

EFFECT OF WORD PUZZLE GAME-BASED APPLICATION ON JUNIOR SECONDARY STUDENTS' PERFORMANCE AND MOTIVATION IN ENGLISH SPELLINGS IN ILORIN

¹Dr. ADEYANJU, Christianah Oluwakemi; ²Dr. ISHOLA, Ayodele Oluwaseun;

³Dr. GBADEYAN Josephine Nwachi; ⁴ADEROJU, Oluwadara Oluwaseyi

christyadey@gmail.com; ishola.ayodele@bouesti.edu.ng;

nwachiposta@gmail.com; dararoju@gmail.com

1. Department of Educational Technology, University of Ilorin, Kwara State, Nigeria
2. Department of Educational Technology, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Ekiti State, Nigeria.
3. J4 Educational and Career Services, Ilorin Nigeria
4. Gamich Educational Consults, Ilorin Nigeria

Abstract

Word puzzle game-based learning applications use game elements to improve students' English spelling, participation, motivation, and academic performance. Despite their potential, their adoption remains limited, while traditional teaching methods continue to hinder spelling skills and learner engagement. This study examined the effect of a word puzzle game-based learning application on junior secondary school students' performance and motivation in English spelling in Ilorin, Nigeria. A quasi-experimental design was adopted. An intact class of purposively selected students was pre-tested using a paper-based crossword puzzle and post-tested using the game-based application as an intervention. Data were analyzed using descriptive and inferential statistics, including frequency, percentage, mean, standard deviation, ANCOVA, and t-tests at a 0.05 significance level. Findings revealed that the game-based application significantly improved students' spelling performance and increased their motivation. The study concluded that word puzzle game-based learning is an effective tool for enhancing both performance and motivation in English spelling. It recommended that educators integrate such applications alongside traditional teaching methods to improve learning outcomes.

Keywords: Effect, Word Puzzle, Game-Based Application, English Language, Academic Performance, Motivation

Introduction

Game-based learning (GBL) is a concept related to the use of game elements in education, it is an instructional approach aimed at encouraging students' active participation in the learning process, engagement, enhanced motivation and improved academic performance, thereby making the learning process more fun and enjoyable for students'. According to Kristanto, (2020), the integration of game-based learning approach into the teaching and learning process, also aims at developing students' problem-solving skills, foster interaction, and enhance critical thinking ability.

However, while game-based learning approach is not entirely new, it has gained considerable attention over the years, for its ability to influence students' behavior, encourage friendly competition, and enhance collaboration among students'. Also, it should be noted that, the integration of game-based learning is also aimed at complementing the traditional approach into a more dynamic, engaging and enjoyable learning experience capable of motivating students' and enhancing academic performance. Consequently, IJAAR, (2022) opined that the use of games in education can greatly enhance learners' interest and involvement, making learning more engaging and appealing.



Specifically, word puzzle game-based learning application is a technological game approach designed to enhance students' engagement and active participation in the learning process, especially in English spelling proficiency. This is because, students often feel more encouraged to learn with the intervention of game-based approach, due to its features that motivates students to learn than the traditional approach. It should also be noted that, game-based application encourages social interaction and collaboration among students', because game-based applications incorporate multiplayer modes or social features and game elements, that encourage interaction and collaboration among students.

According to Alsadoon, Alkhawajah, and Suhaim (2022), integrating game elements into educational activities makes the learning process more enjoyable, dynamic, interactive, and effective for students. Similarly, Aina, *et al.*, (2018), game-based application elements like competition, tasks, achievement, and rewards for completed tasks stimulates students' motivation to engage with learning contents. Consequently, when students are given the opportunity to explore and experiment within game-based environments, they are likely to take ownership of their learning (Sulyman, *et al.*, 2022). This method boosts students' motivation and also helps develop vital skills such as critical thinking and problem-solving, which are crucial for achieving academic success. Motivation is a critical factor influencing students' performance in a game-based learning situation. Specifically, game-based applications have shown significant improvement in students' motivation.

Empirical findings on the effect of word puzzle game-based learning in the study of Onasanya, Aladesusi, and Onasanya (2021) revealed that students achieved better results when learning English vocabulary through digital word puzzle game. Similarly, Zhonggen, (2023) examined students' learning outcome, motivation, and satisfaction in a gamified English vocabulary learning, findings revealed that student's motivation, satisfaction and learning outcome in a gamified English vocabulary learning was significantly higher compared to non-gamified learning approach. Al-absi, (2017) also investigated the effect of using word puzzle games on students' mathematical thinking. Findings of the study revealed that word puzzle games had a positive effect on improving students' mathematical thinking and self-efficacy.

