

Design and Development of *Synonym Battlefront*: A Gamified Approach to Enhancing Vocabulary Diversity in Academic Writing

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Abstract

This paper presents the conceptualisation, design and development process of *Synonym Battlefront*, a board game aimed at addressing the challenge of insufficient vocabulary knowledge among non-native English-speaking university students, particularly in the context of academic writing. While vocabulary diversity is essential for academic success, many students face challenges related to vocabulary repetition, often stemming from restricted lexical awareness and constrained language repertoires. To tackle this, this study introduces gamified strategies to promote synonym usage through an engaging and interactive gameplay experience. Using iterative design processes and playtesting, the game was evaluated for its efficacy in enhancing vocabulary diversity and academic writing proficiency. The findings demonstrate the potential of educational game design to overcome language learning challenges, foster meaningful engagement, and support academic success. The results underscore the transformative potential of educational game design in addressing language acquisition challenges, fostering sustained learner engagement, and contributing to academic success in higher education contexts.

Keywords: *language teaching, gamified, educational game design, vocabulary development, synonym*

Introduction

In today's academic landscape, mastering vocabulary diversity is essential for success in scholarly endeavours. However, non-native English-speaking university students often struggle with limited vocabulary knowledge, particularly in academic writing, which leads to challenges such as repetitive word usage. To effectively address these issues, innovative approaches like gamification are gaining recognition. Gamification, as defined by Suryadi et al. (2023), integrates game-like features such as challenges, rewards, and progress tracking into educational settings, making learning more engaging and enjoyable through gaming principles and mechanics.

This paper focuses on the innovative design and development of *Synonym Battlefront*, a gamified board game aimed at reducing vocabulary repetition among university students. By fostering synonym awareness and enhancing vocabulary diversity, this approach tackles one of the most persistent barriers faced by non-native English-speaking students in academic writing.

While traditional methods, such as dictionary use, have proven effective for vocabulary acquisition, they often fail to sustain student engagement. For instance, Phung and Nguyen (2021) demonstrated that synonym and antonym dictionaries boosted student motivation and learning outcomes, while Mokhtar et al. (2010) highlighted the role of dictionaries in helping learners understand unfamiliar words. However, these tools alone do not address the motivational and interactive needs of modern learners. Hartt et al. (2020) emphasized that game-based learning strategies, when integrated into education, enhance engagement and improve learning outcomes compared to conventional methods.

Research further highlights the struggles of non-native English-speaking university students with synonym usage. Katagiri (2019) noted that vocabulary repetition often stems from limited lexical range and unfamiliarity with alternative vocabulary options. In Malaysia, Mokhtar et al. (2021) found that tertiary students, despite over 12 years of formal English education, lacked sufficient vocabulary breadth to express themselves effectively in academic contexts. These challenges underscore the need for innovative teaching strategies to foster vocabulary growth and reduce repetition. This deficit often resulted in redundant word usage, impeding their ability to convey complex ideas effectively and confidently. These findings highlight the inadequacy of traditional teaching methods in equipping students with the lexical tools required for academic success. The repeated challenges across different contexts suggest an urgent need for innovative and interactive pedagogical strategies that prioritise vocabulary expansion. Approaches such as gamification and collaborative learning offer potential solutions by creating engaging environments where learners can actively explore and practice synonym usage, thereby fostering greater lexical diversity and reducing the over-reliance on repetitive language structures.

Gamification has shown significant promise in addressing these issues. Rawendy et al. (2017) found that integrating gamification with mnemonic strategies, such as the keyword and loci methods, enhances learners' enthusiasm for language mastery. Additionally, Cónego et al. (2024) noted that Millennials and Generation Z, with their extensive familiarity with digital technologies, are particularly receptive to gamified learning, making it a practical and effective approach for vocabulary acquisition. The success of gamification lies in its ability to bridge the gap between traditional teaching methodologies and the evolving expectations of digitally savvy learners. By transforming vocabulary acquisition into an engaging and goal-oriented activity, gamification not only addresses the issue of limited lexical diversity but also cultivates a more positive attitude toward language learning. As such, it presents a powerful, scalable, and contextually relevant strategy for enhancing vocabulary growth across diverse educational settings.

The proposed *Synonym Battlefield* board game leverages gamification to enhance synonym awareness, reduce vocabulary repetition, and encourage diverse word usage. Inspired by Katagiri's (2019) emphasis on synonym awareness, the game incorporates interactive mechanics to promote engagement and practi-

cal application of vocabulary knowledge. Its development and testing phases have ensured an effective and enjoyable learning experience tailored to the needs of non-native English speakers.

