Enhancing English Vocabulary through Game-Based Learning: A Case Study of the Scramword Application

Jozua F. Palandi
jozuafp@stiki.ac.id
Sekolah Tinggi Informatika & Komputer Indonesia, Indonesia

Zusana E. Pudyastuti
zusanacr@stiki.ac.id
Sekolah Tinggi Informatika & Komputer Indonesia, Indonesia

Kaleb Molewe
molewekaleb@gmail.com
Sekolah Tinggi Informatika & Komputer Indonesia, Indonesia

Abstract: English proficiency is an essential requirement for students in the current era of globalization. Consequently, developing innovative and effective learning methods is crucial. The primary objective of this study is to develop an educational game application called Scramword to enhance students' English vocabulary. This research focuses on creating digital learning media that supports improving English language skills by incorporating interactive elements through a word game. Scramword is designed to enrich students' learning experiences enjoyably and engagingly, motivating them to enhance their understanding of English vocabulary. The development of this application integrates existing digital learning theories with game technology to create a platform that is both educational and entertaining. Scramword allows students to learn English at their own pace, actively interact with the material through various difficulty levels and topics, and receive immediate feedback to monitor their progress, providing them with the confidence that they are on the right track. The results of this study are expected to provide new insights into the use of game-based learning media for teaching English. By utilizing Scramword, students can learn the language more effectively while remaining engaged and motivated to continue their learning journey. Additionally, this research aims to contribute to the language education literature by demonstrating creative and innovative integration of technology and pedagogy in language learning.

Keywords: Scramword, Game-based Learning, English Vocabulary, Case Study, Digital Learning

INTRODUCTION

Educative and exciting applications are a vital means of supporting learning in the digital era that continues to increase. With a variety of interactive and captivating tools at their disposal, the digital applications that have been developed have greatly improved the educational experience for pupils. By integrating gamification, artificial intelligence, and interactive lesson delivery, teachers can better engage students in learning and increase student retention. In terms of gamification, learning English vocabulary may benefit from gamification. Many studies have shown the advantages of implementing gamification in various areas and disciplines that increase students' motivation and engagement. (Hellín et al., 2023; Nawaila et al., 2020; Sailer & Homner, 2020).

This research focused on developing Scramword, an educational game application for learning English vocabulary in which players are challenged to arrange jumbled letters. The main objective of this game application is to create an interactive and enjoyable experience that supports the learning process. Scramword was designed to improve students' English vocabulary knowledge and language skills through enjoyable and intellectually stimulating

gameplay. Using gamification elements, such as live feedback, varying difficulty levels, and competitive assessments, Scramword was intended to motivate students to engage more profoundly with the learning content. Even more than that, the application supports self-paced learning, allowing students to practice and improve their language skills at their own pace and comfortable setting. This personalized learning environment is significant in adapting the instruction for individual needs and enhancing the learning experience (Hellín et al., 2023; Nirmala et al., 2023). It is expected that this game application will not only increase students' interest in learning English but also provide teachers with valuable additional teaching media in their language teaching practice.

REVIEW OF RELATED LITERATURE

DIGITAL LEARNING MEDIA

Digital learning media uses digital-based technology to support teaching and learning. (Loglo & Zawacki-Richter, 2023). The term encompasses many applications, tools, and platforms to facilitate education in traditional classroom contexts and distance learning. Digital learning media aims to make learning more interactive, engaging, and practical. With the development of technology, digital learning media has undergone a significant evolution. In the past, educational technology might have been limited to using computers or televisions in classrooms. However, various forms of technology, such as mobile applications, educational software, and e-learning platforms, have become an integral part of the education system. (Hartman et al., 2019). This technology allows students to learn at their own pace and helps them access learning resources more flexibly. A concrete example of digital learning media is an e-learning platform. Through e-learning, students can access learning videos and course materials and conduct exams online, all accessible via computer or smartphone. (Giannakos et al., 2022). This opens more significant learning opportunities for students requiring flexible study time. Integrating digital technology into learning has become crucial in today's educational context. This is not only due to changes in how students access information but also because they must prepare with the necessary skills for the 21st century. (Singh et al., 2022). Therefore, digital learning media is not only an aid in learning but also an important part of developing essential skills needed in the future.

Digital learning media have become essential in modern education, offering flexibility and accessibility that conventional methods might not provide effectively. The presence of applications such as Scramword is a clear example of how technology can be integrated to support interactive language learning. Scramword, a word game app, provides a platform for users to improve their vocabulary and understanding of the English language understanding through a fun and challenging method. Scramword can adjust the difficulty level according to individual abilities, ensuring a practical and personalized learning experience. Digital learning media such as Scramword enriches teaching methods and motivates users to continue learning outside the traditional classroom environment, making language learning more dynamic and engaging in this digital era. (Nawaila et al., 2020).

