THE USE OF WORD FACTORY TO ENHANCE COMPREHENSION SKILLS AMONG GRADE 4 STUDENTS

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ABSTRACT

This study aimed to evaluate the efficacy of the Word Factory game in improving the comprehension skills of Grade 4 students. The research addressed key questions regarding pre-test and post-test scores' averages and differences between control and experimental groups. It was conducted at San Rafael Integrated School, employing a quasi-experimental design over two weeks. Data analysis utilized SPSS and the K-12 DepEd grading system, employing Mean and Independent Sample T-tests. Pre-test results revealed a significant performance gap, with the control group outperforming the experimental group. However, post-test results demonstrated the Word Factory intervention's effectiveness in enhancing comprehension skills, with the experimental group exhibiting significant improvement compared to the control group. Recommendations include integrating the Word Factory into teaching strategies, providing professional development for teachers, encouraging parental involvement, and DepEd endorsement for broader implementation. These findings underscore the potential of innovative interventions like the Word Factory in enhancing student learning outcomes, particularly in vocabulary and comprehension.

Keywords: Word Factory, Game-Based Learning, Non-Digital Game-Based, Comprehension Skills.

I.   INTRODUCTION

Grade 4 marks a pivotal stage in a student's academic development, as it represents the transition from basic literacy to more advanced reading and comprehension skills. At this juncture, students are expected to not only decode text but also engage in deeper levels of understanding, analysis, and critical thinking. Comprehension skills are essential for academic success, as they allow students to grasp the meaning of texts, make connections between ideas, and apply knowledge in various contexts. However, research highlights several challenges that hinder the development of these skills. For instance, many students struggle to adapt to more complex texts and concepts, which require higher-order thinking and the ability to synthesize information from various sources (Bradberry & De Maio, 2019; Zargar et al., 2020). In addition, vocabulary comprehension remains a major obstacle. Students often encounter words that are unfamiliar or used in unfamiliar contexts, making it difficult for them to fully understand the content of a reading passage (Haiken & Furman, 2022; Jaenudin et al., 2020).

Furthermore, the demands of modern education require students to engage with a wide range of reading materials, many of which require critical thinking skills. Students are expected to analyze texts, infer meanings, and evaluate arguments, which further complicates the comprehension process (Haiken & Furman, 2022). Additionally, metacognitive skills, such as self-awareness of one's understanding and the ability to regulate one's reading strategies, are crucial for effective comprehension. The shift from "learning to read" to "reading to learn" becomes more pronounced in Grade 4, and students must now apply reading as a tool for acquiring knowledge rather than simply a skill for decoding words (Bae & Kwon, 2021; Jones & Christensen, 2022). These transitions, coupled with individual learning differences, make comprehension a complex task for many Grade 4 students. External factors, such as socio-economic background and prior educational experiences, also influence students' comprehension abilities (Dantas & Cunha, 2020; Tuell & Cinquini, 2021).

Considering these challenges, educators play a crucial role in addressing the needs of students and supporting the development of their comprehension skills. Effective teaching strategies must be diverse, tailored to accommodate the varying learning styles, abilities, and backgrounds of students. Research suggests that a variety of comprehension-enhancing techniques, particularly those that focus on vocabulary development, are essential. Contextual learning, word mapping, games, and frequent reading activities are just a few of the strategies that have been shown to improve comprehension (Khalilova, 2023; Majeed et al., 2023; Ali et al.,

2023; Buehl, 2023; Qureshi et al., 2023). Other methods, such as understanding word roots, maintaining vocabulary journals, using interactive technology, promoting collaborative learning, making real-world connections, and conducting regular assessments, can all play a role in reinforcing comprehension skills and fostering a love for reading (Gallen et al., 2023; Zhang & Mao, 2023).

One innovative strategy that has gained attention for its potential to enhance comprehension is the use of the Word Factory, also known as the Boggle Game. This game is based on the principles of gamification and has been shown to offer cognitive, motivational, and pedagogical benefits that support the development of language and comprehension skills. Through word search and formation activities, students engage in pattern recognition, vocabulary expansion, and critical thinking—key components of effective comprehension (Bin-Hady, 2021; Habibah, 2021). Research suggests that such games not only improve vocabulary acquisition but also stimulate deeper cognitive processes, allowing students to make connections between words, recognize word families, and build their understanding of language structures (Metom et al., 2019; Tari & Safitri, 2023). Moreover, the competitive and interactive nature of the game motivates students, encouraging active participation and enhancing their engagement with the learning process (Fauziah et al., 2018). Games like Word Factory also provide opportunities for collaborative learning, where students can share strategies, learn from one another, and apply their comprehension skills in a social context (Bin-Hady, 2021; Habibah, 2021).

