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Results of Using Multimedia Game for English Communicative Skill Development of Grade 3 Students

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Abstract

This study aimed to develop the “At Home” multimedia game to meet the 80/80 efficiency standard and to examine its effects on Grade 3 students’ English communication skills and academic achievement compared to traditional instruction. A quasi-experimental design was employed with a sample of 62 Grade 3 students from a public primary school in Phetchabun Province during the second semester of the 2024 academic year. The students were divided into an experimental group (31 students) and a control group (31 students) through cluster random sampling. Research instruments included the multimedia game, an English achievement test, and an English communication skills test. The data were analyzed using mean, standard deviation, efficiency index (E1/E2), and Analysis of Covariance (ANCOVA) to compare post-test scores while controlling for pre-test differences. The findings revealed that the developed multimedia game achieved the 80/80 efficiency standard (E1 = 82.19, E2 = 81.87). ANCOVA analyses indicated that, after controlling for pre-test scores, the experimental group significantly outperformed the control group in both English communication skills (adjusted means = 31.33 vs. 22.61, Partial $\eta^2 = .442$) and academic achievement (adjusted means = 17.48 vs. 13.13, Partial $\eta^2 = .621$). These results highlight the strong positive impact of the “At Home” multimedia game on improving students’ English learning outcomes.

Keywords: Multimedia games; English communication skills; Academic achievement

■ Introduction

Language is considered the core of human existence and a crucial medium for exchanging ideas, feelings, and knowledge (Puspitasari, 2019). Among the widely used languages worldwide, English is broadly accepted as the “language of knowledge,” playing a vital role in global communication and development across various domains. A large proportion of academic publications, research outputs, digital platforms, and informational media are presented primarily in English, making it an essential tool for accessing

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knowledge and participating in the global community. Moreover, English facilitates communication among individuals from diverse linguistic and cultural backgrounds, fostering intercultural understanding. Owing to this significant role, English has been incorporated into educational curricula from primary to higher education levels in many countries (Boyinbode, 2018).

In Thailand, English language instruction has been implemented continuously from early childhood to higher education for approximately 14 years. Despite these efforts, national English proficiency levels remain a concern. According to the EF English Proficiency Index (EF Education First, 2025), Thailand ranked 116th out of 123 countries and regions and was categorized as having “very low proficiency.” Within Asia, Thailand placed 24th out of 25 participating countries. These findings reflect the ongoing challenge of improving English language competence at the national level. This situation is consistent with Alderson, Clapham, and Wall (1995), who highlighted the difficulty of developing language proficiency in contexts where learners have limited opportunities to use English in authentic communication.

One contributing factor to this issue is the traditional emphasis on grammar-focused instruction rather than communicative language use, which can hinder the development of integrated language skills, including listening, speaking, reading, and writing (Puspitasari, 2019). Recent research suggests that innovative pedagogical approaches such as flipped classrooms, project-based learning, and technology-enhanced instruction can significantly increase student engagement, collaboration, and motivation, ultimately leading to improved learning outcomes (Dellegue & Galigao, 2025).

At a public primary school in Phetchabun Province (School A), Grade 3 students demonstrate unsatisfactory English performance, particularly in reading and writing. Many students experience difficulties with comprehension and vocabulary use and often show low motivation when taught through traditional instructional methods. These local challenges are reflected in the school’s English achievement records, which consistently fall below national benchmarks. Such persistent underperformance indicates a need for instructional innovation. Furthermore, most students belong to Generation Alpha, a cohort characterized by high exposure to digital technologies and interactive media. Traditional classroom practices may therefore be insufficient to meet their learning preferences. As noted by Tapp et al. (2024), Generation Alpha learners are digital-first and tend to respond more positively to interactive and technology-mediated learning experiences.

In response to these challenges, educational research increasingly recognizes games as effective tools for enhancing engagement and supporting language learning. Game-based learning promotes active participation, enjoyment, and confidence in language use, which can facilitate meaningful learning experiences (Liu et al., 2021). Additionally, games provide opportunities for contextualized practice and immediate feedback, contributing to improved vocabulary acquisition and language fluency (Saleh & Althaqafi, 2022). The integration of multimedia elements further enhances learner motivation and supports diverse learning styles (Santhong & Khuvasanond, 2022).

Therefore, this study aims to address both a local instructional need and a broader educational objective by developing and implementing a multimedia game titled “At Home” for Grade 3 students. The game is designed as an interactive instructional tool to enhance student engagement and overcome the

limitations of traditional teaching approaches. The study also seeks to evaluate the effectiveness of the game in improving English communication skills and academic achievement, particularly in reading and writing. By comparing the outcomes of game-based instruction with those of conventional teaching methods, this research intends to provide empirical evidence and practical guidance for educators seeking to integrate educational technology into English language teaching to better support the learning needs of young learners.