ENGLISH LANGUAGE LEARNING

English language learning still plays an essential role in the world of education. Adequate English proficiency increases career opportunities and allows students to communicate and access a broader range of global knowledge. (Daqiq & Akramy, 2024). Vocabulary is the foundation for forming sentences and communicating effectively. This aspect of vocabulary comprehension is crucial in English language education. (Dakhi & Fitria, 2019). In digital learning, technology in English education can significantly affect the effectiveness of teaching and learning vocabulary. (H. Li, 2022). Applications, such as "Scrabble" in digital form, can be adopted to attract students to enrich their vocabulary through challenging and educational games. These apps allow students to discover new words in enjoyable and dynamic contexts, strengthening their understanding and encouraging more effective mastery. In addition, digital language learning apps often provide immediate feedback on students' progress so they can see it in real-time. (Hori et al., 2024). This is very important because students can immediately correct mistakes and reinforce the words already learned. Digital technology also supports individualized learning, allowing students to learn at their own pace and needs, which may not always be possible in traditional classroom settings. (Hughey, 2020). Thus, learning vocabulary in English is limited to expanding vocabulary and forming a solid foundation for other language skills such as reading, writing, speaking, and listening.

Developing a Scramword application is essential in English language learning because it offers an innovative method to build vocabulary effectively. This application is designed to provide an interactive and fun learning experience. Scramword can help users learn vocabulary gradually and structurally. This process allows users to

increase their vocabulary in a natural and immersive way while maintaining their interest and motivation. Ultimately, using the Scramword application to learn English will strengthen spelling skills and improve vocabulary understanding. Technology integration in English language learning has been implemented for decades. Many research studies have highlighted the benefits of this integration in enhancing language skills and communication. (Bhat, 2023; Nawaila et al., 2020).

SCRAMWORD

The urgency of developing Scramword is closely related to the increasing demand for digital learning media in English classrooms. Advancements in information technology, particularly in Artificial Intelligence (AI) and machine learning, have enabled it to incorporate features that analyze players' abilities and provide personalized feedback. This innovation transforms Scramword from a game played for entertainment into a great educational tool. The interactive and engaging design of the application responds to the urgent need for tools that make learning more enjoyable and effective, which aligns with the global trend towards innovative educational solutions. By leveraging AI, Scramword can adapt to each user's learning pace and style. It can also ensure that educational content remains challenging yet accessible. This personalized approach helps to keep students interested and motivated, which is essential for effective and successful learning. In addition, Scramword is equipped with real-time feedback and progress tracking that allows the students and teachers to monitor their English vocabulary improvements and identify areas they need to practice further. Conveying the educational and entertainment functions makes Scramword a comprehensive tool that supports the demands of contemporary education and technological advancements in English language learning, ultimately contributing to the broader goal of improving educational outcomes through digital innovation. (Kayra, 2024).

Since Scramword was designed to improve English vocabulary building and comprehension, students can play the game inside the classroom and beyond. Moreover, the application facilitates cognitive skills improvement and provides practical methods for language acquisition. Utilizing the latest technologies enables the application to adapt to each student's needs and proficiency level, including personalized challenges and feedback. These adjustments ensure that learning remains engaging and compelling and cater to the students' diverse learning styles. It is said that successful language learning is done through regular practice; thus, Scramword can motivate students to practice more since it blends education and entertainment perfectly. It makes learning accessible, enjoyable, flexible, and efficient for everyone. (Kayra, 2024). This innovation empowers students to take control of their learning journey, encourages continuous improvement, and develops lifelong learning skills. (Kayra, 2024).

In today's educational landscape, integrating technology in learning environments has transformed traditional methodologies, particularly in language education. This research explores the development and implementation of Scramword, a digital educational application designed to increase the English vocabulary of secondary school students in Malang. The digital age has brought many tools or media that can make learning more interactive and exciting. Educational games effectively motivate students and enhance their learning experience. (Adipat et al., 2021). Scramword uses this concept by incorporating educational games into vocabulary learning as an example of an effective digital learning medium. Scramword is a mobile game application and an educational strategy incorporating a digital framework. This application uses the Unity 2D engine and is programmed in C#. The app lets students learn and practice new words through interactive challenges and puzzles. This method makes learning more engaging and supports mastering new vocabulary through repeated practices applicable in various contexts. (David & Weinstein, 2023). In addition, the user-friendly design was explicitly emphasized in the development process of this application. This design ensures that the learning process is not hampered by complicated interfaces or difficult navigation, instead making it accessible to all students, even those who have never used this application before. The user-friendly design enables them to use the application easily because they will not need to spend much time or effort getting used to its features. The importance of this kind of digital learning tool goes beyond being as simple as improving vocabulary but also considering the meaningful learning experience for the students. By engaging students in an interactive environment, the Scramword can foster crucial 21st-century skills, such as critical thinking, problem-solving, and digital literacy. (Rahman, 2019). These skills are essential because they prepare students to be academically qualified and to succeed in the ever-evolving digital age. So, this Scramword application is expected to be a digital learning medium that can contribute to providing meaningful learning experiences.

