REGISTER JOURNAL – Vol 18, No 01 (2025), pp. 48-75
DOI: https://doi.org/10.18326/register.v18i1.48-75
p-ISSN: 1979-8903; e-ISSN: 2503-040X

Innovating Indonesian Islamic Elementary English Education through A 5c Skills-Oriented Digital Game Application

Adhan Kholis[1*], Anis Susila Abadi[2], Rini Intansari Meilani[3], Akhris Fuadatis Sholihah[4], and Afan Welman Al Amri[5]
Department of English Language Education, Faculty of Education, Universitas Nahdlatul Ulama Yogyakarta, Yogyakarta, Indonesia[1,4]
Department of Informatics, Faculty of Information Technology, Universitas Nahdlatul Ulama Yogyakarta, Yogyakarta, Indonesia[2,5]
Department of Office Management, Faculty of Education, Universitas Pendidikan Indonesia, Bandung, Indonesia[3]

[*]Corresponding Author
Email: adhan@unu-jogja.ac.id
DOI: 10.18326/rgt.v18i1.48-75

Submission Track:
Received: 17-04-2025
Final Revision: 20-06-2025
Available Online: 25-06-2025

ABSTRACT
Today's education aims to equip students with the 21st-century skills necessary for success in a world shaped by globalization and technological advancement. These skills include creativity, collaboration, critical thinking, communication, and complex problem-solving. In the context of teaching English to young learners, particularly in Islamic elementary schools, integrating a game-based approach into the classroom proves to be an effective strategy. This approach fosters an engaging and dynamic learning

environment that can incorporate all the necessary skills within the language learning process. However, traditional game-based methods often rely on physical or paper-based games that lack interactivity, scalability, and integration with digital literacy, which is a key aspect of 21st-century learning. These methods also tend to be teacher-centered, limited in content variety, and less motivating for digital-native students. This study aims to develop a 5C skills-based English learning game application using the Research and Development (R&D) method. To achieve this, the study employed the ADDIE model, including needs assessment, to analyze elementary school students' needs, wants, and challenges in learning English. This analysis forms the basis for developing the application, as well as its design, development, implementation, and evaluation. Data were collected through interviews and questionnaires. The results of thematic and descriptive statistical analyses revealed the importance of digital game media in actively engaging students and motivating them in their learning. The experiment demonstrated a significant difference in outcomes between students taught through traditional methods and those using digital games. This study suggests the necessity of incorporating digital games in English language learning as a valuable tool that every teacher should consider.

Keywords: 5c Skills, Digital Game-Based Learning, English Learning, Gamification, Primary Students

INTRODUCTION

In the age of globalization, English has emerged as an essential international language that students have to master. Proficiency in English offers various advantages, including increased access to information, opportunities for global communication, and improved career prospects (Cheng et al., 2017). However, various obstacles impede English learning at the elementary level, such as a lack of students' interest and motivation (Kondo et al., 2012; Elaish, Shuib, Abdul Ghani, et al., 2017; Weger, 2013). Additionally, traditional teaching methods like lectures and rote memorization often result in student boredom and disengagement, as they find the process of learning and memorizing vocabulary and verb forms tedious (Montero Perez et al., 2017). Therefore, in light of these challenges, the

adoption of innovative teaching methods and media that encourage active participation and provide relevant learning experiences is crucial for enhancing students' English proficiency. Effective language learning involves active involvement, group interaction, regular feedback, and links to real-world situations (Roschelle et al., 2000).

At the elementary level, acquiring English language skills is essential for developing students' communication abilities, which are crucial for their future academic and social success. To optimize the effectiveness of language instruction, it is important to integrate the 5C skills framework into course design. This framework encompasses critical thinking, communication, collaboration, creativity, and complex problem-solving. Complex problem-solving, a transversal skill, entails three key processes: applying knowledge, exploring the problem, and representing the problem (Molnár & Greiff, 2023). Critical thinking refers to the capacity to conceptualize, implement, analyze, synthesize, and assess information gathered through various methods, such as observation, experience, and communication. Effective communication is necessary for clearly and persuasively expressing ideas and opinions. Collaboration emphasizes the capacity to collaborate with others to achieve common goals. Finally, creativity is characterized by the ability to generate novel ideas, ask innovative questions, and provide unexpected solutions (Fadel et al., 2015). By incorporating these 5C skills into English language courses for young learners, we not only prepare them for the challenges of a swiftly changing world but also enhance their linguistic proficiency.

Integrating 5C skills and adopting innovative approaches like digital game-based learning are essential for modern elementary education. Traditional learning methods are losing their appeal, as many e-learning modules that consist solely of flipped pages tend to bore people who have grown up playing video games for an average of twelve years (Kapp, 2012). Today's young learners were raised in a digital environment characterized by the widespread use of digital devices, setting them apart from

previous generations (Zheng et al., 2023). Games serve not just as entertainment; they play a crucial role in developing emotional intelligence. The facial expressions and noises that children make during gameplay reflect their emotions, thoughts, and moods (Kozlov et al., 2024). Additionally, games offer a fun way to learn, facilitating vocabulary acquisition, language learning, and music instruction (Prakash & Rao, 2015).

Gamification, which involves integrating game elements into non-game contexts, has been shown to enhance academic achievement, motivation, participation, and social interactions (Saleem et al., 2021; Kapp, 2012; Millis et.al., 2017; Elaish et al., 2018). This approach includes badges, rewards, challenges, scores, prizes, leaderboards, levels, progress markers, and ratings—all integrated into the digital game to enhance the learning experience (Seaborn & Fels, 2014; Hamari, 2019). By stimulating their intrinsic need for enjoyment and fulfillment, gamification fosters their intrinsic motivation to learn (Li et al., 2019). Moreover, gamification positively impacts students' psychological well-being and learning behaviors, providing dynamic and immersive educational experiences (Cattoni et al., 2024). Digital game-based learning not only improves students' digital literacy but also significantly boosts their motivation and engagement in the learning process (Zheng et al., 2023; Cattoni et al., 2024; Peterson, 2010). Numerous studies have demonstrated that gamification aids in developing essential soft skills, such as cooperation and social communication, while also promoting specific academic skills, such as reading and writing (Aldemir et al., 2017; Hamari, 2019; Gray et al., 2019; Sailer et al., 2016).

