



Developing an interactive folktale-based digital learning application integrating the SQ4R strategy to enhance elementary students' reading comprehension and narrative writing

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Abstract

Background: Elementary students frequently encounter difficulties in reading comprehension and narrative writing due to the limited availability of interactive digital learning resources that integrate structured literacy strategies with culturally relevant content.

Aims: This study aimed to develop an interactive folktale-based digital learning application integrating the SQ4R (Survey, Question, Read, Recite, Record, and Review) strategy and to evaluate its feasibility and effectiveness in enhancing fourth-grade students' reading comprehension and narrative writing.

Method: A Design and Development approach employing the ADDIE model was adopted. The application was implemented with fourth-grade students from five elementary schools in Sumedang Regency, Indonesia, through one limited trial and four broader field trials. Data were collected using expert validation sheets, reading comprehension and narrative writing tests, and teacher and student response questionnaires. Data were analyzed using the Shapiro-Wilk test, paired-sample *t*-test or Wilcoxon signed-rank test, and normalized gain (N-Gain).

Results: The application achieved a very feasible rating across the material, language, and media aspects. Reading comprehension demonstrated moderate improvement with N-Gain values ranging from 0.51 to 0.55, while narrative writing achieved N-Gain values between 0.48 and 0.55. Significant improvements ($p < 0.001$) were consistently observed across all participating schools. In addition, both teachers and students provided highly positive evaluations regarding the usability, attractiveness, and instructional value of the application.

Conclusion: The developed application provides an effective technology-enhanced literacy learning environment by integrating local folktales with the SQ4R strategy to simultaneously improve reading comprehension and narrative writing. These findings demonstrate the potential of culturally responsive digital learning to support meaningful and integrated literacy instruction in elementary education.

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INTRODUCTION

Literacy is widely recognized as a fundamental competency that underpins students' academic achievement, lifelong learning, and active participation in society, particularly during elementary education when foundational language skills are systematically developed. Among the essential components of literacy, reading comprehension and narrative writing play complementary roles in enabling learners to understand information, construct meaning, and communicate ideas effectively across academic and real-life contexts (Afrilyasanti et al., 2025; Beltrán-Palanques, 2024; Fadzil et al., 2025). Reading comprehension equips students with the ability to interpret explicit and implicit information, evaluate textual meaning, and integrate new knowledge with prior experiences,

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whereas narrative writing enables them to organize ideas into coherent and meaningful written discourse. These two competencies are mutually reinforcing because exposure to well-structured reading materials provides linguistic models, vocabulary development, and organizational patterns that support students in producing quality written texts (Taye & Teshome, 2025). Consequently, literacy instruction should encourage the simultaneous development of reading and writing rather than treating them as isolated learning objectives. Contemporary literacy education also emphasizes higher-order thinking processes, including analyzing, synthesizing, evaluating, and communicating information through multiple forms of representation (Damaianti et al., 2020; Lewis III & Lewis, 2021; List & Sun, 2023). Such expectations require instructional approaches that actively engage students in constructing knowledge instead of merely receiving information from teachers. Therefore, developing integrated literacy competencies has become an important priority in elementary education to prepare students for increasingly complex academic demands. Educational reforms in many countries likewise advocate literacy learning environments that promote meaningful interaction, critical thinking, and authentic communication through student-centered instructional practices. These developments highlight the need for innovative literacy learning models capable of supporting elementary students in acquiring comprehensive reading and writing competencies simultaneously.