Moreover, this application effectively combines motivational aspects of learning and games. Technological advancements in education must be adapted to structured English language learning to meet the diverse needs of

students. Teachers must explore and implement innovative solutions to enhance learning and prepare students for their future.
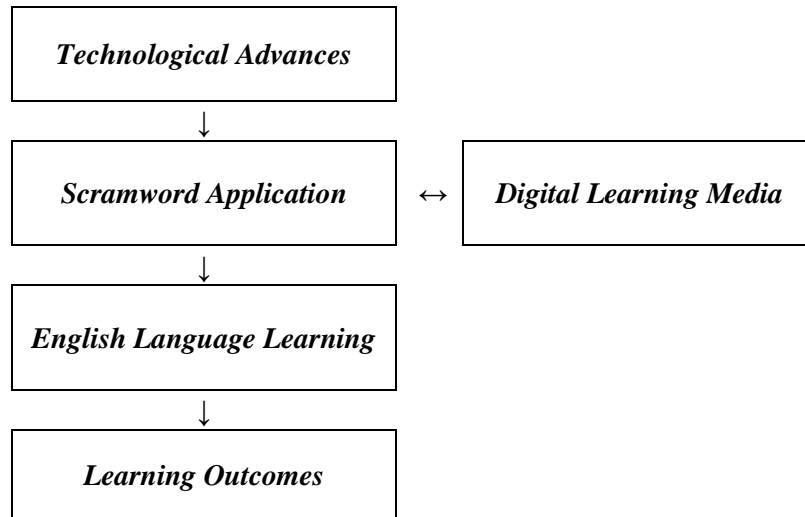
CONCEPTUAL FRAMEWORK

Figure 1. Conceptual Framework

The development of the Scramword application is fundamentally driven by technological advances in artificial intelligence (AI) and machine learning. These technologies enable the creation of advanced features within the application, such as personalized feedback and player ability analysis, which enhance its educational value. As an integral part of digital learning media, Scramword leverages these innovations to provide an engaging and interactive platform that aligns with the increasing demand for innovative educational tools. By enhancing English language learning, Scramword aims to improve vocabulary building and cognitive skills through its word arrangement challenges and jumbled letter puzzles. This interactive and enjoyable approach motivates students to participate more actively and effectively, improving their language proficiency and cognitive abilities. Consequently, the strategic development of Scramword contributes to better learning outcomes, resulting in higher student engagement and educational effectiveness in today's digital age.

RESEARCH OBJECTIVES

When embarking on the development of Scramword, formulating clear and measurable research objectives was very important to determine the scope and direction of this study. These objectives define the expected results and establish the methodology and evaluation criteria. The main objective of this study is to develop an educational game application called Scramword to improve students' English vocabulary.

Specifically, it aims to create an application with the following features:

1. A simple and interactive user interface: Scramword is designed to enhance students' English vocabulary through interactive and engaging gameplay.
2. Support for independent learning: The application provides opportunities for students to engage in independent learning outside the classroom, allowing them to learn at their own pace and time.
3. Increased interest in learning English: Scramword aims to increase student's interest and motivation by making learning enjoyable and interactive.
4. Support for teachers: The application also intends to support teachers in their English language teaching by offering a supplementary tool that enhances traditional teaching methods.

METHODOLOGY

NEEDS AND REQUIREMENTS IDENTIFICATION

This process began with gathering information through surveys and interviews with English teachers and students. The goal was to identify the most essential vocabulary (key vocabulary) and features that made the app valuable and exciting. This collected data was used to design application specifications following the user's needs.

DESIGN AND PROTOTYPING

After the needs had been determined, the next stage was to design an intuitive and attractive user interface. This design was then implemented as a prototype that the students could use. They could also benefit from using this application to improve their English vocabulary. The prototype helped collect initial feedback before initiating the actual game app development.
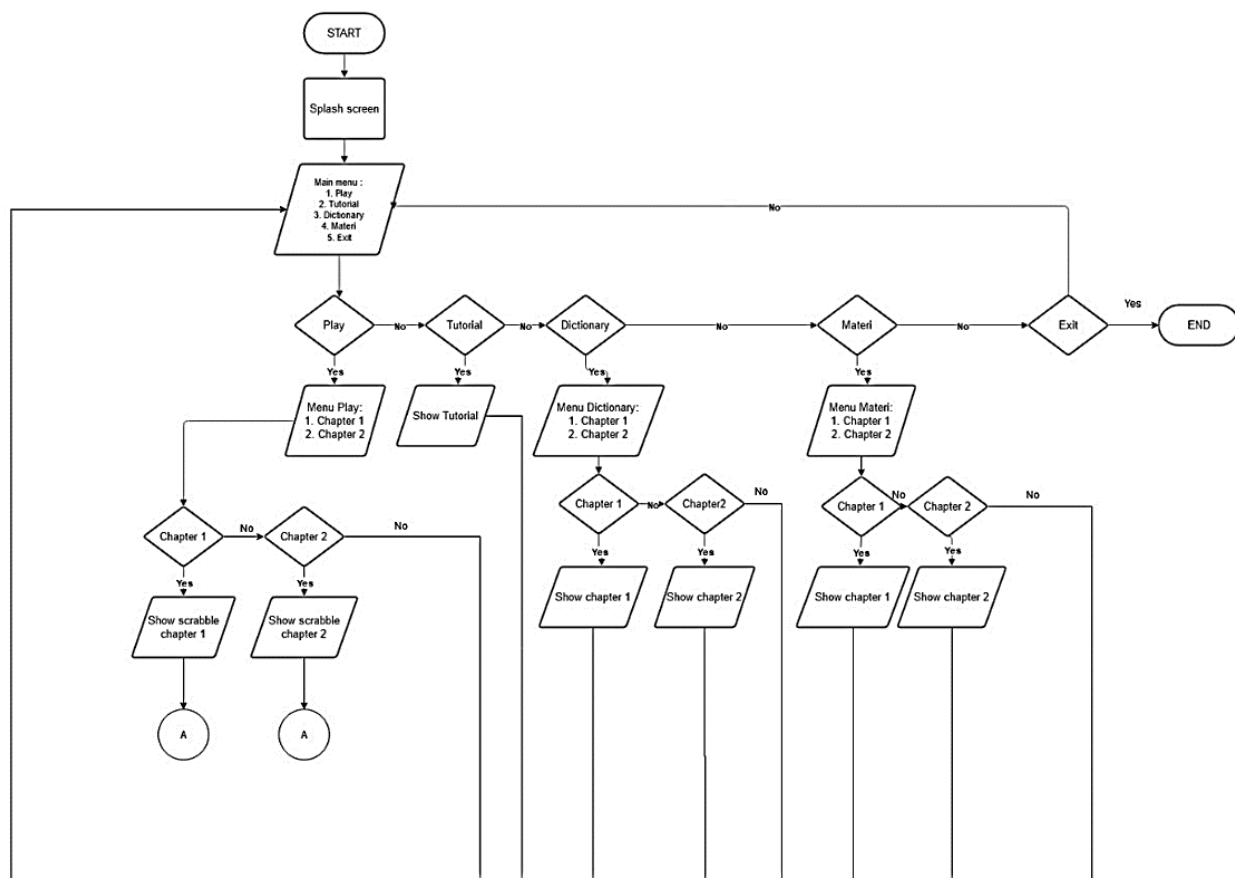

