt (2020) emphasised the importance of intentional vocabulary learning and repeated exposure in developing word knowledge. Similarly, González-Fernández and Schmitt (2020) demonstrated that vocabulary knowledge consists of several interconnected components that develop progressively. These findings highlight the need for instructional approaches that provide learners with opportunities to practise different aspects of vocabulary knowledge and strengthen their achievement.

The need to improve vocabulary achievement has encouraged researchers to examine instructional approaches that make vocabulary learning more interactive and meaningful. Among these approaches, game-based learning has received considerable attention because it provides opportunities for learners to engage directly with instructional content while practising specific skills. Educational games can incorporate repetition, problem-solving, immediate feedback and interaction, which may support the acquisition and retention of new knowledge. In vocabulary instruction, games can provide opportunities for students to recognise words, associate them with meanings and apply their knowledge through structured activities. Thompson and von Gillern (2020), in a Bayesian meta-analysis of 19 studies, found that game-based instruction had a positive overall effect on English vocabulary acquisition, although the effects varied across studies and instructional conditions. Similarly, Vnucko and Klimova (2023), in their systematic review of 13 studies, reported that digital game-based vocabulary learning could support vocabulary retention and

produce positive learning outcomes. These findings provide evidence of the potential of games to support vocabulary acquisition, although the effectiveness of individual games may depend on their design and implementation.

Among the instructional games that can be used in vocabulary teaching are Vocabulary Match and Word Puzzle games. Vocabulary Match is a card game in which students associate words with their corresponding meanings, definitions or related expressions. The activity requires learners to identify relationships between vocabulary items and their meanings, thereby providing structured opportunities for word recognition, association and recall. Through repeated matching exercises, students may strengthen their understanding and retention of vocabulary. Word Puzzle, on the other hand, involves identifying, arranging or locating words within a puzzle based on given clues or instructions. The game requires students to apply their knowledge of word forms, spelling and meanings while solving vocabulary-related problems. Its use may encourage students to retrieve previously learnt words, recognise spelling patterns and develop greater familiarity with unfamiliar vocabulary. Although both games provide opportunities for active vocabulary practice, they differ in their instructional processes. Vocabulary Match emphasises direct association between words and meanings, whereas Word Puzzle places greater emphasis on word identification, retrieval and problem-solving. These differences raise the question of whether the two games produce similar or different effects on students' achievement in English language vocabulary.

Empirical studies have provided further evidence of the potential of games to improve vocabulary achievement. Thompson and von Gillern (2020) found that learners who received video-game-based vocabulary instruction generally achieved better learning outcomes than those taught without games. Their findings, however, also revealed considerable variation in the effects across different studies, suggesting that the effectiveness of game-based instruction may depend on the type of game and the conditions under which it is implemented. In a related systematic review, Vnucko and Klimova (2023) found that digital games could support vocabulary learning, with several experimental studies reporting higher achievement among learners exposed to game-based instruction. Yang et al. (2020) also found that a game-based approach improved high school students' English vocabulary achievement. Although these studies demonstrate the potential of games in

vocabulary instruction, much of the available evidence concerns digital games or general game-based approaches. There is comparatively less evidence on the effects of specific non-digital card games, particularly Vocabulary Match and Word Puzzle, when used to teach senior secondary school students.

Within the Nigerian educational system, English language is an important school subject and a major means of communication and instruction. Students require adequate vocabulary knowledge to understand classroom materials, express their ideas and demonstrate their learning in written and oral assessments. However, vocabulary instruction requires approaches that go beyond the explanation and memorisation of word meanings. The use of instructional games may provide opportunities for students to practise vocabulary through word recognition, association and retrieval. Evidence from Nigerian educational research also suggests that games can be investigated as practical alternatives for teaching language content. Ike (2021), in a study conducted among primary school pupils in Enugu North Local Government Area, investigated the effects of Word Connect games on achievement in English language spelling and vocabulary. The study provides a relevant local example of the application of word games in language instruction. However, its focus on primary school pupils and a different type of game leaves questions about the application of Vocabulary Match and Word Puzzle games among senior secondary school students.