The objectives of this study are:

1. To develop and evaluate the effectiveness of the *Synonym Battlefield* board game in addressing vocabulary repetition.
2. To examine the impact of the game on students' engagement, motivation, and ability to use synonyms in academic writing.

By addressing these objectives, this research seeks to contribute to the fields of gamified education and language learning, providing a pathway for improving academic writing skills through innovative teaching strategies.

Literature Review

Gamification in Education

Gamification employs game mechanics such as challenges, rewards, and interactivity to foster engagement, motivation, and active participation in educational contexts (Suryadi et al., 2023). Research has consistently highlighted its potential to enhance learning outcomes.

For instance, Hartt et al. (2020) found that students preferred gamified lectures over traditional methods, noting increased engagement and collaborative learning. Similarly, a meta-analytic review by Kim and Castelli (2021) demonstrated that gamified interventions effectively improved behavioural outcomes and cognitive skills, particularly in short-term applications.

Innovative implementations of gamification, such as Suryadi et al.'s (2022) *ReadOn* application, illustrate its adaptability to modern learners' needs. Designed to improve reading comprehension among Generation Z university students, the app incorporated game elements that leveraged users' familiarity with digital technologies. Through carefully designed features such as rewards, progress tracking, and interactive challenges, the application succeeded in transforming reading into an engaging and goal-oriented activity. Feedback from users indicated significant gains in engagement and comprehension, underscoring gamification's flexibility in addressing diverse academic challenges.

Broader studies, such as those by Manzano-León et al. (2021), have also validated gamification's ability to enhance academic performance and motivation while fostering essential skills like critical thinking and teamwork. Together, these findings highlight gamification's transformative potential, particularly in making educational content more interactive and learner focused. These findings underscore gamification's transformative potential in reshaping traditional educational paradigms. Unlike conventional teaching methods that often prioritise passive knowledge consumption, gamification shifts the focus toward active, learner-centred experiences. This approach not only increases student participation but also supports diverse

learning styles, making educational content more accessible and adaptable to individual needs. The interactive nature of gamified learning also promotes sustained interest, allowing students to remain engaged with challenging material over extended periods.

Vocabulary Learning and Gamification

Vocabulary acquisition is a cornerstone of language learning but presents challenges for non-native speakers, including limited lexical diversity and over-reliance on repetitive vocabulary. Traditional tools, such as dictionaries, have long been effective in addressing these issues. For example, Phung and Nguyen (2021) found that synonym and antonym dictionaries increased learners' motivation and engagement, leading to positive outcomes. Mokhtar et al. (2010) similarly emphasized dictionaries' utility in helping students understand unfamiliar words. However, these studies focus predominantly on traditional methods without considering how gamification could complement or enhance these approaches.

Gamification introduces a dynamic alternative, offering interactive and engaging experiences that traditional methods lack. Rawendy et al. (2017) demonstrated the effectiveness of gamification when combined with mnemonic strategies, such as the keyword method and loci, in enhancing enthusiasm for language learning. This approach is particularly effective for Millennials and Generation Z learners, who are accustomed to digital interactivity (Cónego et al., 2024).

The potential of gamification in vocabulary learning is supported by Katagiri's (2019) findings, which suggest that synonym awareness can reduce repetitive language use and improve lexical variety in writing. While existing research has explored gamification's role in developing skills such as reading comprehension (Suryadi et al., 2022), there remains limited exploration of its application in vocabulary acquisition, particularly in fostering synonym diversity. Moreover, the scarcity of research in this area highlights an opportunity to examine how gamified approaches could bridge persistent gaps in traditional language education. Non-native English-speaking learners often experience limited lexical awareness, resulting from rote memorisation techniques and a lack of meaningful, contextual vocabulary practice. Gamification, with its focus on active participation and real-time feedback, provides a platform for learners to explore synonyms in an immersive and practical context, thus reinforcing retention and application.

Bridging the Gap

This study contributes to the growing body of research on gamification by demonstrating its application in a previously unexplored domain: synonym acquisition and usage in academic writing. By addressing the limitations of traditional vocabulary learning methods, such as a lack of engagement and interactivity, it highlights how gamified approaches can enhance learning experiences. Through the design and implementation of *Synonym Battlefront*, this study aims to bridge the gap between traditional vocabulary strategies and gam-

ification, offering a novel pathway to overcoming the challenges of vocabulary repetition and limited lexical variety in academic writing.