Figure 2. Game Process Flowchart

DEVELOPMENT

The technology used to develop this game was Unity. The programming language chosen was C#. Application development was carried out according to a pre-made design. During this phase, all technical aspects of the application were implemented, including databases for vocabulary and game logic.

APPLICATION TESTING

Application testing is a critical part of the development process. This phase involved unit testing and integration testing to ensure all parts of the application work correctly. In addition, user acceptance testing was conducted by involving end users, namely teachers and students, to ensure that this application met their needs.

IMPLEMENTATION AND LAUNCHING

The next step was implementation and launch, following the application testing and refining. The application was integrated into the school environment and used as a learning medium in the English class. This launch was accompanied by promotions for teachers and students to employ the application in the English language learning process.

EVALUATION AND MAINTENANCE

In this phase, the app continued to be monitored to evaluate how it affected student learning. Periodic maintenance was carried out to ensure the application remains up-to-date and technical issues-free.
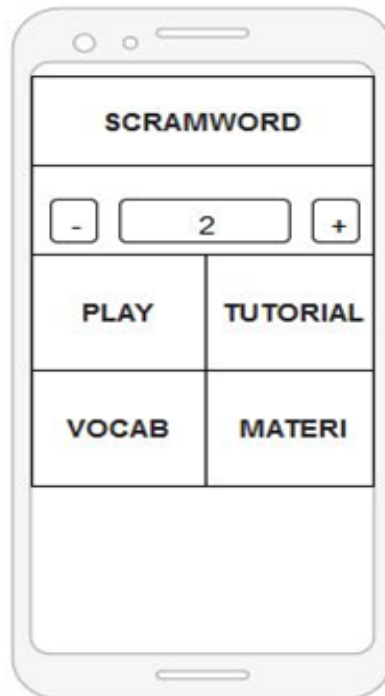

Figure 3. Scramword UI Design

CONTINUOUS FEEDBACK AND ITERATION

Feedback from all app users was collected continuously as part of the evaluation process. This information was critical for the next iteration of the application, allowing the development team to make necessary improvements and adjustments based on actual usage and user needs.

RESULTS

APPLICATION DEVELOPMENT

As mentioned above, the development of Scramword aims to increase the mastery of English vocabulary for middle school students. After going through several critical stages, this research showed positive results. Initially, this study identified students' specific needs for vocabulary that often become an obstacle in learning English. Based on these needs, the Scramword application was designed to provide students with an interactive learning experience by integrating digital educational games to increase student motivation and engagement. The use of Unity and C# programming language ultimately successfully created a stable and attractive platform. The app was then piloted in a controlled environment involving students who provided feedback. Based on this feedback, several iterations were made to improve and refine the application. Application effectiveness testing in the teaching of English was carried out through pre-test and post-test methods to measure the students' vocabulary improvement. The results showed that

the student's vocabulary mastery increased when they used the applications compared to those who did not use the application. (Ajisoko, 2020).

The level of user acceptance and engagement also measured the success of this application. Students reported that the app was not only for education purposes but also for entertainment purposes. This indicates that the game-based learning approach has successfully attracted students. (Adipat et al., 2021). Teachers also noted that students who used the application became more active and confident in English lessons. (Tsymbal, 2019). Thus, this study proves that effectively designed educational technology can increase students' interest in learning and improve their academic performance.

SELF-PACED LEARNING OUTSIDE THE CLASSROOM

The development of the Scramword app was significantly successful in providing students with opportunities to engage in independent learning outside the classroom. Thus, it allows them to learn at their own pace and time. It was shown through several critical aspects of the app and user feedback.