Furthermore, Rabu and Talib, (2017) examined the effects of digital game-based learning on students' English vocabulary achievement and acceptance. Findings of the study showed high significant difference that proved students acceptance of digital game-based intervention and demonstrate better English vocabulary outcome than those taught using the traditional method. Similarly, Cabrera-Solano, (2022) revealed that the effect of game-based learning through the use of Genially in English as a foreign language (EFL) in an online instruction have the potential to enhance EFL learners' academic performance, especially in aspects related to students' knowledge of grammar and vocabulary. Findings further showed that the implementation of game-based learning increased students' motivation, especially when feedback is effectively provided.

Statement of the Problem

Game-based learning application is the use of game elements as a technological intervention to support students' learning process, foster active participation, enhance motivation and academic performance. However, despite the enormous capacity of game-based learning approach in instruction, the adoption of game-based learning applications in English language at junior secondary school level in Ilorin, Nigeria remain very limited. Consequently, the ability to construct word spellings in English language and be able to create meaningful expressions from it is fundamental to developing an effective communication and cognitive skills among junior secondary school students.

However, despite the importance of having good spelling ability as tantamount to developing strong communication skills in English language, the traditional instructional approach continues to limit students' spelling ability, comprehension, interest and overall academic performance of junior

secondary school students in Ilorin, Nigeria. Hence, the need to integrate game-based learning as a different approach vital to addressing gaps in the traditional approach, by exposing students to game-based learning application, a technological intervention aimed at improving students spellings, motivation and academic performance in English language. Therefore, this study examined the effect of word puzzle game-based learning application on junior secondary school students performance and motivation in English spellings in Ilorin, Nigeria.

Purpose of the Study

This study examined the effect of word puzzle game-based learning application on junior secondary school students' academic performance and motivation in English spellings in Ilorin, Nigeria. Specifically, this study;

1. determined the effect of word puzzle game-based application on junior secondary school students' academic performance in English Spellings;
2. examined the level of motivation of junior secondary school students towards the use of word puzzle game-based application for learning spellings in English Studies;
3. examined difference in the pre-test and post-test mean scores of junior secondary school students taught English spellings using word puzzle game-based application;
4. determined difference in the post-test academic performance of male and female junior secondary school students taught English spellings using word puzzle game-based application; and
5. examined the effect of gender on the level of motivation of junior secondary school students towards the use of word puzzle game-based application for learning spellings in English Studies.

Research Questions

The following research questions were answered in the study:

1. what is the effect of word puzzle game-based application on junior secondary school students' academic performance in English Spellings?
2. What is the level of motivation of junior secondary school students towards the use of word puzzle game-based application for learning English spellings?
3. what is the difference in the pre-test and post-test mean scores of junior secondary school students taught English spellings using word puzzle game-based application?
4. What is the difference in the post-test academic performance of male and female junior secondary school students taught English spellings using word puzzle game-based application? and
5. What is the effect of gender on the level of motivation of junior secondary school students towards the use of word puzzle game-based application for learning English spellings?

Research Hypotheses

The following hypotheses were tested at 0.05 significant level in the study:

- H₀₁: there is no significant interaction effect in the pre-test and post-test mean scores of junior secondary school students taught English spellings using word puzzle game-based application;
- H₀₂: there is no significant difference in the post-test academic performance of male and female junior secondary school students taught English spellings using word puzzle game-based application; and
- H₀₃: there is no significant difference on the level of motivation of male and female junior secondary school students towards the use of word puzzle game-based application for learning English spellings.



Methodology

The study adopted a quasi-experimental design, the group was exposed to word puzzle game-based application and word puzzle game on paper to determine difference in students' learning of English spellings using game approach. The group was pre-tested using cross word puzzle game on paper and then poste-tested on the word puzzle game-based application with English spelling tasks. Population for the study comprised all junior secondary school students in Ilorin, Nigeria. The target population was a junior secondary school purposively selected on the availability of ICT laboratory equipped with mobile tablets and computers. 30 junior secondary school class two students in an intact class actively participated in the study.

Research instruments used in the study include an adopted word puzzle game-based application, paper cross-word puzzle game. Using both word puzzle games, students were expected to draw out meaningful English words. Then also, the study made use of English performance test to assess the students' pre-test and post-test performance in English spelling task. Data collected for the study were analyzed using descriptive and inferential statistics. The data were coded on Excel spread sheet, while Statistical Product and Service Solutions (SPSS) version 23.0 was used to analyze the data. Frequency, Percentage, Mean and Standard Deviation was used to answer research questions, ANCOVA was used to test research hypothesis one, while *t-test* was used to test research hypotheses two and three at 0.05 significant level.