Methodology

Theoretical Framework

This study is grounded in Constructivist Learning Theory, which emphasises the role of active participation and social interaction in knowledge construction (Vygotsky, 1978). Constructivism posits that learners build knowledge more effectively through hands-on experiences and collaboration, making it an ideal foundation for gamified learning environments. By engaging students in the competitive and collaborative gameplay of *Synonym Battlefield*, the study aligns with this framework to foster vocabulary acquisition in meaningful contexts.

Research Design

This research adopts a Design-Based Research (DBR) approach, a methodology specifically suited for creating and iteratively refining educational tools and interventions in real-world settings (Barab & Squire, 2004). DBR integrates theory with practice by testing and refining innovations through systematic cycles of design, implementation, and evaluation. By employing this methodology, the study ensures that the game's design and instructional effectiveness are responsive to the needs of learners and educators.

Observational Studies

Preliminary observations assessed students' existing vocabulary knowledge, engagement levels, and attitudes towards traditional teaching methods. This diagnostic phase was crucial in shaping the design framework of the board game, ensuring its pedagogical alignment with the learners' cognitive needs, linguistic challenges, and preferred learning styles. These insights guided the design and development of the board game to foster active participation, enhance vocabulary acquisition, and promote sustained engagement in the language learning journey.

Iterative Design Process

The game was developed using a structured iterative design process, informed by DBR principles (Reeves, 2006). Each iteration involved collecting feedback from educators and students during playtesting sessions. Core features, such as chance cards, gameplay mechanics, and board layout, were revised across multiple cycles to optimize the game's educational impact and engagement potential.

Participants

Participants consisted of university students of Universiti Teknologi MARA, Sarawak Branch, Mukah Campus, from various language proficiency backgrounds. Each playtesting session involved a new cohort of students, enabling the collection of diverse data on gameplay behaviors, interactions, and learning outcomes.

Playtesting and Data Collection

Playtesting sessions were conducted in controlled classroom environments. Observational techniques were employed to examine students' engagement levels, synonym usage, and overall gameplay experience. Data were collected through:

1. **Field notes** documenting gameplay interactions, strategies and use of synonyms.
2. **Post-session reflections** where students shared feedback on the game's design and educational value.

Game Mechanics, Instructional Phrases, and Rationale

The following paragraphs illustrate the details of the game mechanics, instructional phases, and the rationale for each stage, offering a thorough understanding of how *Synonym Battlefront* operates as an effective educational tool.

Stage 1: Introduction (5 minutes)

The initial phase of the lesson focuses on refreshing students' prior knowledge and setting the context for the day's activities. The teacher begins by asking students about their understanding of synonyms and encourages them to share examples they know. This interactive session serves two primary purposes: it helps students recall their existing knowledge of synonyms and provides an overview of the lesson's objectives.

By engaging students in recalling and sharing their knowledge, the teacher not only assesses the students' current understanding but also creates an interactive and inclusive learning environment. This sets a positive tone for the lesson, ensuring that students are mentally prepared for the activities that follow.

Stage 2: Presentation (5 minutes)

In this phase, the teacher defines synonyms and presents common academic phrases and words using a PowerPoint presentation. This structured presentation helps in establishing a clear understanding of synonyms and their applications. The presentation serves as a foundational step, ensuring that students have a clear and precise understanding of synonyms. By presenting common academic phrases and words, the teacher prepares students for the practical application of these concepts in the subsequent tasks.

Stage 3: Practice (5 minutes)

AAAAa. Students then engage in a hands-on activity where they use dictionaries to find definitions and list three synonyms for given words. They write these synonyms on a whiteboard in turns, promoting active participation and collaborative learning. This practical exercise familiarizes students with new words and encourages extensive reading. It also teaches them how to effectively use dictionaries, thereby enhancing their research skills and vocabulary acquisition. Writing on the whiteboard promotes a collaborative learning environment where students can learn from each other.

Stage 4: Production (20 minutes)

The core of the lesson is the introduction of the war-themed board game *Synonym Battlefield*. Students are divided into two groups, *Team West*, and *Team East*, each led by a *Commander*. The gameplay incorporates dynamic mechanics, including **Chance Cards**, which consist of **Bomb Cards** for launching attacks on the opposing team and **Sandbag Cards** for fortifying defenses. The game mechanics involve teams using chance cards; that is a Bomb card to attack opponents and a Sandbag card to defend themselves; and quickly providing synonyms for given words to move forward on the board. The first team to reach the finish line wins.