First, the user-friendly interface design of the Scramword application makes it easy for the students to access and use the application without needing constant assistance from the teacher. (W. Li et al., 2022). This feature is essential because it allows students to feel comfortable exploring and using the app independently. It supports the concept of self-directed learning. Moreover, it does not discourage the students from using the application to build their vocabulary.
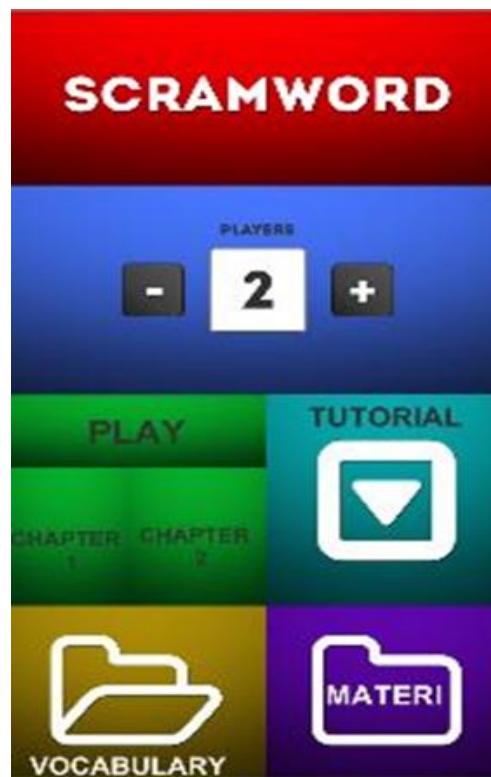

Figure 4. Game-based Implementation

Second, by providing different difficulty levels and customizable vocabulary categories, Scramword allows the students to select topics suitable for their level of understanding. This ability to manage difficulties gives students control over their learning, allowing them to tackle challenges at a pace that works for them without pressure. This kind of control also fulfills another criterion in self-directed learning, which is very important for developing ownership of the learning process.

Third, the Scramword is equipped with an instant feedback system that provides immediate correction and praise when students answer correctly. The system supports independent learning because the provided feedback

allows students to recognize and comprehend their mistakes. They can learn from this feedback and have a meaningful learning experience. This is very important because a lack of guidance often hampers independent learning.

Fourth, according to feedback from students and teachers involved in testing the application, many students felt they could use it in their free time, such as at home or while traveling. This shows that the Scramword application successfully provides flexibility in time and place during the learning process, which is at the core of self-directed learning.

All these aspects show that the Scramword application provides ample support for independent learning in the context of learning English vocabulary, and it also successfully makes students more responsible for their learning. Therefore, it could be argued that the study of the goals of providing students with opportunities to engage in independent learning outside the classroom allows them to learn at their own pace and time.

STUDENTS' INTEREST IN ENGLISH

This research shows increased student interest in learning English through various vital indicators. One indicator is the increased level of student engagement while using the application. Students are enthusiastic about accessing and interacting with applications regularly, including using applications beyond school hours. It shows a strong interest in independent learning and exploring the topic provided (Mebert et al., 2020). Positive feedback from students and teachers indicates increased interest and satisfaction in learning English. Students reported that they found learning methods using digital games more enjoyable and engaging than traditional methods in which games were not used. (Wang et al., 2022). They felt more motivated to learn and use new vocabulary in authentic contexts. Teachers also noted a significant increase in class participation and enthusiasm for English assignments. (Bergmark & Westman, 2018). The increase in test scores also reflected a rise in interest in learning. The students who used Scramword showed a more significant improvement in vocabulary tests. This increase indicates better mastery of the topics and reflects a higher interest in their profound language.

Furthermore, English teachers reported that students who used the application tended to participate more actively in class discussions, ask questions more often, participate in debates, and use the new vocabulary they had learned in a natural context. Thus, using Scramword increases the students' vocabulary knowledge and improves their confidence in using English actively. This application has also positively impacted students' interest and motivation to learn English. They reported feeling more confident in their English skills and are more motivated to continue learning and improving their language skills in academic and social settings. Various indicators from this research show that the Scramword application has increased students' interest in learning English, making language learning more dynamic, interactive, and exciting and positively impacting their learning outcomes.