In the global context of English Language Teaching (ELT), there was a growing demand for more engaging and learner-centered approaches, particularly for young learners who necessitate developmentally appropriate approaches that enhance motivation and cultivate 21st-century skills. Although various international studies examined digital game-based learning, these advancements were often designed for secondary or adult learners and are seldom adapted to address the needs of primary students

in non-English-speaking countries, such as Indonesia. Within the Indonesian educational framework, English was taught as a foreign language, typically constrained by limited instructional time, traditional textbook-driven methods, which result in minimal learner engagement. These contextual challenges highlighted the urgent need for innovative solutions that were rigorously pedagogical and contextually relevant. Preliminary observations and informal interviews conducted in June 2024 with two English teachers and 22 students at Nahdlatul Ulama Elementary School in Yogyakarta revealed several pressing issues. Students were often unmotivated and easily distracted during English lessons, especially when the instruction involved repetitive drills or textbook-based tasks. Furthermore, while the majority of students demonstrated familiarity with mobile devices and digital games, the existing English learning games often failed to align with curriculum goals and lacked adequate pedagogical depth.

The current research in this area was contextualized and differentiated through an examination of relevant studies. Dehghanzadeh et al. (2019) conducted a systematic review that offers a comprehensive overview of gamification in digital environments for English language learning. This review provided valuable insights into the development of digital gamification strategies that positively influence student learning, experiences, and outcomes. Furthermore, Chowdhury et al. (2024) identified essential principles for the design of future digital game-based language learning. These principles included the optimization of visual elements, the importance of allocating time for the development of technical skills, the promotion of learner autonomy, and the creation of engaging and generative learning experiences. Additionally, a systematic review by Haoming & Wei (2024) explored vocabulary acquisition within augmented reality (AR) and virtual reality (VR) gamification contexts, revealing distinct advantages for each approach. Gamified AR and VR were particularly effective in promoting collaborative learning, visualizing content, supporting self-regulated learning, and bridging the gap between reality and virtual environments.

Despite the growing body of research on gamification and digital tools in English education, there remained a notable lack of context-specific digital applications tailored to meet the cognitive and motivational needs of elementary school students, especially in the integration of 21st-century competencies like the 5C skills. Most existing studies focused on general game-based strategies without thoroughly addressing the design and development process needed to incorporate these key competencies.

Drawing upon insights from the existing literature, this study aimed to develop a gamified English language learning application that effectively integrated digital visual literacy and the 5C skills (critical thinking, creativity, collaboration, communication, and cross-cultural understanding). To address this gap, this study employed a Research and Development (R&D) approach to create a customized and pedagogically grounded learning application. To achieve this goal, the study sought to address the following research questions:

1. What are the English learning needs, preferences, and challenges encountered by Indonesian elementary school students?
2. How can a digital game-based application be designed to integrate the 5C skills into English language learning at the elementary level?
3. What is the effectiveness of the developed application in enhancing student motivation, engagement, and learning outcomes when compared to traditional instructional methods?

The distinctive aspect of this research resided in its integration of the 5C skills within a gamified content framework, which aims to provide a challenging yet pleasurable English learning experience for young learners. The primary focus of this formative phase was to design and develop a robust gamification framework that prioritizes on contextually pertinent and user-friendly content.

RESEARCH METHODS

Research Design

This study applied a Research and Development (R&D) methodology aimed at designing, creating, and evaluating an educational product—a gamified English learning application for elementary school students. The development process was guided by the ADDIE framework (Branch, 2009). The R&D method provides a systematic approach to identifying educational problems, developing solutions, and testing their effectiveness in real-world contexts. The ADDIE model (Analysis, Design, Development, Implementation, Evaluation), a well-known instructional design framework, was chosen for its clear and structured phases, flexibility for iteration, and alignment with the goals of educational innovation. This framework facilitates the creation of a concrete and innovative educational product that directly addresses the practical needs and challenges faced by young English learners. Each phase of ADDIE systematically guides the research process, from identifying learners' needs to designing, developing, testing, and evaluating the effectiveness of the digital game application.

Analysis

In this phase, researchers identified the main learning challenges experienced by elementary students in English language learning, with a particular focus on vocabulary mastery, grammar, and motivation. Data was collected through classroom observations, teacher interviews, and questionnaires completed by students. The needs analysis examined learners' current proficiency levels, their desired learning outcomes, and common obstacles, such as low confidence, passive engagement, and limited use of technology in the classroom. This diagnostic stage helped to pinpoint specific gaps between the current state of learning and the desired outcomes, which guided the subsequent design of the application.

Design

The design phase focused on developing instructional objectives, developing learning materials, structuring user interfaces, and incorporating gamification elements. A thorough review of the cores and basic competencies from the curriculum was conducted to ensure that the application's content aligns with educational standards. Instructional strategies were planned to support 5C skills integration, and game mechanics were mapped to encourage communication, creativity, collaboration, and critical thinking. Furthermore, flowcharts were created to illustrate the app's learning routes.

Development

In this phase, the initial designs were translated into a working prototype. The digital game application, titled "English Explorer," was created based on user interface mock-ups and instructional content outlined earlier. The content was adapted to meet the needs of fourth-grade learners, incorporating five learning themes: time, daily activities, transportation, school/classroom, and fruits/vegetables. Various game activities—such as word guessing, matching, and reading quizzes—were implemented to reinforce the learning material. This stage also involved iterative revisions driven by initial feedback and expert validation.