■ Significance and Purposes

- 1) To develop an English multimedia game for grade 3 students that meets the 80/80 efficiency standard.
- 2) To compare the English communication skills of students who learn through multimedia game-based instruction with those who follow traditional teaching methods.
- 3) To analyze and compare the English achievement of students who learn through multimedia game-based instruction with those who follow traditional teaching methods.

■ Hypothesis

- 1) Students' English achievement after learning with the "At Home" multimedia game is higher than that of students who learn through traditional methods.
- 2) Students' English communication skills after learning with the "At Home" multimedia game are higher than those of students who learn through traditional methods.

■ Literature Reviews

English Language Education Framework

The Basic Education Core Curriculum B.E. 2551 (A.D. 2008) serves as a foundational guide for English language education in Thailand. This curriculum, which has been in place for over a decade, emphasizes the development of communicative competence and sets specific learning standards and indicators relevant for Grade 3 students. Communicative competence goes beyond simple grammar rules, focusing on students' ability to use language effectively and appropriately in real-world contexts. However, despite continuous instruction under this framework, the persistent challenges in English proficiency among Thai learners, as highlighted by the EF Education First (2025) report, indicate a clear need for innovative teaching approaches that can effectively align with these national standards. In this regard, research highlights that engaging and interactive methodologies, such as digital storytelling, can meaningfully involve young learners in constructing multimodal texts and foster deeper communicative competence (Lestariyana & Widodo, 2018).

*Multimedia Games***Definition and Components**

Multimedia games are defined as interactive digital learning tools that combine various forms of media—such as text, audio, images, animation, and video—within a structured learning environment. Unlike traditional instructional materials, multimedia games are designed to balance entertainment with pedagogical objectives, enabling learners to engage in meaningful and experiential learning processes. In educational settings, they are widely recognized as effective tools for enhancing language learning because they provide contextualized practice, immediate feedback, and opportunities for active participation (Khoroshevska & Khoroshevskyi, 2025).

From a design perspective, multimedia games encompass several essential components that contribute to their instructional effectiveness. First, they integrate multimodal content to present information in ways that support diverse learning styles and facilitate deeper understanding. Second, interactivity is a fundamental element, allowing learners to make decisions, explore scenarios, and receive feedback, which enhances motivation and sustained engagement. Third, instructional objectives are embedded through structured tasks such as simulations, problem-solving activities, and guided challenges, enabling learners to apply knowledge in authentic contexts. These elements collectively support meaningful learning by encouraging learners to actively construct knowledge rather than passively receive information.

The effectiveness of multimedia games can also be explained through cognitive learning principles. According to Mayer's cognitive theory of multimedia learning (2019), learning is enhanced when verbal and visual information are integrated in ways that reduce cognitive overload and promote active processing. Consequently, well-designed multimedia games can foster deeper cognitive engagement and improve knowledge retention. Conversely, poorly designed games that lack clear instructional alignment or overload learners with extraneous elements may result in superficial learning outcomes (Cahyadi & Karisma, 2025). Therefore, careful alignment between game mechanics, learning objectives, and cognitive principles is essential to ensure that multimedia games function as effective instructional tools.

Benefits and Design

Using multimedia games in education offers numerous benefits. They make learning enjoyable, create a positive attitude toward school, and encourage greater student participation (Phiwma, 2021). Games also help develop problem-solving and collaboration skills and promote long-term knowledge retention through hands-on practice (Phappimjai, 2018). For effective game design, it is essential to follow motivational theories by creating challenges, fostering a sense of self-respect, stimulating curiosity, encouraging imagination, and giving learners a sense of control over their own learning, all of which contribute to a highly motivating learning experience (Noppawong Na Ayutthaya, 2019).

Recent research in both Thai and international contexts continues to support the effectiveness of multimedia and game-based instruction. Nooyod, Nooyod, and Bunrueng (2021) demonstrated that multimedia-supported lessons significantly improved English proficiency in real educational settings. More

recent evidence also confirms these benefits. A systematic review by Li, Huang, and Wu (2024) found that game-based learning had a positive effect on young learners' language development, particularly in motivation and vocabulary acquisition. Similarly, research by Phungsuk, Viriyavejakul, and Ratanaolarn (2022) reported that multimedia learning environments enhanced learner engagement and supported deeper conceptual understanding through interactive and multimodal content. In addition, Kurniawan and Rahmawati (2025) found that video-game-based activities significantly improved English vocabulary learning outcomes, highlighting the role of interactive digital media in language acquisition. Furthermore, Khoroshevska and Khoroshevskyi (2025) emphasized that digital training games function as effective multimedia learning resources by integrating feedback, interactivity, and instructional design principles. Collectively, these studies reinforce the pedagogical value of multimedia games as effective tools for enhancing language learning outcomes in primary education.