In Enugu Education Zone, the need to improve students' achievement in English language vocabulary provides a basis for examining instructional approaches that encourage direct engagement with words and their meanings. Vocabulary Match and Word Puzzle games offer different ways of practising vocabulary, but their relative effects on students' achievement cannot be assumed to be identical. While Vocabulary Match provides structured practice in associating words with their meanings, Word Puzzle requires learners to retrieve and identify words through clues and patterns. It is therefore necessary to establish whether these differences in learning activities translate into differences in students' achievement. Evidence from studies involving digital games and other educational contexts cannot, on its own, establish the effectiveness of these particular card games among senior secondary school students in the zone.

Although previous studies have established the potential of game-based instruction to improve

vocabulary achievement, there remains a need for further investigation into the effects of specific instructional games. Thompson and von Gillern (2020) reported a positive overall effect of video-game-based instruction on English vocabulary acquisition, while Yang et al. (2020) found that a cognitive complexity-based competition game significantly improved high school students' English vocabulary performance. Similarly, Vnucko and Klimova (2023), in a systematic review, identified evidence that digital game-based learning can improve vocabulary acquisition and retention. However, these studies largely focused on digital games and did not directly examine the effects of Vocabulary Match and Word Puzzle card games. This leaves a gap in understanding how these two instructional strategies affect senior secondary school students' vocabulary achievement, particularly in Enugu Education Zone. Addressing this gap will provide context-specific evidence to guide English language teachers in selecting appropriate instructional strategies. Against this background, the present study examined the effects of Vocabulary Match and Word Puzzle games on senior secondary school students' achievement in English language vocabulary in Enugu Education Zone.

Research Questions

The following questions were posed to guide the study.

1. What are the effects of vocabulary match and word puzzle games on senior secondary school students' mean achievement scores in English language vocabulary?
2. What are the mean achievement scores of male and female senior secondary school students in English language vocabulary?
3. What is the interaction effect of instructional strategies and gender on senior secondary school students' mean achievement scores in English language vocabulary?

Hypotheses

The following null hypotheses were formulated and were tested at 0.05 level of significance.

- Ho₁: There is no significant difference in the mean achievement scores of senior secondary school students taught English language vocabulary with vocabulary match and those taught with word puzzle.
- Ho₂: There is no significant difference in the mean achievement scores of male and

female senior secondary school students in English language vocabulary.

H₀₃: There is no significant interaction effect of instructional strategies and gender on senior secondary school students' mean achievement scores in English language vocabulary.

Methods

The study employed a quasi-experimental design. Specifically, the study employed pre-test, post-test, non-equivalent quasi-experimental research design. The study was conducted in Enugu Education Zone of Enugu State. Enugu Education Zone is made up of three (3) Local Government Areas, namely, Enugu East, Enugu North and Isi-Uzo local government areas. The area was chosen because of prevalence of poor vocabulary performance among students, and limited use of innovative teaching strategies such as game-based learning. The area was therefore used to provide empirical evidence to ascertain whether the use of vocabulary match and word puzzle games by the teachers improved students' motivation and achievement in vocabulary in secondary schools.

The population of the study comprised 4,578 Senior Secondary School (SS2) students in the 33 public secondary schools in Enugu Education Zone of Enugu State. The population consisted of 1,517 male and 3,061 female students according to records from the Post Primary Schools Management Board (2025). The sample size of the study consisted of 154 Senior Secondary Student Two (SS2) students (85 males and 69 females) drawn from the population of 4,578 SS2 students in the 33 public secondary schools in Enugu Education Zone of Enugu State. A multistage sampling procedure was used to arrive at the sample size for the study. First, purposive sampling technique was used to select 23

co-educational secondary schools in Enugu Education Zone. Secondly, simple random sampling technique was used to draw two schools from the 23 co-educational secondary schools. Thirdly, the two schools were assigned to the two experimental groups using simple random sampling technique (toss of a coin). Finally, the researcher selected two intact SS 2 classes from each of the two sampled schools and used the four intact classes for the study. For the Vocabulary Match (VM) group, a total of 79 students (38 males and 41 females) participated in the study, while the Word Puzzle (WP) group consisted of 75 students (47 males and 28 females).