SUPPORT FOR TEACHERS

The development of the Scramword application has increased students' interest and English vocabulary skills and significantly supports teachers in English language teaching. This support manifests in several ways: a) The Scramword application provides additional resources teachers can use to supplement existing teaching materials. With various games and activities designed to enrich vocabulary, teachers have an effective medium to grab students' attention and keep the classroom dynamic. The application allows teachers to introduce new vocabulary and English concepts more interactively and engagingly, which is often more effective than traditional methods; b) Scramword provides instant feedback to students, which, in this case, is very helpful in the learning process. This feature allows students to instantly know the correct or incorrect answers so that they can fully understand their mistakes. With this feedback, teachers can focus more on other aspects of teaching that require more attention rather than spending time providing individual corrections, which can be very time-consuming; c) This application makes it easy for teachers to measure and track student learning progress through reports and analysis generated by the application. After reading the available data, teachers can make better decisions about subsequent teaching strategies, tailoring lessons to meet the class's or individual students' specific needs. (Regan et al., 2022); d) The Scramword can be considered an exciting alternative in English language learning. It helps reduce the burden on teachers in managing student motivation. Learning sessions will become more productive and interactive when the students are more engaged and motivated. It increases teaching effectiveness and enables teachers to improve their teaching performance; e) The application also reinforces collaborative and communicative learning approaches. By integrating games that require cooperation or healthy competition, teachers can improve their teaching practices to create a whole new environment for the students. Teachers can use Scramword to teach communication and cooperation skills, an essential part of language acquisition. (Nguyen et al., 2020).
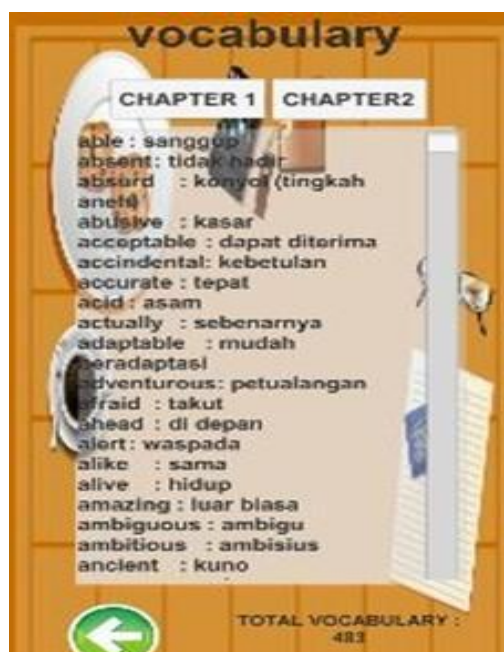
Figure 5. Introducing new vocabulary

Thus, the success of the Scramword application in supporting English Language teaching reflects its ability to be a valuable learning medium for students and teachers in achieving more effective and efficient educational goals.

DISCUSSION

THE EFFECTIVENESS OF GAME-BASED LEARNING METHODS

By utilizing interactive games, this Scramword application supports vocabulary mastery and facilitates the development of broader communicative skills of the students. Research conducted by Adipat et al. (2021) Shows that technology-based learning, specifically through games, is very effective for acquiring new language skills. Game-based learning improves student engagement and motivation, crucial for continuous and immersive language learning. The Scramword and other educational games allow students to engage more in contextual and relevant language practice, which helps them profoundly understand actual language use.

Furthermore, research by Yasir et al. (2021) Explores how the use of game-based educational applications can change traditional teaching practices. The results of his study confirm that digital learning applications transform education by introducing interactive methods that strengthen collaborative learning and enhance students' analytical skills. Scramword, with its game-oriented approach, creates a more dynamic and engaging learning experience, which is very influential in supporting effective language learning.

The game-based learning approach also increases retention through concealed repetition and engaging context. Take the Scramword application as an example, and students might engage in an activity that requires them to rearrange letters to form new words. This activity is challenging and allows for the repetition usage of vocabulary in different formats. It helps students remember the words more effectively as well. This approach strengthens neural connections associated with language learning because students can read and memorize the words, and the words can be used in different and cognitively challenging contexts.

Figure 6. Interactive effective.

THE ROLE OF TECHNOLOGY IN EDUCATION

Integrating technology in education, especially game-based technology, enables more interactive and engaging teaching that meets the needs of diverse learning types of students or their diverse backgrounds. At the same time, this game-based technology can increase student engagement. The application of digital technology in education initiates new opportunities for educators to design their teaching to be more informative, enjoyable, and engaging. For example, the Scramword application utilizes game elements to teach English vocabulary, which turns a potentially monotonous learning session into a dynamic and interactive experience. According to Fitria (2023), this approach has proven effective in increasing student motivation and helping them understand learning material better.

Table 1.
Technology Specification

No.	Element	Details
1.	Title	Scramword: Educational Application to Improve English Vocabulary of Secondary School Students.
2.	Platform	*Smartphone Android.*
3.	Target Age	All ages, especially students of Grade 7.
4.	Genre	*Word Game, Board Game.*
5.	Advantages	- The tutorial menu is available. - Discussion of a textbook, which is used as a reference for the vocabulary of Scramword.

In addition, educational technology allows for more flexible curriculum adaptation. Learning applications can be customized to support students' different levels of ability and learning speed. It is specifically crucial in a classroom with diverse student abilities. Pandita & Kiran (2023) Highlighted that educational technology allows for deep personalization of learning, ensuring that each student can learn at a pace that suits their particular needs.

Technology also plays a vital role in making education more inclusive. With a game-based application, such as Scramword, students who may have learning difficulties in traditional settings can have alternative methods of learning that better suit their learning style. This creates a more supportive learning environment and reinforces that all students have equal access to quality educational tools regardless of their background or learning needs.

Technology-based approaches in education, particularly by employing game-based learning applications, enrich the learning experience and promote adaptation and inclusion in education. By utilizing technology, educators can be more effective in teaching. Meanwhile, students can be more engaged and enjoy their learning process. Ultimately, it improves overall learning outcomes.