The game is designed to reinforce students' recall and application of synonyms in a dynamic and competitive environment. It strengthens memory retention, fosters team spirit, and boosts confidence. Additionally, the game encourages strategic thinking and leadership skills, as students must decide how to use their chance cards effectively and respond promptly with synonyms.

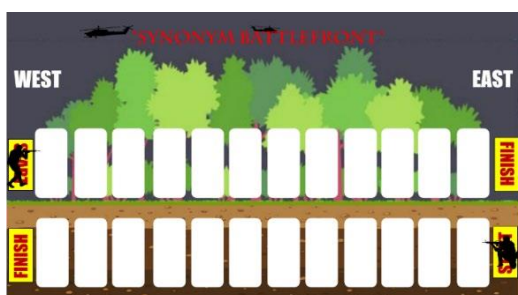


Figure 1: Board Game Template



Figure 2: Chance Cards

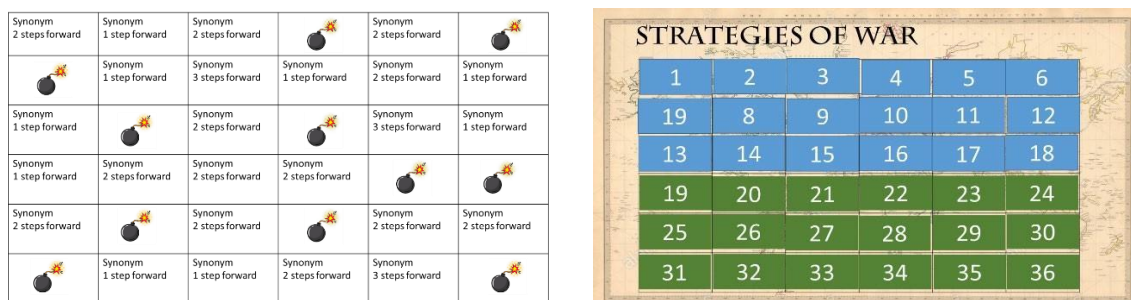


Figure 3: The team leader selects a question number, revealing how many synonyms are needed to advance (e.g., two synonyms = two spaces)

Stage 5: Closure (5 minutes)

The lesson concludes with a sharing session where students discuss what they have learned, what they enjoyed, and what could be improved. This reflective activity allows students to express their thoughts and provides the teacher with valuable feedback on the lesson's effectiveness.

Reflection is a critical aspect of the learning process. This sharing session helps students consolidate their learning, provides insights into their experiences, and helps the teacher assess whether the lesson objectives were met. It also fosters a culture of open communication and continuous improvement.

Finding and Discussion

The findings from the implementation of *Synonym Battlefront* reveal several important insights into the effectiveness of gamified learning in vocabulary acquisition.

Firstly, the high level of student engagement and enjoyment underscores the importance of incorporating interactive and fun elements into educational activities. When students enjoy what they are learning, their motivation and retention levels increase significantly. This finding aligns with educational theories that suggest students' intrinsic motivation is strengthened when they are actively engaged and derive satisfaction from their activities. As a result, this increased motivation contributes to more efficient and long-lasting learning outcomes. Furthermore, the enjoyment experienced from the game also contributes to fostering a positive classroom atmosphere, an essential element in creating an optimal learning environment. The war-themed and competitive nature of *Synonym Battlefront* effectively captured students' interest, making the learning process both enjoyable and memorable.

Secondly, the improvement in students' quick-thinking abilities suggests that time-bound challenges can be beneficial in enhancing cognitive skills. This aspect of the game fosters students' capacity to think swiftly and retrieve vocabulary promptly, thereby cultivating a highly valuable skill set in both everyday communication and academic environments. By requiring students to provide synonyms within a short time

frame, the game encouraged them to think on their feet and quickly recall relevant vocabulary. The augmentation of quick-thinking abilities implies that time-constrained challenges in educational games can function as a potent instrument for cognitive advancement. This skill is particularly valuable in real-world communication scenarios where prompt responses are often required.