Results

Research Question 1: what is the effect of word puzzle game-based application on junior secondary school students' academic performance in English Spellings?

Table 1: *Effect of Word Puzzle Game-Based Application on Junior Secondary School Students' Academic Performance in English Spellings*

Score	N	Mean	SD	MD
Pretest	30	49.93	8.16	23.63
Posttest	30	73.56	3.69	

Table one shows the result of the pre-test and post-test to determine the effect of word puzzle game-based application on junior secondary school students academic performance in English spellings, with a pre-test mean score of 49.93, a post-test mean score of 73.56, and a mean difference of 23.63 between the pre-test and post-test, indicating an improvement in the students' performance after the technology intervention, showed that the word puzzle game-based application had a positive effect on the students' academic performance in English spellings.

Research Question 2: What is the level of motivation of junior secondary school students towards the use of word puzzle game-based application for learning English spellings?

Table 2: *Junior Secondary School Students Level of Motivation towards the Use of Word Puzzle Game-Based Application for Learning English Spellings*

S/N	Items	Mean	SD
1	I was motivated to play word puzzle game due to my curiosity to learn new words and correct spellings	3.33	.60
2	I am motivated to play games that challenge my knowledge in English Language	3.33	.80
3	I find word puzzle game app as an enjoyable approach to improve my spelling ability and learn new words.	3.53	.50

4	As I play to learn, I am also driven to play games that offer rewards for my progress.	3.63	.49
5	I am motivated to play games that allow me express my knowledge and abilities	3.43	.81
6	The challenge to play games that allow me think critically and solve problems motivated me even more.	3.26	1.08
7	I prefer the word puzzle game as a different approach to improve my performance in English Language compared to other instructional strategies.	3.20	.96
8	The constant adverts always obstruct my game and affect my motivation towards the word puzzle game app	2.56	1.04
9	Request for online payment to gain points to move past obstacles in the word puzzle game app is discouraged me a few times.	2.83	1.05
10	Playing word puzzle game app enhanced my motivation, and as well improved my spelling ability in English Language	3.60	.49
Grand Mean Score		3.27	

Table two revealed the results of the level of students' motivation towards the use of word puzzle game-based application for learning English spellings. The lowest mean score of 2.56 reflects the students' dissatisfaction with the game application constant advertisement, which always obstructs their game time. However, with a grand mean score of 3.27, which is above the benchmark of 2.5, it can be deduced that junior secondary school students in Ilorin were highly motivated towards the use of word puzzle game-based application, which enhanced the students English spellings proficiency.

Research Hypotheses

Hypothesis One: there is no significant interaction effect in the pre-test and post-test mean scores of junior secondary school students taught English spellings using word puzzle game-based application

Table 3: ANCOVA Showing Significant Interaction Effect in the Pre-test and Post-test Academic Performance of Junior Secondary School Students Taught Spelling Using Word Puzzle Game-based Application

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	349.731 ^b	2	174.865	10.706	.000
Intercept	4981.059	1	4981.059	304.961	.000
Pretest	343.212	1	343.212	21.013	.000
Group	32.984	1	32.984	2.019	.000
Error	441.002	27	16.333		
Total	325514.000	30			
Corrected Total	790.733	29			

a. R Squared = .442 (Adjusted R Squared = .401)

Table 3 shows the analysis of covariance (ANCOVA) that was conducted to examine the effect of word puzzle game-based application on students' performance in English spellings. The difference in the pre-test scores and post-test scores F-value of 2.019 with $p < .000$, showed that prior knowledge of the pre-test intervention significantly influenced the post-test performance. Therefore, the null

hypothesis (H_{01}) is rejected. The implication is that there was a significant interaction effect in the pre-test and post-test academic performance of junior secondary school students taught English spellings using word puzzle game-based application.

Hypothesis Two: there is no significant difference in the post-test academic performance of male and female junior secondary school students taught English spellings using word puzzle game-based application

Table 4: *t-test Showing Significant Difference in the Post-test Academic Performance of Male and Female Junior Secondary School Students Taught English Spellings Using Game-Based Application.*

Gender	N	Mean	SD	df	t	Sig.2 (tailed)	Remark
Male	16	73.87	2.98	28	.482	0.63	Not Rejected
Female	14	73.21	4.45				

Table four showed the *t-test* result of the null hypothesis (H_{02}); $t(28) = 482$, $p(0.63) > 0.05$, which indicate that the null hypothesis (H_{02}) was not rejected, hence, there was no significant difference in the post-test academic performance between male and female junior secondary school students taught English spellings using word puzzle game-based application. This implied that the performance of both male and female students in English spellings had significantly improved using word puzzle game-based application.