USERS' FEEDBACK AND RESPONSES

Positive feedback from users is often an essential indicator of the success of technology integration in education. It indicates that the application successfully meets or exceeds language learning expectations. Studies conducted by Pandita & Kiran (2023) Showed that intuitive and interactive design in learning apps can significantly improve student engagement. They found that the students were more likely to actively participate and retain the information taught when they engaged with learning material through an engaging interface in a learning application. This directly supports the use of Scramword in many schools since its implementation gets positive feedback from the students and teachers regarding the interactivity and enjoyable aspects of language learning.

Furthermore, a study by Rintaningrum (2023) They Explored the impact of educational technology on student learning motivation. Their findings suggest that game-based learning, such as that done through the Scramword, increases students' intrinsic motivation because it offers a more dynamic and relevant experience than traditional learning methods. Enjoyable and challenging apps allow students to engage more with learning materials on a deeper level, increasing their desire to learn and showing active participation. (Fitria, 2023).

LONG-TERM IMPACT ON ENGLISH LANGUAGE EDUCATION

The Scramword application encourages students to learn new words and phrases and develop broader English communication skills. Research by Zainuddin (2023) Shows that technology integration in language learning can significantly improve language acquisition. They found that technology, particularly applications that enable interactive and continuous learning, assists vocabulary mastery and communicative skills. In the context of Scramword, it reflects how applications can assist students in memorizing words and in applying them in a broader communicative context.

In addition, research by Yasir et al. (2021) Explores how game-based learning technologies transform traditional teaching practices. They argue that this technology enriches the subject matter and motivates students to engage more deeply with the learning materials through more collaborative and interactive methods. Scramword, as a learning medium, combines these elements by contributing to a more thorough and immersive learning experience.

Each discussion point shows that the Scramword application is successful in technical and educational aspects and influences how students and teachers interact with the English learning process. As such, the study highlights the importance of innovation in education and how technology can be leveraged to enrich students' learning experiences.

CONCLUSION

APPLICATION DEVELOPMENT

The development of the Scramword application aims to improve the mastery of English vocabulary for middle school students through an innovative and interactive learning approach. Employing a game-based learning method, the application was designed to facilitate a more engaging and practical learning experience related to the research objectives.

ACHIEVEMENT OF RESEARCH OBJECTIVES

The Scramword application has successfully achieved its research objectives by employing technology to create a dynamic learning platform. The application improves mental retention and motivates students to engage more in the English language learning process by integrating games into vocabulary learning. Thus, the initial plan of developing the application as an effective tool to improve students' language skills has been achieved successfully.

IMPACT ON LEARNING

In education, the Scramword has a significant impact in supporting teachers in English language teaching. It also provides a valuable medium to attract students' interest and strengthen vocabulary teaching. The application has also allowed students to learn at their own pace, giving them control over their learning process, reflecting one of its main research goals.

REFERENCES

Adipat, S., Laksana, K., Busayanon, K., Ausawasowan, A., & Adipat, B. (2021). Engaging students in the learning process with game-based learning: The fundamental concepts. *International Journal of Technology in Education, 4*(3), 542–552. https://doi.org/10.46328/ijte.169

Ajisoko, P. (2020). The use of Duolingo apps to improve English vocabulary learning. *International Journal of Emerging Technologies in Learning, 15*(7), 149–155. https://doi.org/10.3991/IJET.V15I07.13229

Bergmark, U., & Westman, S. (2018). Student participation within teacher education: Emphasising democratic values, engagement and learning for a future profession. *Higher Education Research and Development, 37*(7), 1352–1365. https://doi.org/10.1080/07294360.2018.1484708

Bhat, R. A. (2023). The impact of technology integration on student learning outcomes: A comparative study. *International Journal of Social Science, Educational, Economics, Agriculture Research and Technology (IJSET), 2*(9), 592–596. https://doi.org/10.54443/ijset.v2i9.218

Dakhi, S., & Fitria, T. N. (2019). The principles and the teaching of English vocabulary: A review. *JET (Journal of English Teaching), 5*(1), 15. https://doi.org/10.33541/jet.v5i1.956

Daqiq, B., & Akramy, S. A. (2024). The impacts of English language proficiency on employment opportunities. *American Journal of Science Education Research, 609*, 1–8. https://doi.org/10.47991/2835-6764/AJSER-183

David, L., & Weinstein, N. (2023). Using technology to make learning fun: Technology use is best made fun and challenging to optimize intrinsic motivation and engagement. *European Journal of Psychology of Education, 0123456789*, 1–23. https://doi.org/10.1007/s10212-023-00734-0

Fitria, T. N. (2023). The effectiveness of word search puzzles game in improving student's vocabulary. *Pioneer: Journal of Language and Literature, 15*(1), 50. https://doi.org/10.36841/pioneer.v15i1.2766

Giannakos, M. N., Mikalef, P., & Pappas, I. O. (2022). Systematic literature review of e-learning capabilities to enhance organizational learning. *Information Systems Frontiers, 24*(2), 619–635. https://doi.org/10.1007/s10796-020-10097-2

Hartman, R. J., Townsend, M. B., & Jackson, M. (2019). Educators' perceptions of technology integration into the classroom: A descriptive case study. *Journal of Research in Innovative Teaching and Learning, 12*(3), 236–249. https://doi.org/10.1108/JRIT-03-2019-0044