Implementation

The prototype was implemented in real classroom settings, involving two groups: an experimental group using the application and a control group receiving traditional instruction. During this phase, the application was actively employed in teaching activities. Both teachers and students engaged with the digital game during classroom sessions, allowing researchers to observe levels of engagement, motivation, and usability. This phase also served as a field trial to identify any technical or pedagogical issues that required refinement. The researchers conducted a final try-out of

the application at Ma'arif elementary schools in Yogyakarta, specifically at Sekolah Dasar Nahdlatul Ulama Sleman.

Evaluation

The evaluation process was conducted both formatively and summatively. Formative evaluation took place during the development and implementation phases, emphasizing the ongoing refinement of the application's content, interface, and usability. This process involved expert reviews employing a usability checklist derived from standard educational technology criteria (e.g., interface clarity, ease of navigation, instructional relevance, and learner engagement). In addition, early user testing was carried out with a select group of teachers and students to assess practical usability, attractiveness, and functionality through observation sheets and feedback forms. Summative evaluation was conducted through pre- and post-tests to measure the effectiveness of the application in improving students' English skills and 5C competencies. Additional qualitative insights were gathered via interviews and questionnaires to understand students' and teachers' perceptions regarding the app's design, user experience, and learning impact.

Participants

The participants in this study were fourth-grade students from Nahdlatul Ulama Primary School, a privately owned school in Yogyakarta. The school was selected through purposive sampling due to its accessibility and relevance to the research context. The fourth-grade cohort was comprised of four classes; however, for this study, two classes (4A and 4B) were selected using cluster sampling, treating the entire class groups as intact units for implementation. To gain a comprehensive understanding of the students' experiences and perspectives in a gamified English learning environment, two English teachers and 22 students from each class were selected as participants.

Data Collection

The information pertaining to English language learning was gathered through two primary methods: structured interviews and students' questionnaires. The interviews were conducted in-person during designated English class periods. These interviews aimed to investigate and explore students' learning needs, identify areas where their English proficiency is insufficient, and determine the necessary features required for the development of a learning application. A total of at least 14 interview questions were posed, addressing various aspects such as students' prior English learning experiences in learning English, difficulties in understanding vocabulary or grammar, their motivations and preferences, as well as the prospective advantages of integrating 5C-oriented gamification into the learning process. Furthermore, a comprehensive questionnaire consisting of 14 questions was administered to students, encompassing several domains including: (1) past experiences in learning English, (2) level of interest in learning English, (3) specific learning needs and preferences, (4) favored approaches of instruction, (5) perceived significance of incorporating gamification in learning, (6) proficiency in the 5C skills, and (7) feedback and expectations regarding English language learning.

Data Analysis

The data analysis for this study was carried out in several stages. Initially, qualitative data from interviews and questionnaires were analyzed through thematic analysis (Braun & Clarke, 2006), allowing for the identification of key themes regarding the perceptions, needs, and challenges of both students and teachers. These themes were then organized into specific categories that guide the design and development of the application. For the quantitative data, pre- and post-tests were administered to evaluate the effectiveness of the game application. To ensure the validity and reliability of the quantitative instruments, the test items were constructed based on established language learning standards and underwent expert review for content validity. Reliability was assessed using Cronbach's alpha, indicating acceptable internal consistency of the test instruments.

Additionally, the study examined the impact of a game application on student learning outcomes, employing paired sample t-tests to determine whether significant improvements were present.

FINDINGS AND DISCUSSION

This section presents and discusses the findings from the analysis phase of the ADDIE model, with a particular emphasis on understanding the needs of students in learning English. The insights were gathered through in-depth interviews with two experienced elementary school English teachers. The interviews were guided by fourteen core questions that explored students' English proficiency, learning challenges, motivation, and the use of technology in teaching. The goal of this stage was to identify instructional gaps and pedagogical opportunities that could be addressed through the development of a gamified English learning application. The game's development was informed by the analysis of students' needs, wants, and shortcomings in learning English, as well as the teachers' insights (See Supplementary Materials). The following sections provide a detailed explanation of the findings based on each phase of ADDIE model.

Analysis Phase

The analysis phase concentrated on identifying the needs, wants, challenges, and contextual factors influencing students' learning of English, as well as the media and technology used in the classroom, levels of motivation, and students' English proficiency. This information was gathered through in-depth interviews conducted with two experienced elementary English teachers. The key findings indicated that students possessed basic vocabulary, pronunciation, and grammar recognition; however, they encountered difficulties in applying these skills in both speaking and writing. Both teachers confirmed that grammar, vocabulary retention, and speaking constituted the most challenging areas for students. Although students might have comprehended grammar rules in isolation, they faced challenges in employing these rules fluently within

communicative contexts. This finding supports prior research by Vygotsky (1978), which highlighted the importance of social interaction in the internalization of linguistic rules, as well as the work of Nation (2013), who emphasized the necessity for exposure to high-frequency vocabulary with engaging contexts.

Furthermore, the distinction in assessment methods utilized by the teachers—structured summative evaluations versus formative peer assessments—revealed a lack of a standardized pedagogical framework, which contributes to inconsistent learning outcomes. The teachers reported a reliance on traditional, teacher-centered instruction characterized by limited interactive or communicative activities. This approach aligned with the criticism articulated by Richards and Rodgers (2001), which suggested that such methods frequently overlook students' cognitive engagement. The findings highlighted the need for pedagogical innovation, particularly through the integration of interactive and digital tools that facilitate experiential and student-centered learning. Constraints related to classroom resources, such as insufficient access to projectors, along with limited teacher experiences in educational technology, further hindered the implementation of innovative practices. Both teachers acknowledged the motivational potential of digital tools but have yet to integrate them effectively due to barriers, including access issues and entrenched pedagogical beliefs (Ertmer, 1999).