However, the effectiveness of games like Word Factory in improving comprehension is not guaranteed without thoughtful instructional design. It is essential that educators carefully plan and facilitate these activities to align with educational objectives and to ensure that students are provided with the necessary guidance and support. When integrated effectively into the curriculum, these games can foster an environment that promotes both language development and critical thinking (Allcoat & Evans, 2023).

In the context of San Rafael Integrated School, the lack of sufficient reading comprehension skills among fourth-grade students has been a noted concern. During the researchers' field study experience, the need for enhanced comprehension instruction was evident. Many students struggled with understanding the content of the texts they were reading, which, in turn, affected their academic performance across subjects. In response to this challenge, this study proposes the use of the Word Factory or Boggle Game as a novel approach to improve the students' comprehension skills. By introducing this game as an engaging and interactive tool, the researchers aim to provide a solution to the comprehension difficulties faced by the students at San Rafael Integrated School and contribute to the growing body of research on gamification in education.

This paper will explore the potential of the Word Factory game to enhance comprehension skills among Grade 4 students, drawing on existing literature, theoretical frameworks, and empirical data to assess the effectiveness of this innovative approach. The study seeks to highlight the importance of incorporating diverse, interactive strategies into classroom instruction to support the development of critical literacy skills at a crucial stage in students' academic journeys.
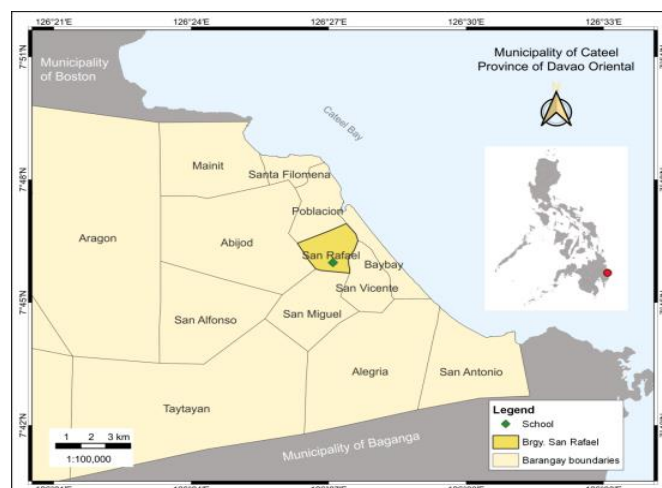
II. METHODS

Research Locale

Figure 1. Map of Cateel, Davao Oriental, highlighting San Rafael Integrated School

The study was conducted at San Rafael Integrated School, Municipality of Cateel, Province of Davao Oriental. Figure 1 shows the research locale of the paper. San Rafael Integrated School was one of the schools in Cateel, District 2, that offered Kindergarten to Grade 6. Each grade level comprised 2 to 3 sections. Furthermore, the intervention and data gathering from the respondents were completed within 1 month and there were only two sessions per week.

Research Design

The researchers employed a quasi-experimental research design for this study, specifically using a pre-test and post-test approach. The study involved two groups: an experimental group, which received the Word Factory intervention, and a control group, which continued with traditional instruction. Both groups were administered the same pre-test to assess their initial comprehension levels and the same post-test to evaluate the effectiveness of the intervention. The respondents were randomly assigned to either the experimental or control group, ensuring a fair comparison and minimizing potential biases. This design allowed the researchers to determine whether the Word Factory game had a significant impact on students' comprehension skills.

Research Respondents

The researchers randomly selected 26 Grade 4 students from San Rafael Integrated School as their respondents. The students were chosen from a single school to ensure the sample was representative of the student body at this school. The random selection process helped minimize bias, ensuring that every student had an equal chance of being selected for the study. This approach aimed to increase the reliability of the results and allowed researchers to generalize the findings within the context of San Rafael Integrated School.

All respondents administered pre-test and post-test questionnaires, and only those who completed both tests were included in the final analysis. To ensure data validity, respondents who were absent during the post-test but completed the pre-test were excluded from the analysis.

Research Instrument

The researchers themselves created pre-test and post-test questionnaires. The questionnaire consisted of a 26-item multiple-choice test about synonyms and antonyms, based on the K to 12 English Curriculum with the learning competency: identify multiple meanings of words (EN4V—IIId—3). Furthermore, to further ensure the validity of the questionnaire, it was checked and subjected to validation by three (3) experts, specifically Master Teachers.