Additional empirical evidence further supports the effectiveness of multimedia and game-based learning in language education. Studies have consistently reported that well-designed digital games enhance student engagement, motivation, and overall language proficiency across diverse learning contexts (Garcia & De la Cruz, 2025; Ongoro & Fanjiang, 2024). Moreover, interactive game environments have been shown to improve vocabulary retention and communicative competence more effectively than traditional instructional methods (Kurniawan & Rahmawati, 2025). These findings reinforce the potential of game-based learning to address persistent challenges in conventional language instruction and to promote meaningful learning outcomes.

Evaluating the Effectiveness of Multimedia Games

Evaluating the effectiveness of multimedia games is a critical process to ensure their pedagogical quality and reliability. Typically, the evaluation begins with expert review and iterative revisions, followed by staged testing in individual, small-group, and full-scale field trials. At each stage, data are analyzed against the E1/E2 80/80 efficiency standard, which assesses both the learning process and outcomes. Previous studies consistently applied this procedure. For instance, Pasawano (2021) demonstrated that blended multimedia lessons surpassed the benchmark ($E1 = 83.95$, $E2 = 85.57$), validating their instructional effectiveness. Likewise, Intarapreecha and Sangsawang (2023) confirmed the effectiveness of augmented reality games in primary education, showing efficiency values above the 80/80 criterion. More recently, Wongsurin et al. (2025) reported similar results when developing a mobile learning package, with field test outcomes meeting the standard ($E1 = 80.16$, $E2 = 80.38$).

Complementing these findings, Adita et al. (2021) conducted a systematic review of game-based biology learning between 2010 and 2019 and concluded that educational games consistently enhanced engagement, motivation, and cognitive outcomes while supporting the development of 21st-century skills. This broad evidence reinforces the reliability of systematic evaluation procedures and the cross-disciplinary effectiveness of game-based learning.

English Language Learning Management

Learning management is the process of providing students with learning experiences through activities, theories, and technology to foster a lasting change in behavior and enable them to effectively apply their knowledge (Narin et al., 2019; Pitipongpol, 2020; Takrudkaew, 2020). Modern learning management models are student-centered, where the teacher acts as a facilitator and guide.

In the context of English language education, the teacher and the media used in the classroom are the primary sources of language exposure for students (Bland, 2019). Several key teaching methods have evolved over time, each with its own focus:

- The Grammar-translation Method emphasizes reading and translating foreign texts.
- The Direct Method focuses on direct communication, using the target language for instruction and building proficiency through imitation and practice.
- The Audio-lingual/Aural-oral Method trains students through the repetition of sentence patterns to facilitate quick communication.
- Role-play exercises provide realistic scenarios that encourage spontaneous language use, promoting speaking fluency and learner confidence (Rababah, 2025).
- Game-based instruction uses games to create a fun, motivating atmosphere that helps students quickly grasp and remember lesson content (Li et al., 2024).

The choice of teaching method is crucial, and the ideal approach varies depending on the context. However, based on the provided text, game-based instruction is highlighted as a particularly effective method because it combines learning with enjoyment and promotes rapid knowledge acquisition.

English Communication Skills

English communication skills are the cornerstone of language learning, extending beyond rote memorization of vocabulary and grammar to encompass the effective and context-appropriate use of language for exchanging information, ideas, and feelings. This concept is affirmed by various scholars who have provided comprehensive definitions of the skill.

Definition of English Communication Skills

Communication is a complex and multifaceted process. Babayiğit and Shapiro (2020) state that the linguistic components that enable students to communicate effectively include grammar, vocabulary, and comprehension, which work together to allow learners to construct meaningful sentences from known words, ensuring smooth understanding between the speaker and listener. Communication is not limited to verbal expression; it also includes non-verbal cues such as facial expressions, gestures, and body language that enhance the message's clarity.

Similarly, Plengsantia (2021) defines English communication as a process that occurs through various channels, where the recipient must be able to interpret and understand the message, including the sender's intent, emotions, attitudes, and the surrounding context.

Ruenark (2021) clearly summarizes English communication skills as the ability to convey meaning accurately and appropriately in English, dividing them into four core skills: Listening, Speaking, Reading, and Writing. These skills form the essential foundation for communicative language learning.

Based on the views of several educators, the four skills are defined as follows:

- **Listening Skill** is not just about hearing sounds but involves a cognitive process. Ruenark (2021) defines it as the ability to receive and grasp the main idea of a message, and to analyze it to understand the sender's true meaning. Jaruma and Kornnaimuang (2020) add that listening starts with hearing, followed by cognitive processing, differentiation, and critical judgment to decide on the veracity of the message, leading to profound understanding and the ability to utilize the information.
- **Speaking Skill** is the act of communicating through spoken words accompanied by gestures to convey thoughts and feelings to a listener, who then understands the speaker's purpose and can respond accordingly (Jaruma and Kornnaimuang, 2020). Ruenark (2021) provides a more practical definition, stating it refers to daily communication through speaking to explain, answer questions, or provide brief messages.
- **Reading Skill** is a cognitive process of interpretation, which can sometimes be literal but often requires the reader's prior knowledge and experience for deeper understanding (Jaruma and Kornnaimuang, 2020). Khochunnun (2018) describes it as the process by which a reader correctly translates, interprets, elaborates, and understands the meaning of what is read, grasping the main idea and details based on their ability and experience. Ruenark (2021) adds that it is the basic ability to understand the meaning of a text, including correctly pronouncing, spelling, and reading simple sentences or texts according to principles.
- **Writing Skill** is the conveyance of the writer's thoughts, feelings, knowledge, and experiences using written characters (Ruenark, 2021). This can be in the form of answering questions, writing explanations, essays, or other texts to inform the reader of the intended purpose.