In response to the potential for utilizing digital gaming in instruction, both teachers expressed strong belief in the efficacy of gamification applications in enhancing students' English skills, emphasizing their engaging nature and alignment with the interests and habits of contemporary students. Their perspectives highlighted the effectiveness of gamification in fostering a stimulating and motivational learning environment, particularly for young learners. For the successful implementation of gamification, it is important to align game content with the curriculum and learning objectives (Wood, K., & Drew, S., 2025). These insights corresponded with the teachers'

responses regarding the integration of technology in the teaching and learning process.

Teacher 1: *In teaching, I had not yet utilized digital tools or technology. Textbooks and worksheets were still frequently used as learning resources. Several times, I had tried using educational videos from YouTube as a motivational strategy. In general, students found greater enjoyment in learning English through a combination of digital media, such as applications or games*.

Teacher 2: *I was still focused on using textbooks as the main teaching material. Perhaps with the presence of digital learning resources such as animated videos, electronic-based books, or online games, students can be encouraged to be active and motivated in the classroom.*

Motivational challenges emerged as a critical barrier to students' willingness to learn English. Many students displayed low intrinsic motivation, which can be attributed to difficulties with pronunciation and the inherent challenges of learning a foreign language. However, extrinsic motivators such as games and quizzes fostered student engagement. These findings underscore the need for pedagogical innovations that blend interactive, digital, and gamified learning approaches in alignment with curriculum goals. These corresponded with teachers' answers as follows:

Teacher 1: Students' *motivation levels can differ. While many were eager to learn and enjoy the interactive and creative aspects of lessons, others may need more encouragement and support to stay engaged.*

Teacher 2: *The motivation of students to learn English remains relatively low. Several factors contribute to this, namely challenges with pronunciation, spelling, and the fact that English is not their primary language.*

Dörnyei (2001) posited a motivational framework that emphasizes the role of task value, learner beliefs, and the classroom climate in sustaining student engagement. Gamified applications that incorporate elements such as challenge, choice,

and feedback could address students' motivational deficits, especially when they are aligned with culturally relevant content.

An analysis of students' 5C Skills—Creativity, Collaboration, Critical Thinking, Communication, and Complex-Problem Solving— yielded several findings. The analysis indicated that students require additional opportunities to cultivate these skills during English language instruction. Observations and teacher interviews suggested that classroom activities are often dominated by rote learning, limiting chances for students to engage in critical thinking, express their creativity, or collaborate on meaningful tasks. In addition, students lacked opportunities for real communication in English or to engage in responsible digital behavior. This analysis highlighted the need for a more interactive and skill-oriented approach to language education. To mitigate participation barriers, teachers should integrate collaborative activities, peer-assisted learning, and interactive digital tools into their teaching practices (Bhat et al., 2023); Oskarita & Arasy, 2024). Activities such as group discussions, pair work, role-playing, and games could provide valuable opportunities for students to work together, practice communication skills, and engage in peer learning. Such collaborative activities are essential in fostering an interactive learning environment conducive to English acquisition (Altun & Sabah, 2020; Fadhli et al., 2020).

Design Phase

Based on the findings from the analysis phase, the design phase concentrated on developing a student-centered gamified mobile application specifically tailored to the cognitive, affective, and linguistic characteristics of Indonesian fourth-grade elementary students, as well as the 5C Skills. The resulting prototype, named English Explorer, was conceptualized with two core components: **a Learning Page** and **a Play Page**. The Learning Page provides structured and scaffolded instructional content that integrates vocabulary, grammar, and correct pronunciation contextualized within familiar themes, such as time, daily activities, transportation, school, and classroom

situations, and fruits and vegetables. These themes were selected for their alignment with the national curriculum and syllabus, as well as their relevance to students' everyday experiences, aiming to enhance meaningful learning and promote language retention.

In contrast, the Play Page was designed to feature various mini-games (e.g., word matching, sentence-building puzzles, and image-audio association challenges) that serve as reinforcement tools for vocabulary retention, basic sentence construction, problem-solving, and interactive communication. Each game incorporates a point-based reward system, badges, and progress tracking to bolster both extrinsic and intrinsic motivation, following Malone and Lepper's (1987) theory of intrinsic motivation in educational gaming.

Design decisions were influenced by constructivist learning theories (Piaget, 1972; Jonassen, 1999), emphasizing the importance of active, self-directed exploration and knowledge construction. In addition, Vygotsky's (1978) scaffolding theory informed the app's progressive difficulty levels and the inclusion of teacher-guided instructions embedded in the learning tasks. This design allows learners to progress from guided practice to independent performance within their Zone of Proximal Development (ZPD).

To foster learner autonomy and self-regulated learning, the app incorporates features such as optional hints, immediate feedback, and a "practice again" button, aligned with Zimmerman's (2002) Self-Regulated Learning Model. Navigation within the app has been deliberately simplified using large icons, voice-activated instructions, and minimal text, catering to the digital literacy levels of young learners while also providing inclusive access for students with emerging reading skills. Moreover, the visual design employs vibrant colors, animated characters, and culturally relevant graphics to enhance engagement and promote emotional connections. The selection of fonts, sound effects, and user interface components was also informed by usability principles for children (Shneiderman et al., 2016), ensuring that the app remains intuitive and enjoyable.

Overall, the design phase strategically addressed the motivational, interactive, and practical language use challenges identified in the analysis phase, transforming them into actionable design elements that support the development of foundational English proficiency through meaningful and enjoyable experiences.