In this study, researchers introduced a customized assessment tool to evaluate participants' learning outcomes before and after the intervention. The tool was validated and tested for reliability. Content validity, confirmed with Aiken's V coefficient of 0.85, was established through expert review. Reliability, measured by Cronbach's alpha, scored 0.60, indicating adequate internal consistency. These assessments demonstrated the tool's accuracy and reliability for educational research (Sireci & Bond, 2014; Ahdika, 2017).

Data Collection

The research process began with the researchers seeking ethical clearance from the research department of Davao Oriental State University - Cateel Extension Campus, ensuring that all ethical considerations were met before proceeding with the study. Following this, a permission letter was sent to the School Principal of San Rafael Integrated School, requesting approval to conduct the action research. Once permission was granted, the researchers submitted a letter to the Grade 3 class advisers to gain consent for utilizing the tool and strategy with the learners.

To ensure the reliability of the questionnaire, the researchers conducted pilot testing with Grade 3 students at Cateel Central Elementary School, refining the tool before administering it to the study participants. Next, the researchers proceeded with administering the pre-test questionnaire to the students at San Rafael Integrated School. This pre-test served as an introduction to the upcoming activities and helped the researchers assess the students' baseline comprehension and vocabulary skills.

After the students completed the pre-test, the researchers retrieved the questionnaires, tallied the results, and analyzed the data to establish a baseline for the study. The researchers then began conducting the intervention,

where the experimental group engaged in sessions using the Boggle or Word Factory Game as a learning tool, while the control group received traditional instruction.

Once the intervention was completed, the researchers administered the post-test to evaluate the effectiveness of the intervention on the students' skills. After the post-test was completed, the questionnaires were retrieved, and the data was tallied, encoded, analyzed, and interpreted to determine whether the intervention had a significant impact on the experimental group's comprehension and vocabulary development.

III. DATA ANALYSIS

When the observation of the experimental and controlled group respondents is complete through the pre-intervention and post-intervention, tabulation of the raw data was the initial step in encoding the results. In analyzing and achieving reliable, realistic, and proper interpretation of the gathered data, using Statistical Package for the Social Sciences (SPSS), a software program used for quantifying data analysis, and K-12 DepEd grading system used for interpreting remarks of data results, comparing the performances of the two groups. Moreover, the statistical tools to be used are the following:

Table 1. K to 12 grading system

GRADING SCALE	INTERPRETATION
90-100	Outstanding
85-89	Very Satisfactory
80-84	Satisfactory
75-79	Fairly Satisfactory
Below 75	Did Not Meet Expectations

Mean. This statistical tool was used to determine (1) the level of pre-test scores and (2) the post-test scores of the respondents from the two groups. On the other hand, the mean was appropriately utilized as a tool to answer objectives 1 and 2.

Independent T-test. This statistical tool was used in determining (3) the significant difference in pre-test results between the controlled and experimental groups, (4) the significant difference in post-test scores between the controlled and experimental group, and lastly, in other words, the mentioned tool was utilized accordingly to answer objectives 3 and 4.

IV. RESULTS

Level of Pre-test Scores

The purpose of employing a pre-test in this study was to assess the initial comprehension and vocabulary levels of the participants before any intervention was applied. This baseline measurement allowed for a clear comparison between the control and experimental groups, highlighting any differences in their starting points.

Table 2. Level of pre-test scores between control group and experimental group

Group	Total Score	Standard Deviation	Mean	Grade Percentage	Remarks
Control	26	5.77	15.60	80.58	Satisfactory
Experimental	26	2.80	9.37	68.02	Did Not Meet Expectations

The data indicates that the control group achieved a higher mean score of 15.60 with a grade percentage of 80.58, reflecting a Satisfactory performance. In contrast, the experimental group had a lower mean score of 9.37 and a grade percentage of 68.02, which indicates that they did not meet expectations. The standard deviation for the experimental group (2.80) is smaller, suggesting less variability in their scores compared to the control group, which had a higher standard deviation (5.77), implying more varied performance among the students.

Significant Difference of Pre-test Scores Between Control Group and Experimental Group

This section discussed the significant difference in mean scores of pre-test comprehension test achievements between the control and experimental groups. The statistical analysis of these scores is summarized in the table provided below.