Despite the growing emphasis on literacy education, many elementary school students continue to experience considerable difficulties in reading comprehension and narrative writing. Previous studies have shown that students generally perform adequately when identifying explicit information but encounter substantial challenges when making inferences, evaluating ideas, synthesizing information, and organizing coherent written narratives (Castells et al., 2023; MacArthur et al., 2023; Rice & Wijekumar, 2024; Vandermeulen et al., 2023). These difficulties are frequently associated with instructional practices that emphasize memorization and teacher explanation rather than active literacy engagement. Classroom learning also tends to separate reading activities from writing instruction, preventing students from developing a meaningful connection between understanding texts and expressing ideas through writing (Segundo Marcos et al., 2020; Taylor & Leung, 2020). In addition, learning resources commonly rely on printed materials that provide limited opportunities for interaction, immediate feedback, and independent exploration. A preliminary study conducted with twenty-eight fourth-grade students supported these observations. The findings revealed that 57.2% of the students demonstrated low to very low reading comprehension performance, while the average narrative writing score was only 51.8, indicating unsatisfactory writing achievement. Further analysis showed that students experienced particular difficulties in inferential comprehension, evaluative thinking, plot organization, spelling accuracy, punctuation, and appropriate word choice. Classroom observations further indicated that learning activities remained predominantly teacher-centered and rarely utilized interactive instructional media capable of promoting active participation. These findings demonstrate the necessity of developing more contextual, engaging, and technology-supported literacy learning environments that simultaneously foster reading comprehension and narrative writing.

Recent developments in educational technology have created new opportunities to transform literacy instruction through interactive digital learning environments that encourage active participation, personalized learning experiences, and immediate feedback. Digital learning applications have increasingly been recognized as effective instructional tools because they integrate multimedia elements that facilitate deeper cognitive processing and improve students' learning motivation (Abdulrahman et al., 2020; Cavanagh & Kiersch, 2023; Md Sabri et al., 2024; Skulmowski & Xu, 2022; Wong & Hughes, 2023). At the same time, culturally responsive learning has received growing attention because instructional materials reflecting students' cultural backgrounds enable

learners to construct meaning more effectively and develop stronger emotional engagement with learning (Anyichie et al., 2023; Berlian & Huda, 2022; Shih, 2024). Folktales represent valuable culturally relevant learning resources because they preserve local wisdom while simultaneously providing meaningful contexts for language and literacy development. Furthermore, structured instructional strategies remain essential to maximize the educational potential of digital technology by guiding students through systematic learning processes. One promising approach is the SQ4R strategy, which encourages learners to survey, question, read, recite, record, and review information through active and reflective learning activities. The sequential stages of SQ4R naturally support the transition from reading comprehension to written expression because students are required to process, organize, and reconstruct information before producing written texts. Integrating interactive digital learning, culturally responsive folktales, and the SQ4R strategy therefore offers considerable potential to establish a comprehensive literacy learning environment. Such an integrated approach is expected not only to improve students' reading comprehension and narrative writing but also to enhance learning engagement, motivation, and meaningful knowledge construction. Consequently, developing an interactive folktale-based digital learning application integrating the SQ4R strategy represents a promising instructional innovation for strengthening elementary students' literacy competencies.

Recent studies have demonstrated that reading comprehension can be enhanced through various instructional strategies, cognitive interventions, and technology-assisted learning environments, while narrative writing has been improved through scaffolding techniques and structured writing instruction (Duke et al., 2021; Fu & Relyea, 2024; Nouwens et al., 2021; Smith et al., 2021). Similarly, the SQ4R strategy has consistently been reported as an effective approach for improving students' reading comprehension and metacognitive reading performance, although its implementation has primarily relied on conventional classroom instruction rather than interactive digital learning environments (İncirkuş & Beyreli, 2020). At the same time, research on digital literacy has emphasized the growing importance of integrating digital technologies into learning to foster students' literacy competencies and engagement (Anthonysamy et al., 2020; Audrin & Audrin, 2022; Tinmaz et al., 2022). Furthermore, studies on folktale-based learning have confirmed that culturally relevant learning materials can enhance students' language learning, literacy development, and cultural awareness (Songsirisak et al., 2024). However, these studies have largely investigated reading comprehension, narrative writing, SQ4R instruction, digital literacy, and folktale-based learning as separate pedagogical approaches. Limited empirical evidence is available regarding the development of an interactive digital learning application that integrates culturally responsive folktales with the SQ4R strategy to simultaneously enhance reading comprehension and narrative writing among elementary school students. Addressing this gap, the present study develops an interactive folktale-based digital learning application that combines these complementary instructional components into a unified technology-enhanced literacy learning environment, thereby providing a more comprehensive approach to elementary literacy instruction.