Development Phase

The following was the Development of the English Explorer Application Interface. The name of this game application was "*English Explorer*". This application comprises two core components: **the Learning Page** and **the Play Page**, both aimed at fostering engaging and interactive English language acquisition for fourth-grade elementary students (Supplementary Materials). The Learning Page allowed students to access an array of English language learning materials, ranging from basic vocabulary, grammar to correct pronunciation. Five primary topics were available, including time, daily activities, transportation, school and classroom, and fruits and vegetables. Each topic was tailored to the cognitive and linguistic development level of students, adhering to the principle of age-appropriate content scaffolding (Vygotsky, 1978; Bruner, 1985). The Play Page featured a diverse selection of enjoyable and educational mini-games specifically designed to reinforce the knowledge acquired on the Learning Page, which included word matching, word construction, and reading quizzes. Game-based learning integrates elements that effectively maintain students' engagement, inspire goal attainment, promote competitiveness, stimulate collaborative teamwork, and enhance communication skills (Balalle, 2024). The games were not only designed to reinforce vocabulary and grammar but also to cultivate higher-order thinking skills such as problem-solving, critical thinking, and collaborative engagement. The integration of these elements aligns with constructivist learning theory, which emphasizes learning through doing and interaction (Piaget, 1972; Jonassen, 1999). Students are encouraged to choose topics and games

independently, promoting learner autonomy and self-regulated learning (Zimmerman, 2002), which are crucial components of effective digital pedagogy.

The game commenced with a welcome screen from which the user may choose between the Learning Page and the Game Page. This section provided a brief overview of these components and their respective interfaces. The selection menu offered several options to tailor each student's learning experiences. Students could choose the material they wish to study or the games they prefer to play. This page has been designed to help students operate the game easily. The convenience was evidenced by several features that were already familiar to the students' learning levels.

The following was the main page of the game.

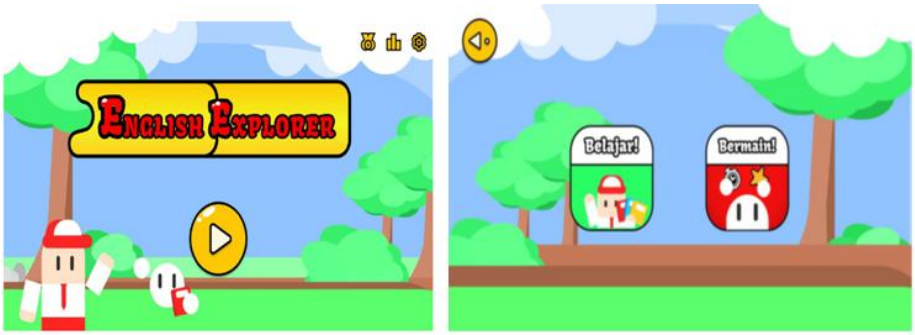

Figure 1. Main Game Interface

In the Learning Menu Options, students were presented with 5 topics that could be selected according to what they wish to learn. Each topic was accompanied by material relevant to its theme: time, daily activities, transportation, school and classroom, and fruits and vegetables. These topics had been adjusted to the level of fourth-grade elementary school students.

In the Play Menu Options, students could choose games that correspond to the materials they wish to practice. There were at least four types of games designed to enhance students' problem-solving skills, communication, and critical thinking. This included word guessing, matching words, constructing words, and reading

activities. Students could enjoy playing while learning new vocabulary or improving their grammar. They could also see the scores and track their progress at the end of each game.

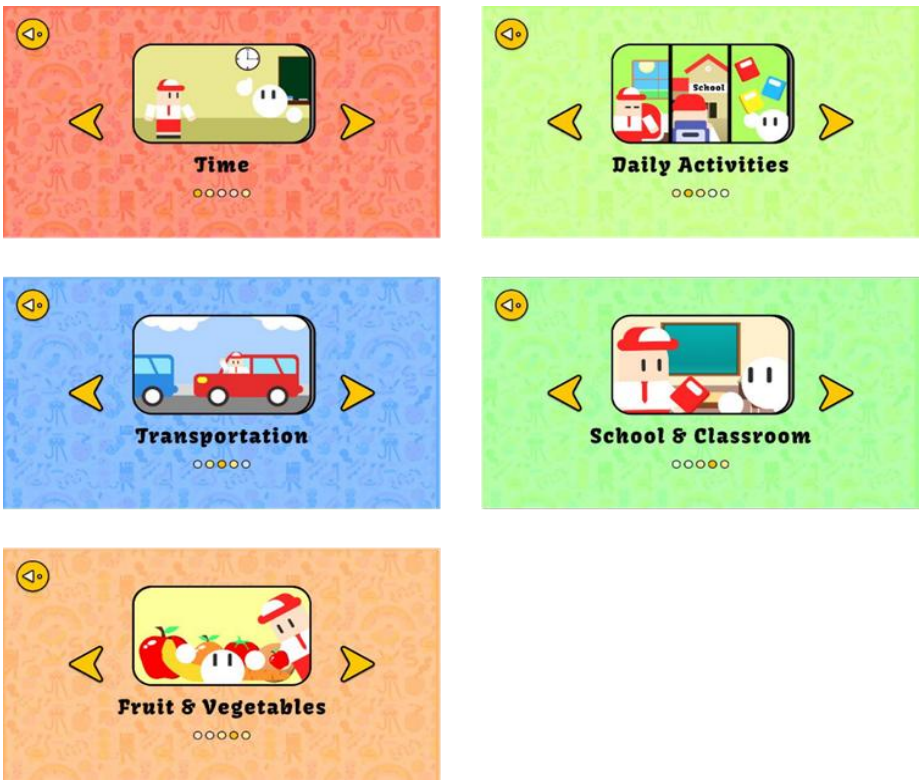

Figure 2. Learning and Play Page

Overall, the English Explorer application effectively integrated instructional content with game-based elements, offering not only exposure to English language structures but also a playful and meaningful context for its application. This design addresses the shortcomings of traditional textbook-based methods

identified in the classroom observations and interviews. While classroom instruction often lacks interactivity, the app bridges this gap by fostering active participation, multimodal input, and intrinsic motivation through game dynamics (Gee, 2007).