Hypothesis Three: there is no significant difference on the level of motivation of male and female junior secondary school students towards the use of word puzzle game-based application for learning English spellings

Table 5: *t-test Showing Significant Difference on the Level of Motivation of Male and Female Junior Secondary School Students Towards the Use of Word Puzzle Game-Based Application for Learning English Spellings*

Gender	N	Mean	SD	df	t	Sig.2 (tailed)	Remark
Male	16	33.12	4.33	28	.577	0.56	Not Rejected
Female	14	32.28	3.51				

Table 5 showed the *t-test* result of the null hypothesis (H_{03}); $t(28) = 577$, $p(0.56) > 0.05$ showed that there was no significant difference on the level of motivation of male and female junior secondary school students towards the use of word puzzle game-based application for learning English spellings. Hence, the null hypothesis (H_{03}) was not rejected, which implied that both male and female students' level of motivation significantly improved towards the use of word puzzle game-based application.

Discussion of Results

This study examined the effect of word puzzle game-based learning application on junior secondary students' performance and motivation in English spellings in Ilorin, Nigeria. The study exposed junior secondary school students' to a pre-test intervention using paper cross word puzzle

game and the main treatment using word puzzle game-based application (post-test) with the same English spellings task. Findings of this study showed that the intervention of word puzzle game-based learning application was very effective in enhancing junior secondary school students' academic performance and motivation in learning English spelling.

Findings of this study is consistent with Serrano (2023); Yan, Effendi, and Matore, (2023) study that game-based learning serves as a motivating and engaging instructional strategy that enhances learners' experiences by incorporating elements such as challenge, reward, and interactive features. Alsadoon, Alkhawajah, and Suhaim (2022) similarly revealed that word puzzle game app is motivating and effective for enhancing students' English language learning. The finding also aligns with Ashraf, et al. (2019) that students exposed to online vocabulary games out performed those taught using traditional methods.

Similarly, Shokri and Abdolmanafi-Rokni (2019) observed improved spelling and motivation among students using spelling games. Mehrpour and Ghayour (2017) also reported significant gains in spelling, especially with homophones and silent-letter words, through the use of educational computerized games. These outcomes suggest that game-based learning provides engaging repetition and exposure, which aids memory and retention. Alalimi and Almassaad (2020) supported this with evidence of enhanced spelling achievement using Kahoot. The interactive nature of games boosts learners' enthusiasm and concentration. Moreover, word puzzle apps challenge students academically. The findings of this study, therefore, affirm that game-based applications significantly enhance spelling performance among students.

Furthermore, Hamari et al. (2015) and Ab-Rahman et al. (2018) emphasized that game-based applications enhance student motivation through interactive and engaging learning environments. Liando and Tatipang (2023) also described word puzzle apps as effective tools for practicing vocabulary and spelling in a fun way. Shokri and Abdolmanafi-Rokni (2019) reported that games like Spelling Bee and Hang Man increased learners' motivation due to repeated exposure and the competitive nature of games.

On the contrary, finding that revealed game-based application enhanced students' motivation and performance, contradicts the findings of Serrano (2019) that revealed adding instructions or feedback to digital game-based learning did not significantly boost motivation or performance beyond collaborative interaction alone, raising questions about whether game elements or its social features significantly influence students' motivation and performance.

Conclusion

This study examined the effect of word puzzle game-based learning application on junior secondary school students' academic performance and motivation in Ilorin, Nigeria. The study concluded that the integration of word puzzle game-based learning application was effective in enhancing students' academic performance and motivation in English spelling. The interactive features of the application like levels, points, and feedback, contributed to motivating students' use of the application and improved academic performance.

The study also concluded that gender did not significantly influence students' motivation when using word puzzle game-based application, indicating that digital learning tools can be beneficial across gender lines. This means that when game-based applications are carefully selected and implemented, it can serve as an inclusive educational tool that caters for diverse learners and needs. These findings therefore demonstrate the potential of educational technology to support traditional



instruction and enhance English language learning through engaging and meaningful game-based activities.