Also, a comparative analysis was conducted on students' written assignments before and after the implementation of *Synonym Battlefront*. Results indicated a notable reduction in vocabulary repetition and an increase in the use of diverse vocabulary, enhancing the quality of academic writing. This improvement demonstrates that the game effectively expanded students' lexical resources and enhanced their proficiency in using synonyms accurately in their writing. The greater diversity in vocabulary not only enriched the students' written expression but also elevated the overall quality of their academic work. These outcomes highlight the potential of the game in facilitating vocabulary acquisition and improving students' writing abilities, both of which are essential for academic success. Furthermore, the game's success suggests broader applications for similar gamified approaches in other areas of language learning, such as improving grammatical accuracy or enhancing reading comprehension. By integrating such tools into the curriculum, educators can create a more engaging and effective framework for addressing the linguistic and cognitive demands of academic writing. These findings reaffirm the importance of innovative pedagogical strategies in equipping students with the skills necessary for academic and professional success.

Finally, the competitive aspect of the game also played a crucial role in motivating students. The desire to win and outperform their peers drove students to actively participate and engage with the content. This finding highlights the potential of competition as a motivating factor in educational settings. The success of *Synonym Battlefront* in bolstering students' enthusiasm for language mastery substantiates these assertions and emphasizes the potential of gamified methodologies to render learning more enticing and efficacious. The findings confirmed Rawendy et al.'s (2017) claim that integrating gamification can significantly enhance students' enthusiasm for language mastery. This is particularly evident among Generation Z participants, who are known for their openness and adaptability to gamified approaches, as highlighted by Cónego et al. (2024).

The success of *Synonym Battlefront* has important implications for educational practice. It shows that incorporating game-based learning strategies can greatly improve student engagement, cognitive abilities, and academic achievements in various subjects. Educators can use the motivational and cognitive benefits of gamification to create more dynamic and effective learning experiences. Additionally, the positive feedback from students and improved academic outcomes suggest that gamified learning can be a valuable addition to traditional teaching methods, offering a comprehensive approach that combines enjoyment with challenging academic exercises.

Conclusion

The *Synonym Battlefront* board game offers a unique solution for non-native English-speaking university students grappling with vocabulary challenges in academic writing. Through gamified strategies and extensive testing, it promises an enjoyable learning experience, fostering meaningful engagement and improving academic writing proficiency. This innovative approach not only addresses language barriers but also holds significant commercialization potential in educational markets. Beyond its commercial value, *Synonym Battlefront* aligns with global initiatives for inclusive education and societal empowerment, making it a promising tool for language development and academic success. While the initial results are promising, there are limitations to this study. The sample size was relatively small, and the study did not include a control group for comparison. Future research should incorporate larger, more diverse samples and control groups to validate the findings. Long-term studies are needed to assess the lasting impact of the game on vocabulary retention and academic performance. Additionally, exploring the game's adaptability to different educational contexts and its effectiveness across various proficiency levels would be beneficial.

Author contributions

Fakhira Jafri conceived the original idea for *Synonym Battlefront*, led the conceptualization, methodology, project administration, and wrote the initial draft. She conducted the majority of the research and oversaw the overall design and development process of *Synonym Battlefront*. Stefanie Natasha Rich Joseph significantly assisted in refining the methodology and findings and reviewed relevant literature on vocabulary acquisition and educational game design. Cindy Robert edited the content for clarity, coherence, and academic rigor while Adeena Mazwa Rabytah Amir Abdullah revised the manuscript for intellectual content.

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Data availability statement

The data related to the design and development process of *Synonym Battlefront* are available within the paper itself, including descriptions of the game mechanics, methodology, playtesting results, and educational principles incorporated. Additional details or clarifications regarding the game's development can be provided upon request.

Conflicts of interest

In order to develop an iterative design process, the game was conducted multiple times during workshops and class time as part of a lesson plan, involving students who also participated in the study. One primary potential conflict arises from the fact that the students who participated in the game were also the subjects of the study, which could introduce biases.

These students were enrolled in courses taught by some of the authors, creating a potential for biases due to the authors' professional interest in the study's outcomes. The educators' professional interest in achieving positive outcomes could inadvertently influence their teaching methods or interactions with students, with the aim of obtaining favorable results. This bias may manifest in various ways. Instructors might unconsciously favor the game in classroom activities, allocating more time and resources to it compared to other methods, thus distorting the data. Furthermore, students might feel compelled to perform well to please their instructor or out of concern that their grades might be affected, even if unintentionally. To address this issue, ensuring voluntary participation and clearly communicating that student performance in the game will not impact their grades can help mitigate these biases. Additionally, involving external evaluators in the data collection and analysis process can provide a more objective perspective. To address this, steps were taken to ensure transparency, voluntary participation, and unbiased data collection and analysis.