This study aimed to develop an interactive folktale-based digital learning application integrating the SQ4R strategy to support elementary literacy learning. The application was designed to provide an engaging and culturally responsive learning environment that simultaneously facilitates reading comprehension and narrative writing. It integrates interactive digital features, local folktales, and structured literacy instruction into a unified learning platform. The study also sought to evaluate the feasibility of the developed application through comprehensive assessments conducted by material, language, and media experts. Furthermore, it examined the effectiveness of the application in improving fourth-grade students' reading comprehension achievement following its implementation. In addition, the study investigated its effectiveness in enhancing students'

narrative writing performance through structured reading-to-writing learning activities. Teacher perceptions regarding the practicality, instructional value, and usability of the application were also explored to determine its applicability in classroom settings. Similarly, students' responses were examined to evaluate their engagement, learning experiences, and acceptance of the digital learning application. By integrating culturally relevant learning content with an evidence-based reading strategy, this study intends to provide an innovative instructional model that supports meaningful and integrated literacy learning. Ultimately, the findings are expected to contribute to the advancement of technology-enhanced literacy education and provide empirical evidence for the implementation of culturally responsive digital learning in elementary schools.

LITERATURE REVIEW

Reading comprehension is a multidimensional cognitive process that enables learners to construct meaning by integrating textual information with prior knowledge, personal experiences, and contextual understanding. Rather than merely recognizing words, effective reading comprehension requires students to identify explicit information, generate inferences, evaluate ideas, and synthesize information across different parts of a text (Hall et al., 2020; Rice & Wijekumar, 2024; Roomy & Muhammad, 2022). These higher-order cognitive processes are fundamental for supporting students' academic achievement because comprehension serves as the basis for learning in nearly all subject areas. In elementary education, reading comprehension is particularly important because it establishes the foundation for students' subsequent literacy development and critical thinking abilities (Paige et al., 2024; Smith et al., 2021). Students who demonstrate strong reading comprehension are generally more capable of interpreting complex information, solving contextual problems, and communicating their understanding effectively. However, many elementary students continue to experience difficulties in inferential and evaluative comprehension despite demonstrating adequate literal understanding. Recent studies have shown that these difficulties are associated with limited opportunities for active learning, insufficient metacognitive guidance, and instructional approaches that emphasize information recall rather than meaning construction (Stanton et al., 2021; Tian et al., 2020). Consequently, literacy instruction should facilitate active cognitive engagement through learning experiences that encourage students to question, interpret, analyze, and reflect on textual information. Interactive instructional approaches have therefore become increasingly important because they promote meaningful learning and strengthen students' comprehension processes through continuous engagement and feedback. Developing students' reading comprehension requires instructional designs that combine effective pedagogical strategies with technology-enhanced learning environments capable of supporting deeper cognitive processing.

Narrative writing represents one of the most essential productive literacy skills because it enables learners to transform ideas, experiences, and information into coherent written communication. Effective narrative writing requires students to organize events logically while maintaining appropriate orientation, complication, resolution, coherence, and language accuracy throughout the text (Janebi Enayat, 2025). Producing high-quality narrative texts also involves planning, drafting, revising, and editing, making writing a complex cognitive activity that integrates linguistic, organizational, and metacognitive skills. The development of narrative writing is closely associated with students' reading experiences because exposure to well-structured texts provides models of vocabulary, sentence construction, discourse organization, and storytelling techniques (Din Eak & Annamalai, 2025; Nguyen et al., 2022; Taye & Teshome, 2025; Vaknin-Nusbaum & Nevo, 2026). This reciprocal relationship suggests that reading and writing should be viewed as

interconnected literacy processes rather than independent instructional objectives. Previous research has consistently demonstrated that integrating reading activities into writing instruction contributes to improved writing quality, richer vocabulary use, and stronger text organization (Jouhar & Rupley, 2021; Kim, Relyea, et al., 2021; Wyse & Hacking, 2024). Nevertheless, classroom instruction frequently separates reading comprehension from writing practice, reducing opportunities for students to transfer their understanding of texts into written expression. Such fragmented instruction limits students' ability to develop comprehensive literacy competencies that support meaningful communication. Therefore, literacy learning should encourage students to read, analyze, organize, and reconstruct information before producing written narratives through structured instructional activities. Establishing meaningful connections between reading comprehension and narrative writing is expected to strengthen students' overall literacy achievement and support sustainable language development.