In summary, English communication skills are the comprehensive ability to use language effectively and accurately for both receiving and producing messages in the forms of listening, speaking, reading, and writing.

Management of English Communication Skills Learning

Effective management of English communication skills learning should promote the use of language in real-life or daily contexts. Bangwat (2020) emphasizes that teaching should focus on integrating both basic and higher-level communication skills. According to Nasimova (2022), communicative language teaching is guided by several key principles: learning should focus on real communication, students should be encouraged to experiment with language use, errors should be treated as a natural part of the learning

process, both accuracy and fluency must be developed, and activities should integrate multiple skills in meaningful and authentic tasks.

Furthermore, Bangwat (2020) concludes that an effective communicative language teaching process depends on three key components: activities, teaching techniques, and the roles of students and teachers. Activities are particularly vital, as they should empower students to use language in practical, real-life forms, with the teacher acting as a facilitator. In conclusion, the most important aspect of effective communicative English instruction is creating an environment where students can use language naturally, are not afraid of making errors, and understand the personal relevance of their learning.

Assessment of English Communication Skills

Assessing English communication skills is a complex and crucial process for obtaining data that reflects a learner's true ability. Brown and Abeywickrama (2019) define language assessment as the process of collecting information on a learner's ability using various tools and methods to achieve accurate and reliable results. In the context of reading and writing, assessment focuses on evaluating how effectively a student can comprehend written text and produce written messages to communicate information and feelings. Plakans and Gebriel (2017) explain that assessing productive skills (speaking and writing) is about capturing a learner's complex ability to convey meaning and interact with others. For reading, assessment involves evaluating a learner's ability to construct meaning from written text, encompassing skills such as vocabulary recognition, syntactic processing, comprehension of main ideas, and inferencing (Carlson et al., 2025).

Therefore, the assessment of English communication skills in reading and writing is the process of evaluating a student's ability to receive and produce messages appropriately through tasks or situations that reflect authentic language use.

■ Conceptual Framework

This study's conceptual framework integrates multimedia games into the learning process to enhance student engagement and outcomes. Games, conceived as rule-based interactive systems oriented to explicit goals, have been shown to serve as effective instructional tools that combine enjoyment with meaningful learning (Villa III et al., 2023; Ongoro & Fanjiang, 2024). Multimedia, with its blended visual, auditory, and interactive formats, stimulates learning and caters to diverse perceptions. Specifically, multimedia games address individual learning needs, are user-friendly, and facilitate rapid content comprehension (Itprida, 2022). Therefore, it is hypothesized that implementing the "At Home" multimedia game for Grade 3 students will lead to higher academic achievement in the "At Home" topic, improved English communication skills.

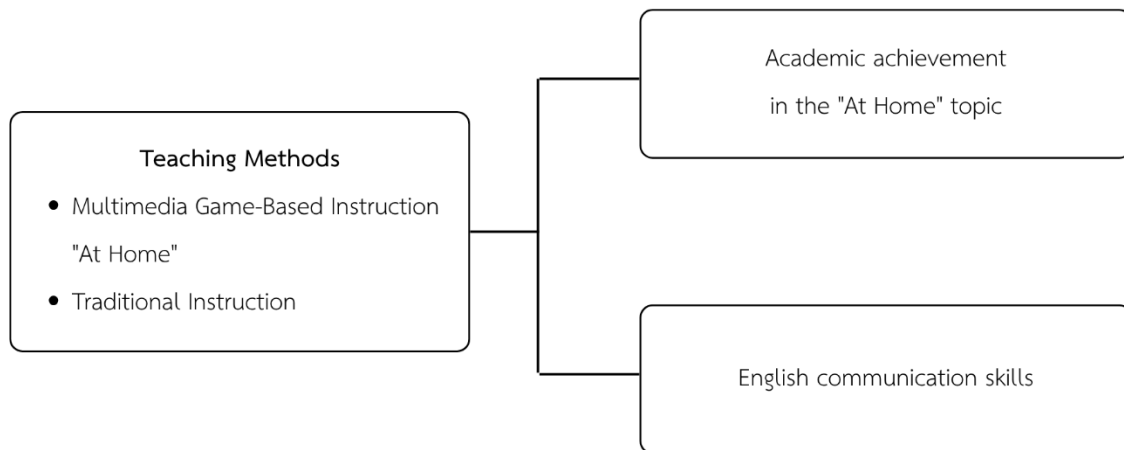


Figure 1. Conceptual Framework

Methods

Participants

The population for this study consisted of Grade 3 students from medium-sized public primary schools in Si Thep District under the Phetchabun Primary Educational Service Area Office 3, totaling 180 students across seven schools (Schools A–G).