Another potential conflict arises from the emphasis on gamification and competition, which may not be suitable for all students. This could potentially induce stress or anxiety in students who struggle in competitive environments. Moreover, some students may find the competitive nature of the game to be overwhelming, ultimately having a negative impact on their learning experience and overall well-being. The excessive emphasis on winning could overshadow the educational objectives, leading to increased anxiety and reduced enjoyment of the learning process. To address this issue, it is essential to incorporate reflective and supportive elements into the game. It is crucial to ensure that the game promotes learning and collaboration rather than solely focusing on competition. Additionally, providing support for students who feel stressed by the competitive aspects of the game is of utmost importance. Teachers should closely monitor students' reactions to the game and be prepared to offer alternative activities if necessary. Ultimately, the success of gamified approaches in education depends on their ability to accommodate diverse learner needs. By prioritising collaboration, inclusivity, and emotional well-being alongside competition, educators can create a more holistic and equitable learning environment. This ensures that the gamified experience not only achieves its educational objectives but also supports the broader developmental and psychological needs of all students.

References

- Barab, S. A., & Squire, K. D. (2004). Design-based research: An emerging paradigm for transformative teaching and learning. *Yearbook of the National Society for the Study of Education*, 103(1), 25-48. <http://doi.org/10.3102/0013189X032001005>
- Cónego, L., Pinto, R., Pinto, J., & Gonçalves, G. (2024). Leveraging gamification in Industry 5.0: Tailored solutions for workplace employees. *Procedia Computer Science*, 232, 1769-1778. <https://doi.org/10.1016/j.procs.2024.01.175>
- Douglas, S. R. (2015). The relationship between lexical frequency profiling measures and rater judgements of spoken and written general English language proficiency on the CELPIP- General Test. *TESL Canada Journal*, 32(9), 43–64. <https://doi.org/10.18806/tesl.v32i0.1217>
- Hartt, M., Hosseini, H., & Mostafapour, M. (2020). Game On: Exploring the Effectiveness of Game-based Learning. *Planning Practice & Research*, 35(5), 589-604. <https://doi.org/10.1080/02697459.2020.1778859>
- Katagiri, R. (2019). A Lexical Profile Analysis of a Diagnostic Writing Assessment: The Relationship between Lexical Profiles and Writing Proficiency [Master's thesis, Carleton University]. Faculty of Graduate and Postdoctoral Affairs. Ottawa, Ontario. <https://doi.org/10.22215/etd/2019-13637>
- Kim, J., & Castelli, D. M. (2021). Effects of gamification on behavioral change in education: A meta-analysis. *International Journal of Environmental Research and Public Health*, 18(7), 3550. <https://doi.org/10.3390/ijerph18073550>
- Manzano-León, A., Camacho-Lazarraga, P., Guerrero, M. A., Guerrero-Puerta, L., Aguilar-Parra, J. M., Trigueros, R., & Alias, A. (2021). Between level up and game over: A systematic literature review of gamification in education. *Sustainability*, 13(4), 2247. <https://doi.org/10.3390/su13042247>
- Mokhtar, A. A., Rawian, R. M., Yahaya, M. F., Abdullah, A., Mansor, M., Osman, M. I., Zakaria, Z. A., Murat, A., Nayan, S., & Mohamed, A. R. (2010). Vocabulary Knowledge of Adult ESL Learners. *English Language Teaching*, 3(1), 71-80. <http://doi.org/10.5539/elt.v3n1p71>
- Phung, P. T., & Nguyen, N. T. (2021). High school students' attitudes towards the use of a synonym and antonym dictionary in learning vocabulary. *TNU Journal of Science and Technology*, 226(13), 109-117. <http://doi.org/10.34238/tnu-jst.5034>
- Rawendy, D., Ying, Y., Arifin, Y., & Rosalin, K. (2017). Design and development of a game for Chinese language learning with gamification and the mnemonic method. *Procedia Computer Science*, 116, 61-67. <https://doi.org/10.1016/j.procs.2017.10.009>
- Reeves, T. C. (2006). Design research from a technology perspective. In J. van den Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Eds.), *Educational design research* (pp. 52-66). Routledge.

Suryadi, P., Rifai, I., & Pranoto, H. (2023). "Read on": Comprehending challenging texts at university through gamification app. *Procedia Computer Science*, 216, 730-738.
<https://doi.org/10.1016/j.procs.2022.12.190>

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.