The SQ4R strategy has been widely recognized as an effective instructional approach for improving reading comprehension because it promotes active, systematic, and reflective learning throughout the reading process. The strategy consists of six sequential stages, namely Survey, Question, Read, Recite, Record, and Review, each of which guides students to engage cognitively with textual information rather than reading passively (Aslan Altan, 2022). The Survey stage activates prior knowledge by encouraging learners to examine the overall structure and content of a text before reading in detail. During the Question and Read stages, students formulate guiding questions and actively search for relevant information, thereby increasing reading purpose and comprehension accuracy. The Recite and Record stages require learners to restate important ideas in their own words and organize information systematically, strengthening memory retention and conceptual understanding. Finally, the Review stage enables students to consolidate knowledge, identify misconceptions, and reinforce long-term learning through reflective evaluation. Beyond improving reading comprehension, the SQ4R strategy naturally supports writing development because students reconstruct information before expressing their understanding in written form. Several empirical studies have reported that the SQ4R strategy significantly enhances students' comprehension performance, learning motivation, and metacognitive awareness across different educational settings (Bulut, 2025; Liang et al., 2025; Toyokawa et al., 2024). Despite these positive findings, previous implementations have predominantly employed printed learning materials or conventional classroom instruction rather than interactive digital learning environments. Integrating the SQ4R strategy into an interactive digital application therefore represents a promising innovation for supporting comprehensive literacy learning that simultaneously strengthens reading comprehension and narrative writing.

Interactive digital learning has transformed contemporary educational practices by creating learner-centered environments that encourage active participation, immediate feedback, and personalized learning experiences. Unlike conventional instructional media, interactive digital applications integrate text, images, audio, animation, and assessment features to facilitate meaningful knowledge construction through multiple cognitive channels (Abdulrahman et al., 2020; Girwidz & Kohnle, 2021; Staneviciene & Žekienė, 2025). The effectiveness of digital learning is further explained by multimedia learning principles, which suggest that students understand information more effectively when verbal and visual representations are presented in a complementary manner. Beyond technological features, the quality of learning also depends on the relevance of instructional content to students' cultural and social experiences. Culturally responsive learning materials help students connect new knowledge with familiar contexts, thereby increasing learning motivation, comprehension, and knowledge retention. Folktales constitute one of the richest forms of culturally relevant instructional resources because they preserve local wisdom while

presenting authentic linguistic structures, moral values, and meaningful life experiences. Previous studies have demonstrated that integrating folktales into literacy instruction improves students' reading engagement, vocabulary development, cultural awareness, and writing performance (Ansoriyah et al., 2026). Nevertheless, most folktale-based instructional resources continue to rely on printed materials or static multimedia, limiting opportunities for interactive learning and continuous student engagement. Integrating local folktales into an interactive digital learning application provides opportunities to combine cultural relevance with technological innovation, creating more authentic and engaging literacy learning experiences. Such integration is expected to strengthen students' motivation, deepen reading comprehension, and facilitate meaningful narrative writing through contextual and technology-enhanced learning activities.