The sample for determining instructional efficiency comprised 34 Grade 3 students from one public primary school in Si Thep District (School B) during the second semester of the 2024 academic year. This sample participated in a three-stage testing process, including individual testing (3 students), small-group testing (6 students), and field testing (25 students).

The sample for the main experiment consisted of 62 Grade 3 students from two intact classrooms at School A during the second semester of the 2024 academic year. The participants were selected using cluster random sampling, with classrooms serving as the unit of assignment. One classroom ($n = 31$) was assigned as the experimental group and received instruction using the “At Home” multimedia game, while the other classroom ($n = 31$) served as the control group and received traditional instruction.

Instruments and Data Collection

The research instruments used in this study were divided into two categories consisted of instruments for the experimental intervention and instruments for data collection.

The instructional tool used for the experimental intervention was the multimedia game titled “At Home,” developed specifically for grade 3 students. This multimedia game was designed to enhance English learning by providing interactive, visually engaging, and age-appropriate content aligned with the curriculum. The game served as the core instructional tool for the experimental group throughout the study.

For data collection, two main instruments were employed. The first was the English Achievement Test on the topic “At Home.” This test consisted of 20 multiple-choice questions, each with four answer options. It was used to evaluate students’ knowledge and understanding of the lesson content after the learning intervention.

The second instrument was the English Communication Skills Test, which comprised both multiple-choice and subjective items, totaling 40 questions. This test was designed to measure students’ abilities in key communication skills, including their reading comprehension and sentence construction capabilities. Together, these instruments provided a comprehensive picture of students’ academic performance and language proficiency resulting from the instructional methods used.

Development of the Instructional Tool

The instructional tool used in this study was the multimedia game titled “At Home”, created specifically for grade 3 students. The development of the game followed a structured instructional design process consisting of five key stages.

1. Analysis Stage The researcher began by analyzing relevant theories, instructional models, and content from documents, textbooks, academic articles, and student interviews.

1.1 Learner Analysis The target learners were 62 grade 3 students at School A. Most of these students had limited foundational knowledge in English, which posed a barrier to learning new content. Additionally, these students, aged 9-10 years, belong to Generation Alpha, a generation that has grown up with digital technology and views its use as normal. However, issues such as pseudo-attention deficit resulting from inappropriate technology use were also observed. Therefore, it was crucial for the instructional approach to adapt by focusing on learning media that could create excitement, interest, and effectively capture the attention of this group of learners to stimulate learning, build motivation, and address potential attention limitations.

1.2 Content Analysis The English course analyzed was subject code E13101 for Grade 3, specifically Unit 3: At Home, which spans five hours of instruction. The content includes vocabulary for household items, room names, object placement, and basic question-and-answer structures. The focus is on developing foundational language for communication, including listening and reading comprehension through dialogues and role-playing, vocabulary recognition, and sentence structure, including color descriptions and spatial awareness.

2. Design Stage At this stage, the researcher identified the learning objectives, selected relevant content, and determined the gameplay structure according to the curriculum's learning outcomes to design the content and features of the multimedia game. A storyboard was created to meticulously plan the sequence of content presentation, activities, and interactions within the game, specifying visuals, audio, text, and movement for each screen or scene, providing a comprehensive overview before actual development. Furthermore, the researcher studied various software and data programs suitable for

developing the “At Home” multimedia game for Grade 3 students to select appropriate technology and platforms for creating an effective and engaging game.

3. Development Stage The initial version of the multimedia game was submitted to three experts in instructional technology and English education for evaluation. Their feedback was used to revise and improve the content. The revised version was then reviewed again to ensure its alignment with the curriculum objectives, instructional process, and assessment. Experts rated each element using a five-point Likert-type scale (from 1 = least appropriate to 5 = most appropriate).

4. Implementation Stage After expert validation, it was piloted with 34 Grade 3 students from School B. This pilot aimed to assess the suitability of time, difficulty of content, identify any flaws, and determine overall appropriateness before its use with the main experimental sample. The piloting process was divided into three sub-stages:

Individual Trial Conducted with 3 students from School B. Observations of behavior while playing the “At Home” multimedia game were made, along with interviews for feedback. It was found that learners did not understand some instructions or game mechanics and showed boredom at certain points. The collected data was used to improve language clarity, add explanatory images to the game, refine graphic design and sound, and add elements to enhance engagement for subsequent trials.