The instruments used for data collection is the English Language Vocabulary Achievement Test (ELVAT) adopted by the researcher from past examination questions of West African Examinations Council (WAEC). The past questions were selected because they are standardized, having being previously validated by test developers in English language. The instrument was validated by three experts in the Faculty of Education, University of Nigeria, Nsukka, and then trial-tested on 20 SSS 2 students outside the study area. A reliability index of 0.72 was obtained for the instrument using Kuder-Richardson 20 (K-R20) formula, indicating the instruments as reliable. The experimental procedure spanned 7 weeks, covering training of research assistants, pretest administration, instructional phase, administration of posttest. Measures were taken to control the following extraneous variables: initial differences, research bias, teacher variable, subject interactions, and testing effect. The data collected were analysed using the Statistical Package for Social Sciences (SPSS), version 25. Mean and standard deviation were used to provide answers to the research questions, while Analysis of covariance (ANCOVA) was employed to test the hypotheses formulated for the study at 0.05 level of significance.

Results

The results from analysis of collected data are presented in tables in line with the research questions and corresponding hypotheses that guided the study.

Table 1: Mean analysis of the achievement scores of students taught English language vocabulary using vocabulary match game and those taught using word puzzle game

Treatment	n	Pretest		Posttest		Adjusted mean
		Mean	Std. Deviation	Mean	Std. Deviation	
Vocabulary Match	79	16.57	2.71	32.58	9.42	32.70
Word Puzzle	75	19.60	4.22	25.65	5.84	25.81

Table 1 indicates that the students who were taught English language vocabulary using

Vocabulary Match had a pretest mean achievement score of ($M = 16.57$, $SD = 2.71$) and a posttest mean

achievement score of ($M = 32.58$, $SD = 9.42$). Similarly, students who were taught English language vocabulary using Word Puzzle had a pretest mean achievement score of ($M = 19.60$, $SD = 4.22$) and a posttest mean achievement score of ($M = 25.65$, $SD = 5.84$). The adjusted mean scores of 32.70 and 25.81 indicate that the students who were taught English language vocabulary using

Vocabulary Match had higher posttest mean achievement score than those taught using Word Puzzle. However, the posttest standard deviations of 9.42 and 5.84 for the students of Vocabulary Match and Word Puzzle respectively, show that the individual achievement scores of the students of the Vocabulary Match varied more widely from their group mean than those of the Word Puzzle.

Table 2: Analysis of covariance of the effect of vocabulary games on senior secondary school students' achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1966.643 ^a	4	491.661	7.861	.000	.174
Intercept	4112.995	1	4112.995	65.764	.000	.306
A pretest	7.094	1	7.094	.113	.737	.001
Treatment	1433.317	1	1433.317	22.918	.000	.133
Gender	4.441	1	4.441	.071	.790	.000
Treatment * Gender	99.812	1	99.812	1.596	.208	.011
Error	9318.708	149	62.542			
Total	142662.000	154				
Corrected Total	11285.351	153				

Table 2 reveals that there is a significant difference in the mean achievement scores of senior secondary school students taught English language vocabulary with vocabulary match and those taught with word puzzle in favour of those taught using Vocabulary Match, $F(1, 149) = 22.918$, $p = .000$. This means that the null hypothesis is rejected since

the associated probability value of .000 is less than the .05 level of significance. Besides, the partial eta square value of .133 implies that 13.3% improvement in the achievement scores of the students is attributed to the effect of Vocabulary Match.