The development of integrated literacy learning environments requires a strong theoretical foundation that explains the reciprocal relationship among reading, writing, instructional strategies, and digital learning. The reading-writing connection proposes that reading and writing are mutually reinforcing processes in which comprehension supports written expression, while writing enhances deeper understanding of texts through reflection and knowledge reconstruction. This reciprocal perspective suggests that literacy instruction should encourage students to move continuously between reading, interpreting, organizing, and communicating information rather than teaching each competency independently. From a sociocultural perspective, scaffolding theory explains that students achieve higher levels of performance when they receive structured guidance appropriate to their cognitive development before gradually assuming greater learning independence (Alanazi et al., 2025; Machimana & Genis, 2025; Sarmiento-Campos et al., 2022). Within the present study, the SQ4R strategy functions as an instructional scaffold by systematically guiding students through sequential stages of questioning, reading, organizing, recalling, and reviewing information before producing written narratives. Simultaneously, the interactive digital learning application provides technological support that facilitates multimedia presentation, active interaction, immediate feedback, and self-paced learning experiences (Desai & Kulkarni, 2022; Yow, 2022). The integration of local folktales further strengthens this instructional framework by providing culturally meaningful contexts that enable students to relate literacy learning to their everyday experiences. Combining these pedagogical and technological components establishes a comprehensive learning environment that supports cognitive engagement, cultural relevance, and meaningful literacy development. Unlike previous studies that have generally examined digital learning, SQ4R instruction, or folktale-based learning separately, the present study synthesizes these complementary approaches into a unified instructional model designed to improve both reading comprehension and narrative writing simultaneously. Accordingly, this integrated theoretical framework provides the conceptual foundation for developing an interactive folktale-based digital learning application that supports technology-enhanced literacy learning in elementary education.

METHOD

Research Design

This study employed a Design and Development (D&D) research approach to systematically design, develop, and evaluate an educational product intended to solve practical instructional problems while generating empirical evidence regarding its effectiveness. The Design and Development approach emphasizes the iterative process of producing educational innovations through systematic analysis, product development, validation, implementation, and evaluation. The development process followed the ADDIE instructional design model, which consists of five sequential phases: Analysis, Design, Development, Implementation, and Evaluation. During the

analysis phase, students' literacy needs, classroom learning conditions, curriculum requirements, and instructional problems related to reading comprehension and narrative writing were identified through preliminary observations and document analysis. The design phase focused on developing the instructional framework, application interface, learning activities, multimedia components, and assessment strategies based on the SQ4R instructional model. During the development phase, the interactive digital learning application was produced and subsequently evaluated by experts in instructional materials, language, and educational media before being revised according to their recommendations. The implementation phase consisted of a limited field trial followed by broader implementation to examine the practicality and effectiveness of the developed application under authentic classroom conditions. Finally, the evaluation phase integrated quantitative and qualitative findings obtained throughout the development process to determine the overall quality and instructional effectiveness of the application. This systematic development process ensured that the resulting application was pedagogically appropriate, technologically functional, and empirically validated before being recommended for elementary literacy learning.

Participants

The participants consisted of fourth-grade students enrolled in five public elementary schools located in Sumedang Regency, West Java, Indonesia. The schools were selected purposively because they had implemented the Merdeka Curriculum and represented appropriate settings for evaluating the developed digital learning application. The research was conducted in two implementation stages. A limited field trial was first carried out in one elementary school to identify the application's initial feasibility and identify aspects requiring revision before broader implementation. After refinement, the application was implemented in four additional elementary schools representing different classroom learning environments to examine its instructional effectiveness. Fourth-grade students were selected because they had mastered basic reading skills and had begun developing higher-order reading comprehension and narrative writing competencies according to the elementary curriculum. Their cognitive development was considered appropriate for participating in learning activities requiring comprehension, interpretation, reflection, and written expression through the SQ4R strategy. Classroom teachers collaborated with the researchers throughout the implementation process by facilitating learning activities and assisting classroom management. All learning activities were conducted during regular classroom instruction to maintain authentic learning conditions. Consequently, the selected participants represented the intended users of the developed application and provided appropriate empirical evidence regarding its feasibility and effectiveness in elementary literacy learning.

Instruments and Data Collection

Multiple research instruments were employed to comprehensively evaluate both the quality of the developed application and its instructional effectiveness. Product feasibility was assessed using expert validation sheets completed by specialists in instructional materials, language, and educational media. These validation instruments evaluated content relevance, language appropriateness, interface design, instructional quality, usability, and technical functionality of the application. Reading comprehension was measured using a ten-item achievement test developed according to the five components of Barrett's taxonomy, including literal comprehension, reorganization, inferential comprehension, evaluation, and appreciation. Narrative writing ability was assessed using an analytic scoring rubric consisting of eight writing indicators covering narrative organization, coherence, vocabulary, grammar, spelling, punctuation, and overall writing quality. Prior to implementation, all assessment instruments underwent expert validation to ensure

their content validity and suitability for elementary students. Teacher and student response questionnaires were administered following implementation to examine the practicality, attractiveness, ease of use, and instructional value of the application. Data collection was conducted sequentially throughout the research process. Expert validation was completed before classroom implementation, whereas students completed pretests before participating in the learning activities and posttests immediately after completing the instructional intervention. Teacher and student questionnaires were subsequently administered to obtain participants' perceptions regarding their learning experiences using the developed digital application.