Small Group Trial Conducted with 6 students from School B. Scores from within the multimedia game (E1) were collected, and a post-test (E2) was administered after completing the game. Interviews for feedback were also conducted. It was observed that some learners still struggled with content comprehension or failed to complete activities. This feedback led to further adjustments of content or presentation methods for problematic areas before proceeding to the next trial.

Field Trial Conducted with 25 students from School B. In-game scores (E1) and post-test scores (E2) were collected to evaluate the efficiency of the “At Home” multimedia game for Grade 3 students against the established criterion of 80/80. The E1/E2 formula was applied to calculate efficiency.

5. Evaluation Stage The final revised version of the “At Home” multimedia game for Grade 3 students was subsequently implemented with the full experimental sample of 62 students. Data collected from this stage contributed to the overall evaluation of the multimedia game’s quality and effectiveness.

Development of Data Collection Instruments

The data collection instruments included two main components, which were the English Achievement Test and the English Communication Skills Test.

1. English Achievement Test

The English Achievement Test on the topic "At Home," used in this research, was a 20-item multiple-choice test with four answer options. An initial pool of 40 items was constructed before item analysis and selection. The development process followed these steps:

1.1 Studying Content and Standards The researcher began by analyzing relevant theories, instructional models, and content from documents, textbooks, academic articles, and student interviews.

This focused specifically on the learning standards, indicators, and the Foreign Language learning area, Unit 3, At Home, for Grade 3 students, along with related research findings.

1.2 Test Construction A 40-item multiple-choice English Achievement Test with four answer options was constructed to ensure alignment with learning standards, indicators, and learning objectives.

1.3 Expert Validation The test was presented to three experts to review its content validity and suitability in relation to the learning content. The Index of Item Objective Congruence (IOC) was calculated between the "At Home" Achievement Test and the learning objectives.

1.4 IOC Calculation and Item Selection The IOC values for the "At Home" English Achievement Test items were calculated. Items with IOC values ranging from 0.67 to 1.00 were selected for use, resulting in 25 items.

1.5 Pilot Testing The "At Home" English Achievement Test was pilot-tested with 34 Grade 3 students from School B, Si Thep District, Phetchabun Province, to assess its quality.

1.6 Scoring and Item Analysis The pilot test scores were analyzed. Each correct answer received 1 point, and incorrect or unanswered items received 0 points. Item analysis was then conducted to determine the difficulty index (p-value) and discrimination index (r-value) for each item.

1.7 Final Test Selection A final version of the "At Home" English Achievement Test, consisting of 20 items, was selected based on p-values between 0.24–0.74 and r-values ranging from 0.20–0.64.

1.8 Reliability Calculation The reliability of the entire test was calculated using the KR20 (Kuder-Richardson 20) formula

1.9 Final Revision The 20-item test was revised and finalized before being administered to the main sample group.

2. English Communication Skills Test

The English Communication Skills Test used in this research was a 40-item test comprising both 4-option multiple-choice and subjective items. The development process followed these steps.

2.1 Studying Guidelines The researcher studied guidelines for English language learning assessment, content, concepts, theories, the meaning of English communication skills, and principles of test construction.

2.2 Test Construction A 50-item English Communication Skills Test, including both 4-option multiple-choice and subjective items, was constructed.

2.3 Expert Validation and Revision The test was presented to three experts for content validity review, and revisions were made based on their suggestions.

2.4 Pilot Testing The revised test was pilot-tested with 34 Grade 3 students from School B, to assess its quality.

2.5 Scoring, Item Analysis, and Reliability The pilot test scores were analyzed to determine the difficulty index (P-value) and discrimination index (B-value) for each item, and the reliability of the test was calculated.

2.6 Final Revision and Selection The test was revised and finalized. The final 40-item test, with difficulty (P-value) between 0.70–0.95 and discrimination (B-value) between 0.33–1.00, was then prepared for administration to the main sample group.

Analysis of Data

The data obtained from the experiment were analyzed using statistical methods to rigorously examine the effectiveness of the “At Home” multimedia game in enhancing students’ English learning outcomes. The analysis was conducted using a standard statistical software package, with the procedure designed to directly address the research hypotheses.

To evaluate differences in both English achievement and English communication skills between the experimental group (taught using the multimedia game) and the control group (taught through traditional instruction), an Analysis of Covariance (ANCOVA) was employed. This method was selected because it allows for the comparison of post-test scores between groups while statistically controlling for potential pre-test differences. By adjusting for baseline performance, ANCOVA provides a more accurate estimation of the true effect of the multimedia game on student learning outcomes.

In this analysis, the pre-test scores of each respective variable (English achievement and English communication skills) were treated as covariates, the type of instruction (multimedia game vs. traditional method) was the independent variable, and the post-test scores were the dependent variables. The significance level was set at $p < .05$. In addition, effect sizes were reported using partial eta squared (Partial η^2) to indicate the magnitude of the observed effects, with values above .14 interpreted as large effects.