Hellín, C. J., Calles-Esteban, F., Valledor, A., Gómez, J., Otón-Tortosa, S., & Tayebi, A. (2023). Enhancing student motivation and engagement through a gamified learning environment. *Sustainability (Switzerland), 15*(14119), 1–20. https://doi.org/10.3390/su151914119

Hori, R., Fujii, M., Toguchi, T., Wong, S., & Endo, M. (2024). Impact of an EFL digital application on learning, satisfaction, and persistence in elementary school children. *Early Childhood Education Journal*, 1–12. https://doi.org/10.1007/s10643-024-01653-5

Hughey, J. (2020). Individual personalized learning. *Educational Considerations, 46*(2), 1–8. https://doi.org/10.4148/0146-9282.2237

Kayra, Z. (2024). Enhancing English vocabulary learning through mobile apps: A new paradigm in educational technology. *Research Studies in English Language Teaching and Learning, 2*(2), 87–95. https://doi.org/10.62583/rseltl.v2i2.41

Li, H. (2022). Effectiveness of mobile applications on vocabulary learning: A literature review. *International Journal of Social Science and Education Research, 5*(8), 384–391. https://doi.org/10.6918/IJOSSER.202208

Li, W., Zhou, Y., Luo, S., & Dong, Y. (2022). Design factors to improve the consistency and sustainable user experience of responsive interface design. *Sustainability (Switzerland), 14*(15), 1–26. https://doi.org/10.3390/su14159131

Loglo, F. S., & Zawacki-Richter, O. (2023). Learning with digital media: A systematic review of students' use in

African higher education. *Journal of Learning for Development, 10*(1), 1–23. https://doi.org/10.56059/jl4d.v10i1.857

Mebert, L., Barnes, R., Dalley, J., Gawarecki, L., Ghazi-Nezami, F., Shafer, G., Slater, J., & Yezbick, E. (2020). Fostering student engagement through a real-world, collaborative project across disciplines and institutions. *Higher Education Pedagogies, 5*(1), 30–51. https://doi.org/10.1080/23752696.2020.1750306

Nawaila, M. B., Kanbul, S., & Alhamroni, R. (2020). Technology and English language teaching and learning: A content analysis. *Journal of Learning and Teaching in Digital Age, 5*(1), 16–23.

Nguyen, K. T., Duong, T. M., Tran, N. Y., Ha, A. T., & Phung, Y. N. T. (2020). The impact of emotional intelligence on performance: A closer look at individual and environmental factors. *Journal of Asian Finance, Economics and Business, 7*(1), 183–193. https://doi.org/10.13106/jafeb.2020.vol7.no1.183

Nurmala, I., Irianto, S., Franchisca, S., Amsa, H., & Susanti, R. (2023). Technology-enhanced language learning: A meta-analysis study on English language teaching tools. *Journal on Education, 6*(1), 2188–2195. https://doi.org/10.31004/joe.v6i1.3221

Pandita, A., & Kiran, R. (2023). The technology interface and student engagement are significant stimuli in sustainable student satisfaction. *Sustainability (Switzerland), 15*(10), 1–21. https://doi.org/10.3390/su15107923

Rahman, M. (2019). 21st century skill "Problem Solving": Defining the concept. *Asian Journal of Interdisciplinary Research, 2*(1), 64–74. https://doi.org/10.34256/ajir1917

Regan, K., Evmenova, A. S., Hutchison, A., Day, J., Stephens, M., Verbiest, C., & Gafurov, B. (2022). Steps for success: Making instructional decisions for students' essay writing. *Teaching Exceptional Children, 54*(3), 202–212. https://doi.org/10.1177/00400599211001085

Rintaningrum, R. (2023). Technology integration in English language teaching and learning: Benefits and challenges. *Cogent Education, 10*(1), 1–21. https://doi.org/10.1080/2331186X.2022.2164690

Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. *Educational Psychology Review, 32*, 77–112.

Singh, R. K., Gupta, M., & Bhandari, M. (2022). Development of 21st-century life skills among students: Teacher TPACK as guideline factor. *Journal of Pharmaceutical Negative Results, 13*(6), 2044–2050. https://doi.org/10.47750/pnr.2022.13.s06.267

Tsymbal, S. V. (2019). Enhancing students' confidence and motivation in learning English with the use of online game training sessions. *Information Technologies and Learning Tools, 71*(3), 227. https://doi.org/10.33407/itlt.v71i3.2460

Wang, L. H., Chen, B., Hwang, G. J., Guan, J. Q., & Wang, Y. Q. (2022). Effects of digital game-based STEM education on students' learning achievement: A meta-analysis. *International Journal of STEM Education, 9*(1), 1–13. https://doi.org/10.1186/s40594-022-00344-0

Yasir, G. M., Shaheen, A., & Hafeez, M. (2021). A systematic review on digital game-based versus traditional learning approaches. *Global Social Sciences Review, 6*(4), 124–135. https://doi.org/10.31703/gssr.2021(vi-iv).12

Zainuddin, N. (2023). Technology enhanced language learning research trends and practices: A systematic review (2020-2022). *Electronic Journal of E-Learning, 21*(2), 69–79. https://doi.org/10.34190/ejel.21.2.2835