Data Analysis

The collected data were analyzed using both descriptive and inferential statistical techniques to evaluate the feasibility and effectiveness of the developed application. Expert validation scores and questionnaire responses were analyzed descriptively by converting the obtained scores into percentages and interpreting them according to predetermined feasibility criteria. Prior to hypothesis testing, the distribution of pretest and posttest scores was examined using the Shapiro-Wilk normality test to determine whether the data satisfied the assumption of normality. Data that met the normality assumption were analyzed using the paired-samples t-test to determine significant differences between students' pretest and posttest scores. Conversely, datasets that did not satisfy the normality assumption were analyzed using the Wilcoxon signed-rank test, a non-parametric alternative suitable for paired observations. Statistical significance was established at the 0.05 significance level. To evaluate the magnitude of students' learning improvement, the normalized gain (N-Gain) was calculated by comparing pretest and posttest scores for both reading comprehension and narrative writing. The resulting N-Gain values were subsequently classified into low, moderate, and high improvement categories according to established interpretation criteria. Combining descriptive statistics, significance testing, and learning gain analysis enabled a comprehensive evaluation of the instructional effectiveness of the developed application. This analytical procedure ensured that the interpretation of the findings was supported by appropriate statistical evidence and reflected both statistical significance and practical learning improvement.

Research Procedure

The research procedure followed the five phases of the ADDIE instructional design model in a systematic and iterative manner. During the Analysis phase, the researchers identified students' literacy problems through classroom observations, curriculum analysis, teacher interviews, and an examination of students' reading comprehension and narrative writing performance. The Design phase involved determining learning objectives, designing the application interface, selecting Priangan folktales, preparing multimedia components, developing learning activities based on the SQ4R strategy, and constructing assessment instruments. In the Development phase, the interactive digital learning application was produced and subsequently validated by experts in instructional materials, language, and educational media before revisions were made according to the validators' recommendations. The Implementation phase began with a limited field trial in one elementary school to obtain initial feedback regarding the application's usability and instructional quality. Following revisions, broader implementation was conducted in four additional elementary schools over four learning sessions using the completed application. Students completed pretests before the intervention and posttests after the completion of all learning activities, while teachers and students also completed evaluation questionnaires regarding the application. Finally, during the Evaluation phase, quantitative and qualitative findings from expert validation, learning achievement tests, and response questionnaires were integrated to determine the overall feasibility, effectiveness, strengths, and limitations of the developed application. The findings obtained from each

development phase were used to produce a refined digital learning application capable of supporting integrated literacy learning in elementary education. This systematic procedure ensured that product development, implementation, and evaluation were conducted in accordance with established Design and Development research principles.