This analytic approach ensured that the findings not only demonstrated statistical significance but also provided evidence of the practical impact of the multimedia game on students’ English learning outcomes.

■ Results and Discussion

Results

1. Efficiency of the "At Home" Multimedia Game

The effectiveness of the developed multimedia game was evaluated using the E1/E2 criterion, which measures the in-process learning performance (E1) and post-learning performance (E2). The results of the game's efficiency are presented in Table 1.

Table. 1

Table 1. Efficiency of the "At Home" Multimedia Game for Grade 3 Students

Phase	N	E_1	E_2
Individual Trial	3	78.23	76.49
Small Group Trial	6	79.71	79.33
Field Trial	25	82.19	81.87

As shown in Table 1, the efficiency of the "At Home" multimedia game was assessed progressively. In the individual trial phase (3 students), the game yielded an E1/E2 efficiency of 78.23/76.49. Following this, improvements were made to the font colors, background music, and inter-level activities. The game was then tested in the small group trial phase (6 students), where it achieved an E1/E2 efficiency of 79.71/79.33. Based on this, further refinements were implemented, including adjusting font sizes and adding animated graphics to enhance completeness. Finally, in the field trial phase (25 students), the developed multimedia game demonstrated an efficiency of 82.19/81.87, which successfully met the predetermined criterion of 80/80.

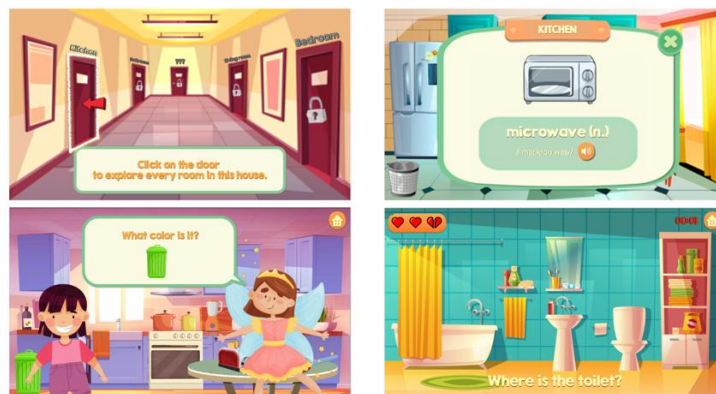


Figure 2. Sample Screenshots of the 'At Home' Multimedia Game for Grade 3 Students

2. ANCOVA Analysis of Post-test Scores

To further investigate the effectiveness of the multimedia game-based instruction, an Analysis of Covariance (ANCOVA) was conducted. This statistical method was employed to compare the post-test scores between the experimental and control groups while controlling for the potential influence of pre-test scores as a covariate. The analysis was performed separately for both English communication skills and English achievement test.

Table. 2

Table 2. Means and Standard Deviations of Adjusted Post-test Scores

Variable	Group	N	Pre-test Mean	S.D.	Post-test Mean	S.D.	Adjusted Mean
English Communication Skills Test	Experimental Group (Multimedia Game)	31	13.77	3.45	31.13	4.49	31.33
	Control Group (Traditional)	31	14.16	3.65	22.81	5.22	22.61
English Achievement Test	Experimental Group (Multimedia Game)	31	11	1.75	17.68	1.8	17.48
	Control Group (Traditional)	31	10.55	1.41	12.94	2.13	13.13

Table. 3

Table 3. ANCOVA Results for Post-test Scores of English Communication Skills Test and English Achievement Test

Dependent Variable	Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	p-value	Partial η^2
English Communication Skills Post-test	Covariate (CS Pre)	28.53	1	28.53	1.25	0.268	0.021
	Group	1045	1	1045	45.92	< .001	0.442
	Error	1342.34	59	22.75			
English Achievement Post-test	Covariate (ACH Pre)	81.33	1	81.33	32.81	< .001	0.357
	Group	240.09	1	240.09	96.86	< .001	0.621
	Error	146.24	59	2.48			

The ANCOVA results demonstrated a statistically significant difference in post-test scores for English communication skills between the experimental and control groups, after controlling for pre-test scores ($p < .001$). The adjusted mean score for the experimental group (31.33) was notably higher than that of the control group (22.61). The effect size, as measured by partial eta squared (Partial $\eta^2 = 0.442$), indicates a large effect, suggesting that the use of the "At Home" multimedia game had a substantial impact on improving students' English communication skills compared to traditional instruction.

Similarly, the ANCOVA revealed a statistically significant difference in post-test academic achievement scores between the two groups ($p < .001$), with the experimental group obtaining a higher adjusted mean score (17.48) than the control group (13.13). The effect size for this outcome was even larger (Partial $\eta^2 = 0.621$), indicating a very large effect. This result highlights the strong positive impact of the multimedia game on students' learning achievement after accounting for initial differences in baseline knowledge.