Implementation Phase

Experiments and Procedures

An inseparable part of the ADDIE model involved implementing this application in the classroom. Before using this game, students completed a pre-test to assess their level of proficiency. During the learning activity, the experimental group utilized a mobile learning game application on their mobile phones, while the control group participated in traditional English instruction using textbooks.

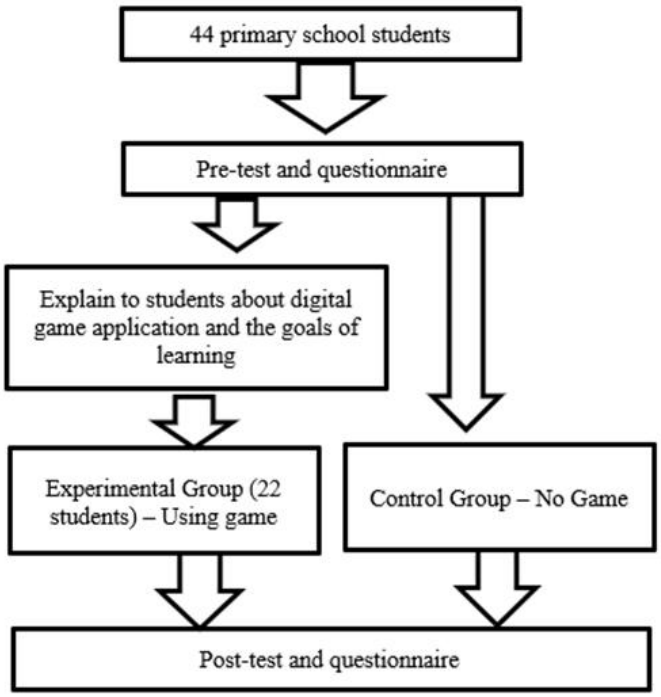

Figure 3. Experiment/Try-out Procedures

An independent sample t-test was conducted to assess whether significant changes occurred in students' performance between the pre-training and post-training periods. Each group consisted of 22 students, with the experimental group achieving an average score of 83, while the traditional group had an average score of 72.8. For the purpose of this study, a sample size of 22 participants was deemed sufficient (See Supplementary Materials). Levene's test for equality of variances indicated no violations ($p > 0.05$), thereby confirming that the assumption of homogeneity of variance was met. The independent samples t-test revealed a statistically significant difference between the mean scores of the control and experimental groups, with a 2-tailed significance value of $p = 0.000$, which is below the threshold of 0.05 (Supplementary Materials). According to Bechkoff (2019), students who participated in the game showed an improvement in their assessment performance, although no significant difference in test duration was observed. Additionally, a greater number of students in the simulation game group reported passing compared to the traditional case discussion group (Rogmans & Abaza, 2019). Generally, the primary goal of using mobile game applications to improve English language skills is to increase motivation and performance (Elaish, Shuib, Abdul Ghani et al., 2017; Elaish, Shuib, Ghani et al., 2017). In the classroom setting, games can enhance students' motivation and academic performance (Balalle, 2024).

Evaluation Phase

The evaluation was conducted in two phases: formative assessment during the development process to pinpoint areas that need improvement, and summative evaluation post-implementation to assess the impact of the application on the learning achievements of elementary school students, particularly in enhancing digital visual literacy and 5C skills (communication, collaboration, creativity, critical thinking, and confidence). Formative feedback was invaluable in refining game mechanics, user interface, and content alignment. The summative

evaluation demonstrated improved student outcomes in digital literacy and the 5C skills.

The evaluation results revealed a high level of student satisfaction with the English Explorer application. Most students reported feeling happy, engaged, and motivated while using the app during English lessons. They found the game-based activities enjoyable and appreciated the interactive design that allowed them to learn vocabulary and grammar in a fun and meaningful way. The visual design, scoring system, and user-friendly interface were frequently highlighted as factors that enhanced their learning experience. Students also noted that the mini games helped them better retain vocabulary and understand language use in context. Integrating various assessment types into gamified environments could make evaluation more formative, adaptive, and contextualized, allowing both teachers and learners to monitor growth continuously (Black & Wiliam, 2009). Overall, the app was perceived not only as an effective learning tool but also as an enjoyable and stimulating alternative to traditional methods, fostering greater enthusiasm and confidence in language learning.

The results of this evaluation will inform further improvements and the ongoing development of the application. Furthermore, this phase highlights the significance of continuous improvement informed by user feedback and learning outcomes, ensuring the application remains effective and relevant. It also identified areas for professional development to support teachers in effectively integrating such digital tools, thereby closing the technology adoption gap noted earlier.

CONCLUSIONS

Based on the findings, several fundamental conclusions can be drawn regarding the development of English language game applications that integrate digital literacy and 5C skills within Nahdlatul Ulama Elementary Schools. The analysis clearly indicated a significant demand for this digital game to support and

motivate students in learning English. The aspects of literacy and the 5C skills were seamlessly incorporated into the game, enhancing students' language proficiency while also developing critical skills such as communication, collaboration, creativity, critical thinking, and problem solving. In practice, this game received positive feedback from students, such as increased engagement and motivation and a rise in problem-solving activities. Moreover, the use of the game in lessons helped overcome students' traditional barriers, such as vocabulary limitations and low confidence in speaking English. The interactive, rewarding features of the game also contributed to fostering a growth mindset and a more relaxed environment for learning, which is in line with Islamic educational values that emphasize motivation, joy in seeking knowledge (*thalabul 'ilmi*), and ongoing self-development.