Table 3: Mean analysis of the achievement scores of male and female senior secondary school students in English language vocabulary

Gender	n	Pretest		Posttest		Adjusted mean
		Mean	Std. Deviation	Mean	Std. Deviation	
Male	85	17.64	3.52	28.60	8.83	29.08
Female	69	18.55	4.15	29.96	8.29	29.43

Table 3 indicates that the male students had a pretest mean achievement score of ($M = 17.64$, $SD = 3.52$) and a posttest mean achievement score of ($M = 28.60$, $SD = 8.83$), while female students had a pretest mean achievement score of ($M = 18.55$, $SD = 4.15$) and a posttest mean achievement score of ($M = 29.96$, $SD = 8.29$). The adjusted mean scores of 29.08 and 29.43 indicate that the female students had higher posttest mean achievement score than the male students. Besides, the posttest standard deviations of 8.83 and 8.29 for the male and female students respectively, show that the individual achievement scores of the male students varied more

widely from their group mean than those of the female students.

Table 2 also reveals that there is no significant difference in the mean achievement scores of male and female senior secondary school students in English language vocabulary, $F(1, 149) = .071$, $p = .790$. This means that the null hypothesis is not rejected since the associated probability value of .790 is greater than the .05 level of significance. The inference drawn is that gender does not have significant influence on students' achievement in English language vocabulary.

Table 4: Mean analysis of the achievement scores of male and female students taught English language vocabulary using vocabulary match game and those taught using word puzzle game

Treatment	Gender	n	Pretest		Posttest	
			Mean	Std. Deviation	Mean	Std. Deviation
Vocabulary Match	Male	38	16.26	2.49	33.24	9.19
	Female	41	16.85	2.90	31.98	9.69
Word Puzzle	Male	47	18.74	3.85	24.85	6.50
	Female	28	21.04	4.48	27.00	4.30

Table 4 indicates that the male students who were taught English language vocabulary using Vocabulary Match had a pretest mean achievement score of ($M = 16.26$, $SD = 2.49$) and a posttest mean achievement score of ($M = 33.24$, $SD = 9.19$), while male students who were taught English language vocabulary using Word Puzzle had a pretest mean achievement score of ($M = 18.74$, $SD = 3.85$) and a posttest mean achievement score of ($M = 24.85$, $SD = 6.50$). On the other hand, female students who were taught English language vocabulary using Vocabulary Match had a pretest mean achievement score of ($M = 16.85$, $SD = 2.90$) and a posttest mean achievement score of ($M = 31.98$, $SD = 9.69$), while female students who were taught English language vocabulary using Word Puzzle had a pretest mean achievement score of ($M = 21.04$, $SD = 4.48$) and a posttest mean achievement score of ($M = 27.00$, $SD = 4.30$). This means that while male students taught using Vocabulary Match had higher posttest mean achievement score than the female students of the same group, the female students taught using Word Puzzle had higher posttest mean achievement score than the male students of the same group.

Table 2 also reveals that there is no significant interaction effect of instructional strategy and gender on senior secondary school students' mean achievement scores in English language vocabulary, $F(1, 149) = 1.596$, $p = .208$. This means that the null hypothesis is not rejected since the associated probability value of .208 is greater than the .05 level of significance. The inference drawn is that senior secondary school students' achievement in English language vocabulary as a result of their exposure to different instructional strategies is not dependent on their gender.