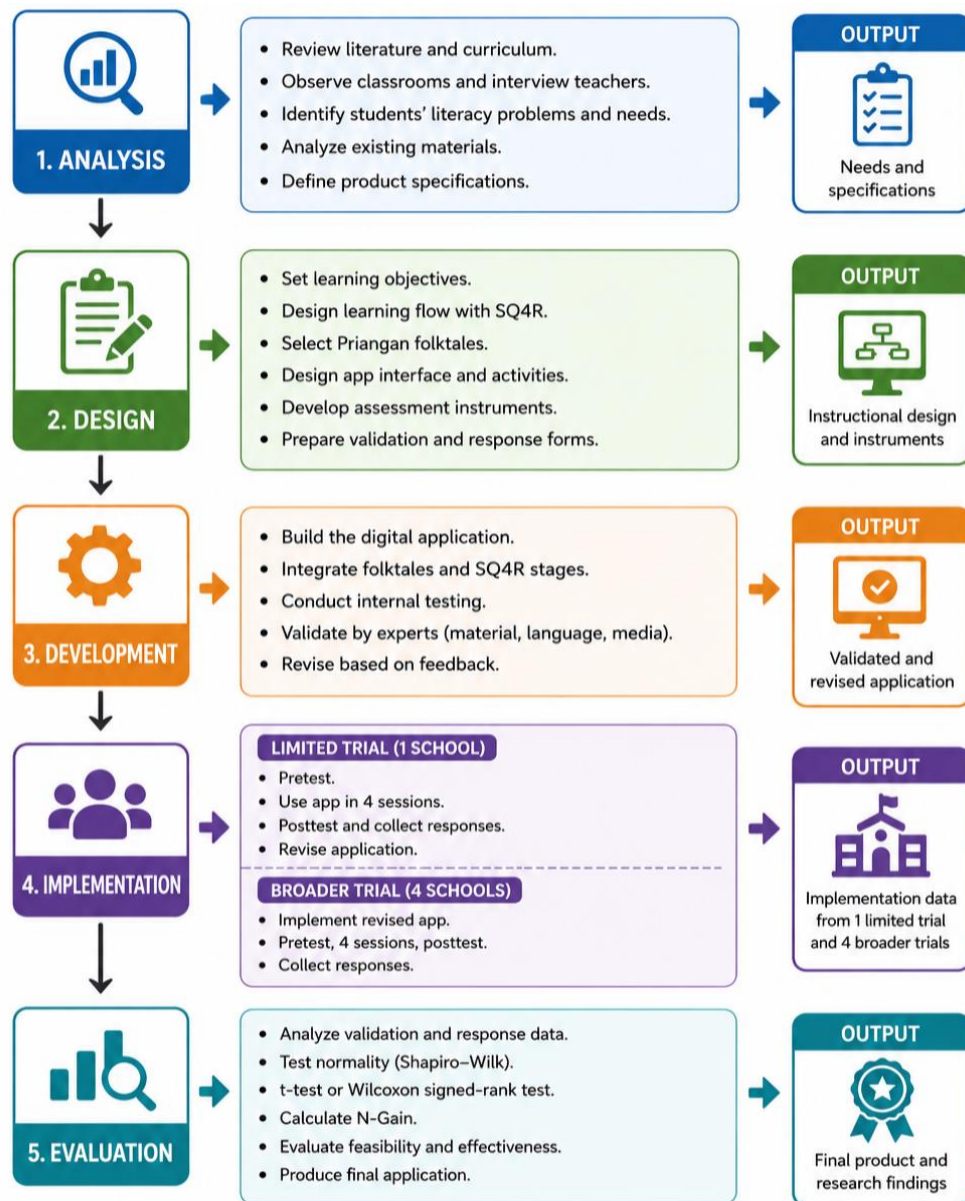


Figure 1. Research Method Flow

RESULTS AND DISCUSSION

Results

The Folktale Text application media was developed as digital learning media accessible through mobile devices and laptops. The application contains five main menus: Profile, Story, Quiz, My Work, and Medal. The Story menu presents illustrated Priangan folktales, while the Quiz menu contains comprehension questions that continue to Pre-writing Practice and Writing Practice. Students' writing is automatically saved in the My Work menu, and the Medal menu provides rewards as a game element. The whole flow follows the SQ4R stages so that reading and writing take place in an integrated manner. The validation results showed that the media was in the very feasible category.

The material expert assessment obtained a mean percentage of 92.5%, the language expert 82.5%, and the media expert 80.4%. Revisions based on the validators' suggestions improved the quality of the media, especially in the relevance of the story content to students' lives and the suitability of the illustrations to the story. The analysis of pretest and posttest scores showed consistent improvement in reading comprehension across all schools. The mean pretest scores ranged from 57.20 to 61.57, and the mean posttest scores increased to the range of 80.00 to 83.00. The mean reading comprehension N-Gain ranged from 0.51 to 0.55, all in the medium category. All difference tests were significant below 0.05. The recapitulation is presented in Table 1.