There was a significant difference between students educated through game-based methods and those taught through traditional methods. Students participating in digital game-based learning improved communication skills, greater willingness to take risks with language use, and more active participation in class discussions. The games' engaging features enabled more personalized learning, enabling students to progress at their own pace while receiving instant feedback, thereby enhancing their learning experience.

It is strongly recommended that this digital media game be incorporated into English language instruction, as it enhances students' interest in learning English while also supports the development of digital literacy, which is crucial in the modern educational landscape. By integrating language learning with game-based strategies and aligning with Islamic values of holistic education (*tarbiyah*), schools can establish a more dynamic, motivating, and effective learning environment for young learners.

Acknowledgments

We would like to express our deepest gratitude to the Ministry of Education, Culture, Research, and Technology of Indonesia,

through the Directorate General of Higher Education, specifically the Directorate of Research, Technology, and Community Service (DRTPM). We sincerely appreciate the support provided via the Fundamental Research Grant, based on the Decision of the Budget User Authority of the Directorate of Research, Technology, and Community Service Number 0459/E5/PG.02.00/2024 dated May 30, 2024. This invaluable support is very important in facilitating the implementation of our research and is expected to make a meaningful contribution to the development of science and the advancement of education in Indonesia.

Supplementary Materials

The tables and figures in this article are available here.

REFERENCES

Aldemir, T., Celik, B., & Kaplan, G. (2017). A qualitative investigation of student perceptions of game elements in a gamified course. *Computers in Human Behavior*, *78*, 235–254. https://doi.org/10.1016/j.chb.2017.10.001

Altun, M., & Sabah, S. (2020). The impact of collaborative learning on speaking skills in English language teaching. *Journal of Language and Linguistic Studies, 16*(1), 525–536. https://files.eric.ed.gov/fulltext/EJ1427925.pdf

Balalle, H. (2024). Exploring student engagement in technology-based education in relation to gamification, online/distance learning, and other factors: A systematic literature review. *Social Sciences & Humanities Open*, *9*, 100870. https://doi.org/10.1016/j.ssaho.2024.100870

Bhat, N., Gurung, S., Gupta, M., Dhungana, N., & Thapa, R. K. (2022). Enhancing collaborative learning through peer-assisted learning. *Journal of Physiological Society of Nepal*, 3(1), 4–9. https://doi.org/10.3126/jpsn.v3i1.57762

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability,* 21(1), 5–31. https://doi.org/10.1007/s11092-008-9068-5

Branch, R. M. (2009). *Instructional Design: The ADDIE Approach*. Springer US. https://doi.org/10.1007/978-0-387-09506-6

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology,* 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Bruner, J. (1985). *Vygotsky: A historical and conceptual perspective. In J. Wertsch (Ed.), Culture, communication and cognition: Vygotskian perspectives* (pp. 21–34). Cambridge University Press.

Cattoni, A., Anderle, F., Venuti, P., & Pasqualotto, A. (2024). How to improve reading and writing skills in primary schools: A comparison between gamification and pen-and-paper training. *International Journal of Child-Computer Interaction*, *39*, 100633. https://doi.org/10.1016/j.ijcci.2024.100633

Cheng, A., Yang, L., & Andersen, E. (2017). Teaching language and culture with a virtual reality game. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, 541–549. https://doi.org/10.1145/3025453.3025857

Chowdhury, M., Dixon, L., Kuo, L.-J., Donaldson, J. P., Eslami, Z., Viruru, R., & Luo, W. (2024). Digital game-based language learning for vocabulary development. *Computers and Education Open*, *6*, 100160. https://doi.org/10.1016/j.caeo.2024.100160

Dehghanzadeh, H., Fardanesh, H., Hatami, J., Talaee, E., & Noroozi, O. (2019). Using gamification to support learning English as a second language: A systematic review. *Computer Assisted Language Learning*, *34*(7), 1–24. https://doi.org/10.1080/09588221.2019.1648298

Dörnyei, Z. (2001). *Motivational Strategies in the Language Classroom*. Cambridge University Press.

Elaish, M. M., Ghani, N. A., Shuib, L., & Al-Haiqi, A. (2018). Development of a Mobile Game Application to Boost Students' Motivation in Learning English Vocabulary. *IEEE Access*, *7*, 1–13. https://doi.org/10.1109/ACCESS.2019.2891504

Elaish, M. M., Shuib, L., Abdul Ghani, N., Yadegaridehkordi, E., & Alaa, M. (2017). Mobile Learning for English Language Acquisition: Taxonomy, Challenges, and Recommendations. *IEEE Access*, *5*, 19033–19047. https://doi.org/10.1109/ACCESS.2017.2749541

Elaish, M. M., Shuib, L., Ghani, N. A., & Yadegaridehkordi, E. (2017). Mobile English Language Learning (MELL): A literature review. *Educational Review*, *71*(2), 257–276. https://doi.org/10.1080/00131911.2017.1382445

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, 47(4), 47–61. https://doi.org/10.1007/BF02299597

Fadel, C., Bialik, M., & Trilling, B. (2015). *Four-dimensional education: The competencies learners need to succeed*. Center for Curriculum Redesign.

Fadhli, M., Susanti, D., & Al Hafizh, M. (2020). Using group discussion to improve students' speaking ability. Journal of English Language Teaching, 9(2), 292–300. https://doi.org/10.24036/jelt.v9i2.109852

Gee, J. P. (2003). *What Video Games Have to Teach Us About Learning and Literacy*. Palgrave Macmillan.