Discussion

The findings of this study provide strong evidence that the “At Home” multimedia game was effective in enhancing both English communication skills and academic achievement among Grade 3 students. After controlling for pre-test scores, the experimental group significantly outperformed the control group, indicating that the observed improvements were attributable to the instructional intervention rather than pre-existing differences. Beyond demonstrating statistical significance, these results highlight the pedagogical value of integrating interactive multimedia tools into primary English instruction.

One possible explanation for the improved outcomes lies in the interactive nature of the multimedia game, which likely promoted active cognitive engagement. Unlike traditional instruction, the game required learners to process information through multiple modalities—visual, auditory, and kinesthetic—thereby facilitating deeper learning and better retention. Immediate feedback embedded in the game may also have helped learners correct misunderstandings in real time, reinforcing accurate language use and supporting incremental skill development. This aligns with cognitive theories of multimedia learning, which suggest that meaningful interaction with content enhances comprehension and transfer of knowledge.

The improvement in English communication skills can further be interpreted through the lens of communicative language learning. The game created contextualized scenarios that required learners to interpret meaning and construct responses, encouraging them to use language functionally rather than merely memorizing vocabulary or structures. Such simulated communicative environments are particularly valuable in contexts where opportunities for authentic English interaction are limited. In this sense, the multimedia game may have acted as a bridge between classroom learning and real-world language use, supporting the development of practical communicative competence.

Another notable finding is the relatively large effect sizes observed in both communication skills and achievement. These substantial effects may be attributed to several factors. First, the novelty of the game-based approach likely increased learners' attention and motivation, especially among young learners who are accustomed to digital media. Second, the high level of interactivity and learner autonomy within the game may have fostered a sense of ownership over learning, which is known to enhance engagement and persistence. Finally, the alignment between game activities and curriculum objectives ensured that engagement translated directly into measurable learning gains.

These results are consistent with previous research indicating that game-based learning can enhance motivation, engagement, and language outcomes. However, the present study extends prior findings by demonstrating that a carefully designed multimedia game can produce substantial improvements not only in knowledge acquisition but also in communicative performance at the primary level. This suggests that the effectiveness of game-based learning may depend not merely on the presence of digital elements but on the degree to which instructional design integrates meaningful interaction, feedback, and contextualized practice.

From a practical perspective, the findings underscore the potential of multimedia games as supplementary instructional tools in primary English classrooms. In educational settings where students often experience low motivation or limited exposure to authentic language use, interactive digital media may provide an accessible and engaging alternative that supports both affective and cognitive dimensions of learning. Consequently, the integration of well-designed multimedia games could represent a viable strategy for addressing persistent challenges in English language education, particularly in contexts similar to those examined in this study.

■ Conclusion

This study demonstrates that the “At Home” multimedia game is an effective instructional innovation for supporting English learning among primary school students. The findings indicate that integrating interactive multimedia into classroom instruction can enhance learners’ communication skills and overall academic performance, highlighting the potential of game-based learning as a meaningful complement to traditional teaching approaches.

The results emphasize the importance of designing learning environments that actively engage young learners through interaction, feedback, and contextualized language use. By creating opportunities for students to participate in meaningful learning experiences, multimedia games can foster both cognitive development and positive learning attitudes, which are essential for sustained language acquisition.

Overall, this study contributes empirical evidence supporting the pedagogical value of multimedia game-based instruction in primary education. The findings suggest that when digital tools are carefully aligned with instructional objectives and learner characteristics, they can play a significant role in improving the effectiveness of English language teaching.

■ Limitations and Recommendations

Limitations

Despite the promising findings, several limitations should be considered when interpreting the results of this study. First, the sample was drawn from a single school in a specific geographical context, which may limit the generalizability of the findings to other educational settings or student populations. In

addition, the participants were all Grade 3 students; therefore, the results reflect the effectiveness of the multimedia game only for learners within this particular developmental stage and may not represent students at different grade levels or proficiency levels.

Moreover, the duration of the intervention was relatively short. As a result, the study may not fully capture the long-term impact or sustainability of multimedia game-based learning on students' English communication skills and academic development.

Recommendations

Based on the findings, it is recommended that multimedia game-based learning be incorporated as a supplementary instructional approach in English language classrooms to enhance student engagement and provide meaningful opportunities for language practice. Teachers may also integrate follow-up activities that connect game content to real-life communication tasks, such as presentations or descriptive speaking activities, to reinforce the practical application of students' language skills.

For future research, studies should investigate the long-term effects of multimedia games on language proficiency and examine the durability of learning outcomes over time. Further research should also test the applicability of this approach across different educational levels, age groups, and learning contexts to enhance its generalizability. In addition, exploring the integration of advanced technologies, such as AI-based adaptive systems, is recommended to provide personalized feedback and learning pathways. Such innovations may also create collaborative learning opportunities, thereby expanding the potential of game-based instruction in English language education.

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