Table 3. Mean comparison between pre-test scores of control group and experimental group

Group	Mean	Standard Deviation	T-value	P-value	Interpretation
Control	15.60	5.77			Pre-test scores between the two groups differ significantly
Experimental	9.37	2.80	5.582	0.000	

The data shows that the T-value of 5.582 and the P-value of 0.000 indicate a statistically significant difference between the pre-test scores of the control and experimental groups. This means that before the intervention, the two groups had significantly different levels of comprehension and vocabulary skills. The control group, with a higher mean score of 15.60, performed better than the experimental group, which had a mean of 9.37, suggesting that the control group had a stronger foundation in these skills prior to the intervention.

Level of Post-test Scores

The purpose of employing a post-test in this study was to evaluate the effectiveness of the Word Factory intervention by measuring any improvements in the participants' comprehension and vocabulary skills after the intervention. By comparing the post-test results with the pre-test scores, the researchers could assess the impact of the intervention on the experimental group. The post-test also helped determine whether the intervention led to a significant increase in student performance, as compared to the control group.

Table 4. Level of post-test scores between the control and experimental groups

Group	Total Score	Standard Deviation	Mean	Grade Percentage	Remarks
Control	26	3.24	18.03	80.05	Satisfactory
Experimental	26	3.52	24.80	91.33	Outstanding

The post-test results reveal that the experimental group, which received the Word Factory intervention, achieved a significantly higher mean score of 24.80 with a grade percentage of 91.33, reflecting an Outstanding performance. In comparison, the control group had a mean score of 18.03 and a grade percentage of 80.05, indicating Satisfactory performance. The higher mean and grade percentage in the experimental group suggests that the intervention was effective in improving their comprehension and vocabulary skills, as evidenced by their superior post-test performance.

Significant Difference of Post-test Scores Between Control Group and Experimental Group

Table 5 shows that the mean score for the control group was 18.03 with a standard deviation of 3.24, whereas the experimental group had a higher mean score of 24.80 with a standard deviation of 3.52. The F-value of 61.001 and a p-value of 0.000 confirm that the difference in post-test scores between the two groups is statistically significant.

Table 5. Mean comparison between post-test scores of control group and experimental group

Group	Mean	Standard Deviation	F-value	P-value	Interpretation
Control	18.03	3.24			Post-test scores between the two groups differ significantly
Experimental	24.80	3.52	61.001	0.000	

The data shows that the F-value of 61.001 and the P-value of 0.000 indicate a statistically significant difference between the post-test scores of the control and experimental groups. This suggests that the intervention (Word Factory) had a significant positive impact on the experimental group, which achieved a higher mean score of

24.80 compared to the control group's mean of 18.03. The significant difference in post-test scores confirms that the intervention effectively improved the experimental group's comprehension and vocabulary skills.

V. DISCUSSION

The findings from this study offer valuable insights into the impact of the Word Factory game (also known as the Boggle Game) on the comprehension skills of Grade 4 students. By comparing the pre-test and post-test results from both the experimental group, which used the game-based intervention, and the control group, which received traditional instruction, the study provides compelling evidence of the benefits of gamified learning in enhancing students' comprehension abilities.

At the outset of the study, the pre-test results indicated that the control group was already meeting the expected proficiency level for Grade 4 students, whereas the experimental group showed lower proficiency levels. The control group's higher pre-test scores reflect the potential advantage of traditional methods, where students are likely exposed to a range of vocabulary-building activities and comprehension strategies such as direct instruction, vocabulary drills, and practice with reading materials (Sembiring & Simajuntak, 2023).

Conversely, the experimental group's lower pre-test scores suggest that they were starting at a disadvantage, possibly due to limited exposure to interactive and engaging tools specifically designed to boost vocabulary and comprehension. This aligns with research indicating that many students in the early grades face challenges transitioning from basic reading to understanding more complex texts, especially as they move toward reading to learn (Bradberry & De Maio, 2019). Moreover, this group may have faced difficulties in making connections between words and meanings, hindering their ability to extract information effectively from texts.

After the intervention was introduced, the experimental group demonstrated significant improvement in their post-test performance, achieving a mean score of 24.80 and a grade percentage of 91.33, classified as "Outstanding." This suggests that the Word Factory game was highly effective in improving their comprehension skills. One of the key reasons for this improvement is the nature of the intervention itself. The Word Factory game is a gamified approach that promotes active learning through interaction, competition, and immediate feedback, elements known to enhance students' engagement and cognitive processing (Fauziah et al., 2018; Tari & Safitri, 2023). According to the **Game-Based Learning Theory (Gee, 2013)**, the use of games in educational settings can lead to deeper learning by increasing motivation, providing immediate feedback, and encouraging collaboration.