Recommendations

Based on the findings of this study, the following recommendations were proposed:

1. Schools and teachers should incorporate game-based applications like the word puzzle game application into the English language curriculum, to enhance English spellings, students' motivation and academic performance even more in a fun and interactive way.
2. Researchers should explore the effectiveness of game-based application in other arrears of English studies like grammar, comprehension and other subjects like Mathematics and science, in other to broaden the effect of game-based learning.
3. Developers and educators should also ensure that game-based applications are designed to be inclusive and appealing to both male and female students, given that no significant gender differences were observed in their level of motivation or academic performance.

References

- Ab-Rahman, R., Ahmad, S., & Hashim, U. R. (2018). The effectiveness of gamification technique for higher education students engagement in polytechnic Muadzam Shah Pahang, Malaysia. *International Journal of Educational*, 15(1), 1–16.
- Aina, J. K., Ogundele, A. G., & Olanipekun, S. S. (2018). Students' proficiency in English Language relationship with academic performance in science and technical education. *American Journal of Education Research*, 1(9), 355-358.
- Al-absi, M. (2017). The Effect of Using Puzzles and Games on Students' Mathematical Thinking at the Faculty of Educational Sciences and Arts (UNRWA). *An-Najah University Journal for Research*, 31(10), 1-22.
- Alsadoon , E., Alkhawajah, A., & Suhaim, A. B. (2022). Effects of a gamified learning environment on students' achievement, motivations, and satisfaction. *Heliyon*, 8(8), 10249–10259.
- Alalimi, M., & Almassaad, A. (2020). The Effectiveness Of Kahoot Online Game On Efl Learners' Spelling Achievement And Their Perceptions Towards The Game. *Asian Journal of Educational Research*, 8(1), 34-42.
- Ashraf, H., Ghanei-Motlagh, F., & Salami, M. (2019). The impact of online games on learning English vocabulary by Iranian (low-intermediate) EFL learners. *Procedia- Social and Behavioral Sciences*, 98(1), 286-291.
- Cabrera-Solano, P. (2022). Game-Based Learning in Higher Education: The Pedagogical Effect of Genially Games in English as a Foreign Language Instruction. *International Journal of Educational Methodology*, 8(4), 719-729.
- Hamari, J., Huotari, K., & Tovanen, J. (2015). Gamification and Economics. *The Gameful World: Approaches; Issues; Applications*, 139(1), 15-17.
- IJAAR. (2022). The role of games in enhancing students' interest and involvement in learning. *International Journal of Advanced Academic Research*, 8(5), 45–57.
- Kristanto, Y. D. (2020). Effort to improve the qulaity of mathematics learning through flipped classroom and gamification. *proceeding Seminar National Mathematics*, 3(1), 266-278.
- Liando, N. F., & Tatipang, D. P. (2023). On Looking Scrambled Game in English Spelling Teaching. *UNICSSH 2022, ASSEHR 698*, 630–637.
- Mehrpour, S., & Ghayour, M. (2017). The Effect of Educational Computerized Games on Learning English Spelling among Iranian Children. *The Reading Matrix: An International Online Journal*, 17(2), 165-178.



- Onasanya, T. O., Aladesusi, G. A., & Onasanya, S. (2021). Effect of scrabble game on secondary school students' academic achievements in selected English language concepts in Ilorin metropolis. *Indonesian Journal of Learning and Instruction*, 4(2), 17-30.
- Rabu, S. A., & Talib, Z. (2017). The Effects of Digital Game-based Learning on Primary School Students' English Vocabulary Achievement and Acceptance. *Innovative Teaching and Learning Journal*, 1(1), 61–74.
- Serrano, K. (2023). The effect of digital game-based learning on student learning: A literature review". *Graduate Research Papers*.
- Shokri, H., & Abdolmanafi-Rokni, J. (2014). The impact of computer games on EFL learners' spelling: A qualitative study. *Studies In English Language Teaching*, 2(2), 266-274.
- Sulyman, H. T., Saadu, U. T., & Olosunde, J. O. (2022). The effect of game strategy on the academic performance of pupils in literacy in Ilorin metropolis of Kwara State. *International Journal of Academic and Applied Research*, 6(7), 56–63.
- Zhonggen, Y. (2023). Learning Outcomes, Motivation, and Satisfaction in Gamified English Vocabulary Learning. *SAGE Open*, 1–14.
- Yan, L. L., Effendi, M., & Matore, E. M. (2023). Gamification Trend in Students' Mathematics Through Systematic Literature Review. *International Journal of Academic Research in Progressive Education and Development*, 12(1), 433–461.