Gray, S. I., Robertson, J., Manches, A., & Rajendran, G. (2019). BrainQuest: The use of motivational design theories to create a cognitive training game supporting hot executive function. *International Journal of Human-Computer Studies*, *127*, 124–149. https://doi.org/10.1016/j.ijhcs.2018.08.004

Hamari, J. (2019). Gamification. In G. Ritzer (Ed.), *The Blackwell Encyclopedia of Sociology* (1st ed., pp. 1–3). Wiley. https://doi.org/10.1002/9781405165518.wbeos1321

Haoming, L., & Wei, W. (2024). A systematic review on vocabulary learning in AR and VR gamification context. *Computers & Education: X Reality*, *4*, 100057. https://doi.org/10.1016/j.cexr.2024.100057

Jonassen, D. H. (1999). Designing Constructivist Learning Environments. In C. M. Reigeluth (Ed.), Instructional-design theories and models: A new paradigm of instructional theory (Vol. 2, pp. 215–239). Lawrence Erlbaum Associates.

Kapp, K. M. (2012). *The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education*. John Wiley & Sons.

Kondo, M., Ishikawa, Y., Smith, C., Sakamoto, K., Shimomura, H., & Wada, N. (2012). Mobile Assisted Language Learning in university EFL courses in Japan: Developing attitudes and skills for self-regulated learning. *ReCALL*, *24*(2), 169–187. https://doi.org/10.1017/S0958344012000055

Kozlov, P., Akram, A., & Shamoi, P. (2024). Fuzzy Approach for Audio-Video Emotion Recognition in Computer Games for Children. *Procedia Computer Science*, *231*, 771–778. https://doi.org/10.1016/j.procs.2023.12.139

Li, J., Van Der Spek, E. D., Hu, J., & Feijs, L. (2019). Turning Your Book into a Game: Improving Motivation through Tangible Interaction and Diegetic Feedback in an AR Mathematics Game for Children. *Proceedings of the Annual Symposium on Computer-Human Interaction in Play*, 73–85. https://doi.org/10.1145/3311350.3347174

Malone, T. W., & Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, Learning, and Instruction* (Vol. 3, pp. 223–253). Hillsdale, NJ: Lawrence Erlbaum Associates.

Millis, K., Forsyth, C., Wallace, P., Graesser, A. C., & Timmins, G. (2017). The Impact of Game-Like Features on Learning from an Intelligent Tutoring System. *Technology, Knowledge*

and Learning, *22*(1), 1–22. https://doi.org/10.1007/s10758-016-9289-5

Molnár, G., & Greiff, S. (2023). Understanding transitions in complex problem-solving: Why we succeed and where we fail. *Thinking Skills and Creativity*, *50*, 101408. https://doi.org/10.1016/j.tsc.2023.101408

Montero Perez, M., Peters, E., & Desmet, P. (2017). Vocabulary learning through viewing video: The effect of two enhancement techniques. *Computer Assisted Language Learning*, *31*(1–2), 1–26. https://doi.org/10.1080/09588221.2017.1375960

Nation, I. S. P. (2013). *Learning Vocabulary in Another Language (2nd ed.)*. Cambridge University Press.

Oskarita, E., & Arasy, H. N. (2024). The Role of Digital Tools in Enhancing Collaborative Learning in Secondary Education. *International Journal of Educational Research*, 1(1), 26–32. https://doi.org/10.62951/ijer.v1i1.15

Peterson, M. (2010). Massively multiplayer online role-playing games as arenas for second language learning. *Computer Assisted Language Learning*, *23*(5), 429–439. https://doi.org/10.1080/09588221.2010.520673

Piaget, J. (1972). *The Psychology of the Child*. Basic Books.

Prakash, E. C., & Rao, M. (2015). *Transforming Learning and IT Management through Gamification*. Springer International Publishing. https://doi.org/10.1007/978-3-319-18699-3

Richards, J. C., & Rodgers, T. S. (2001). *Approaches and Methods in Language Teaching (2nd ed.)*. Cambridge University Press.

Rogmans, T., & Abaza, W. (2019). The Impact of International Business Strategy Simulation Games on Student Engagement. *Simulation & Gaming*, *50*(3), 393–407. https://doi.org/10.1177/1046878119848138

Roschelle, J. M., Pea, R. D., Hoadley, C. M., Gordin, D. N., & Means, B. M. (2000). Changing How and What Children Learn in School with Computer-Based Technologies. *The Future of Children*, *10*(2), 76. https://doi.org/10.2307/1602690

Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2016). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior*, *69*, 371–380. https://doi.org/10.1016/j.chb.2016.12.033

Saleem, A. N., Noori, N. M., & Ozdamli, F. (2021). Gamification Applications in E-learning: A Literature Review. *Technology, Knowledge and Learning*, *27*(1), 139–159. https://doi.org/10.1007/s10758-020-09487-x

Seaborn, K., & Fels, D. I. (2014). Gamification in theory and action: A survey. *International Journal of Human-Computer Studies*, *74*, 14–31. https://doi.org/10.1016/j.ijhcs.2014.09.006

Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., Elmqvist, N., & Diakopoulos, N. (2016). *Designing the User Interface: Strategies for Effective Human-Computer Interaction* (6th ed.). Boston, MA: Pearson.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

Weger, H. D. (2013). Examining English Language Learning Motivation of Adult International Learners Studying Abroad in the US. *RELC Journal*, *44*(1), 87–101. https://doi.org/10.1177/0033688212473272

Wood, K., & Drew, S. (2025). Aligning gamified learning experiences to learning outcomes. *International Journal of Changes in Education,* 2(1). https://ojs.bonviewpress.com/index.php/IJCE/article/view/3413

Zheng, Y., Zhang, J., Li, Y., Wu, X., Ding, R., Luo, X., Liu, P., & Huang, J. (2023). Effects of digital game-based learning on students' digital etiquette literacy, learning motivations, and engagement. *Heliyon*, *10*(1), e23490. https://doi.org/10.1016/j.heliyon.2023.e23490

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory into Practice, 41(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2