The experimental group's remarkable improvement suggests that the gamified nature of the Word Factory game helped students build vocabulary, recognize patterns in words, and develop stronger comprehension skills. The game likely encouraged students to engage with words in ways that fostered a deeper understanding of word meanings, leading to better performance in synonym and antonym tasks, as well as a greater ability to interpret and analyze texts. This finding is supported by **Bandura's (1977) self-efficacy theory**, which emphasizes that students' belief in their abilities can significantly influence their learning outcomes. As students engaged more confidently with vocabulary tasks in the game, they were likely able to apply these skills to their reading tasks, leading to improved comprehension.

The findings of this study have both local and global implications for educational practices. In local contexts, such as schools in rural areas with limited resources, the Word Factory game offers an affordable, accessible way to enhance vocabulary and comprehension skills. The game can be easily implemented in classrooms with minimal resources, providing an interactive and engaging way for students to expand their language skills. For urban schools, where resources may be more readily available but learning environments are often more diverse, the game offers a versatile tool that can cater to different learning styles and help bridge gaps in comprehension (Sembiring & Simajuntak, 2023).

This study is also relevant to the Sustainable Development Goal (SDG) 4: Quality Education, which advocates for inclusive, equitable, and quality education for all. Game-based learning tools like Word Factory align with this goal by providing innovative, engaging, and inclusive ways to develop essential academic skills. The use of such tools in diverse educational contexts—both rural and urban—can help reduce educational disparities and promote greater access to high-quality learning experiences (UNESCO, 2020).

Implication to English Education

The results of this study highlight the significant potential of game-based learning in enhancing reading comprehension and vocabulary acquisition among Grade 4 students. The integration of the Word Factory (Boggle Game) into the curriculum has shown promising results, offering key implications for English education. First, the success of the experimental group demonstrates that game-based learning can effectively engage students and improve comprehension skills. Games like Word Factory provide an interactive and enjoyable way to promote vocabulary development, critical thinking, and language application—skills essential for effective reading comprehension. Educators should consider incorporating such gamified activities to foster active participation and improve students' language skills beyond traditional methods.

Second, the study underscores the importance of vocabulary acquisition in academic success. Interactive gameplay, like that provided by Word Factory, allows students to deepen their understanding of words and their meanings, helping them transition from basic reading to more complex comprehension tasks. By focusing on vocabulary-building activities that involve context-based learning, teachers can enhance students' ability to understand and apply language in various contexts, rather than relying on rote memorization.

The research also highlights the effectiveness of active learning in improving comprehension skills. Game-based tools like Word Factory promote self-directed learning, increase motivation, and provide immediate feedback. These elements foster an engaging and student-centered approach to teaching that contrasts with traditional, passive methods. This shift to active learning is essential for improving both vocabulary and critical thinking skills.

Additionally, the use of Word Factory illustrates the potential of differentiated instruction, where gamified tools cater to various learning styles and allow for personalized learning experiences. This flexibility ensures that all students, regardless of their academic ability, benefit from engaging and supportive educational methods, thus creating a more inclusive classroom environment.

Finally, the study aligns with Sustainable Development Goal (SDG) 4, which aims to provide inclusive, equitable, and quality education for all. Game-based learning, accessible through digital tools, helps bridge educational gaps, especially in rural and underserved areas. By adopting innovative methods like Word Factory, educators can provide high-quality, engaging learning experiences, supporting the global goal of ensuring equitable education worldwide.

In conclusion, incorporating game-based learning into English education presents a dynamic and effective approach to improving reading comprehension and vocabulary skills. The findings of this study suggest that interventions like Word Factory can significantly enhance student engagement, language acquisition, and overall academic success. As educational systems continue to evolve, integrating such gamified strategies will be crucial in fostering an interactive, inclusive, and effective learning environment for all students.

VI. CONCLUSION

This study demonstrates that the use of the Word Factory (Boggle Game) significantly enhances the reading comprehension and vocabulary skills of Grade 4 students. The experimental group, which engaged in the game-based learning intervention, showed notable improvement in comprehension, compared to the control group. These findings highlight the effectiveness of gamified learning in fostering deeper engagement, active learning, and language development, making it a valuable tool in English education.

Based on the positive outcomes observed, it is recommended that game-based learning be integrated into English curricula, especially in elementary education, to enhance vocabulary acquisition and reading comprehension. Teachers should explore and implement interactive tools like Word Factory and other educational games to promote a more engaging and dynamic learning environment. Additionally, further research should be conducted to explore the long-term impact of such interventions across different grade levels and educational settings, particularly in rural areas where access to resources may be limited.

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