Discussion of the Findings

The study revealed that students taught English language vocabulary using Vocabulary Match achieved higher posttest mean scores than those taught using Word Puzzle, with a statistically significant difference in favour of Vocabulary Match. This indicates that Vocabulary Match was

more effective in improving students' vocabulary achievement, possibly because its structured activities enabled students to associate words with their meanings, thereby strengthening comprehension, recall and retention. The repeated exposure to word pairs, opportunities for collaborative learning and focused practice may have contributed to students' improved performance, while the multiple demands of solving puzzles may have divided students' attention. The finding agrees with Marzano (2010) and Stahl and Nagy (2006), who reported that structured vocabulary instruction and explicit word-meaning associations enhance students' comprehension and academic achievement. However, it disagrees with Sung, Hwang, and Yen (2018) and Tokac, Novak, and Thompson (2019), who found that game-based learning strategies, including puzzles, can significantly improve students' academic performance. These differences may be attributed to variations in instructional procedures, learners' characteristics, subject content and treatment duration.

The study revealed that female students had higher posttest mean achievement scores than male students in English language vocabulary, although the difference was not statistically significant. This suggests that both male and female students benefited similarly from the instructional strategies, with gender having no significant influence on their vocabulary achievement. The slight advantage among female students may be attributed to individual differences in prior knowledge, effort and engagement rather than gender. Since both groups received the same instructional methods, learning materials and classroom experiences, the strategies may have provided equal opportunities for learning through active participation and repeated practice. The finding agrees with Hyde (2014) and Voyer and Voyer (2014), who reported that gender differences in academic achievement are generally small and not always statistically significant, although females sometimes record slightly higher scores. However, it disagrees with Logan and Johnston (2009) and

Reilly, Neumann, and Andrews (2019), who reported significant differences in language-related achievement in favour of female students. These differences may be attributed to variations in research contexts, instructional approaches, sample characteristics and measurement procedures.

The study revealed that male students taught using Vocabulary Match had higher posttest mean achievement scores than their female counterparts, while female students taught using Word Puzzle achieved higher scores than their male counterparts. However, the interaction effect of instructional strategy and gender on students' achievement in English language vocabulary was not statistically significant. This indicates that although the relative effectiveness of the two strategies varied slightly across gender, the differences were too small to establish a meaningful interaction. The finding suggests that both strategies supported vocabulary learning among male and female students through active participation, repeated practice and cognitive engagement. The structured word-meaning associations in Vocabulary Match and the problem-solving activities in Word Puzzle may have supported learning across gender groups, while individual effort, prior knowledge and learning interest may have contributed more to achievement than gender. The finding agrees with Reilly, Neumann, and Andrews (2019) and Stoet and Geary (2018), who reported that gender differences in academic achievement are often small or inconsistent across learning areas. However, it disagrees with Sikora and Pokropek (2018) and Lambert (2020), who reported significant gender differences in language achievement in favour of female students. These differences may be attributed to variations in research context, subject content, measurement procedures and learner characteristics.

Conclusion

The study concludes that the use of card games as instructional strategies can enhance senior secondary school students' achievement in English language vocabulary. Effective use of Vocabulary Match and Word Puzzle card games can provide meaningful learning experiences that promote vocabulary acquisition, understanding and retention. These strategies also offer opportunities for improving students' achievement irrespective of gender.

Recommendations

The following recommendations are made:

1. English language teachers should incorporate Word Puzzle and Vocabulary

Match instructional strategies into vocabulary lessons in order to improve senior secondary school students' achievement in English language vocabulary.

2. English language teachers should make greater use of Vocabulary Match instructional strategy when the objective of the lesson is to improve students' understanding, retention, and recall of word meanings, since it enhances students' achievement in English language vocabulary.
3. Curriculum planners and textbook writers should include more game-based vocabulary exercises such as Word Puzzle and Vocabulary Match in English language instructional materials to promote improved learning outcomes among senior secondary school students.
4. School administrators should provide adequate instructional materials and supportive learning environments that enable teachers to effectively use Word Puzzle and Vocabulary Match instructional strategies in teaching English language vocabulary.
5. Teacher training institutions and professional development organisers should train teachers on how to design and implement Word Puzzle and Vocabulary Match instructional strategies to improve students' achievement in English language vocabulary.

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