Table 1. Recapitulation of Reading Comprehension Results

School	Mean Pretest	Mean Posttest	N-Gain	Category	Test
School A	59.00	83.00	0.55	Medium	Wilcoxon
School B	60.80	80.00	0.51	Medium	Wilcoxon
School C	58.00	81.09	0.53	Medium	Wilcoxon
School D	57.20	80.60	0.51	Medium	t-test
School E	61.57	81.57	0.51	Medium	Wilcoxon

Note: t-test = Paired Sample t-test; all improvements are significant at the 5% level ($p < 0.001$).

Narrative writing skills also showed consistent improvement. The mean pretest scores ranged from 58.13 to 61.72, and the mean posttest scores increased to the range of 77.66 to 82.03. The mean narrative writing N-Gain ranged from 0.48 to 0.55, all in the medium category. School D obtained the lowest writing N-Gain of 0.48, related to the relatively wide spread of students' initial ability. The recapitulation is presented in Table 2, and the comparison of mean pretest and posttest scores for both skills is shown in Figure 1.

Table 2. Recapitulation of Narrative Writing Results

School	Mean Pretest	Mean Posttest	N-Gain	Category	Test
School A	58.15	81.25	0.52	Medium	Wilcoxon
School B	61.72	82.03	0.52	Medium	Wilcoxon
School C	59.22	80.11	0.52	Medium	Wilcoxon
School D	58.13	77.66	0.48	Medium	t-test
School E	60.38	81.70	0.55	Medium	Wilcoxon

Note: t-test = Paired Sample t-test; all improvements are significant at the 5% level ($p < 0.001$).

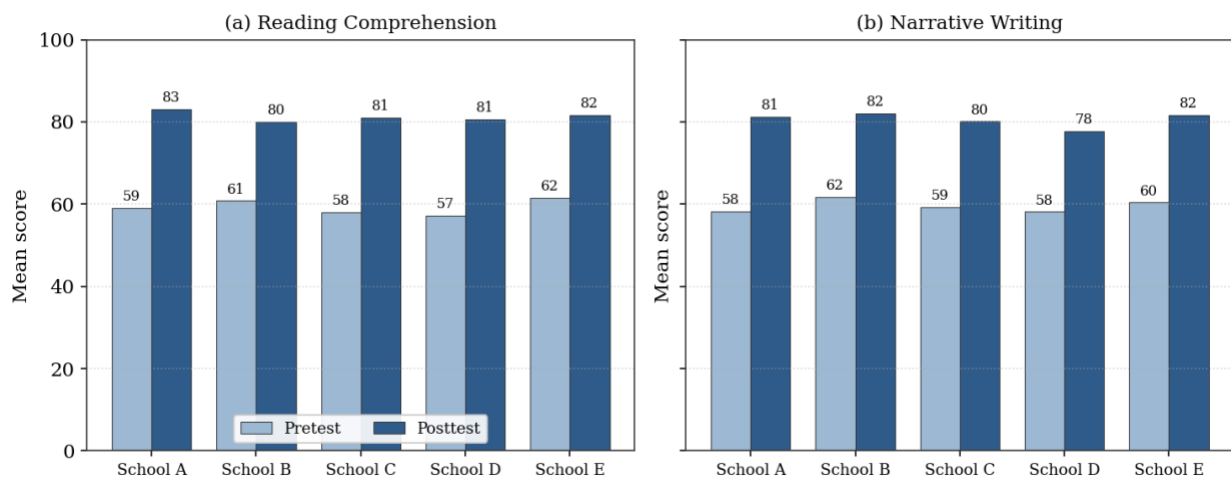


Figure 2. Comparison of Mean Pretest and Posttest Scores of Reading Comprehension and Narrative Writing

All ten difference tests, namely reading comprehension and narrative writing in five schools, produced significant improvement without exception. The mean N-Gain of both skills for each school is shown in Figure 2. Teacher responses to the media increased from 81.43% in the limited trial to 96.07% in the broader trial, both in the very feasible category. Student responses were also very good, at 94.48% in the limited trial and 96.67% in the broader trial.

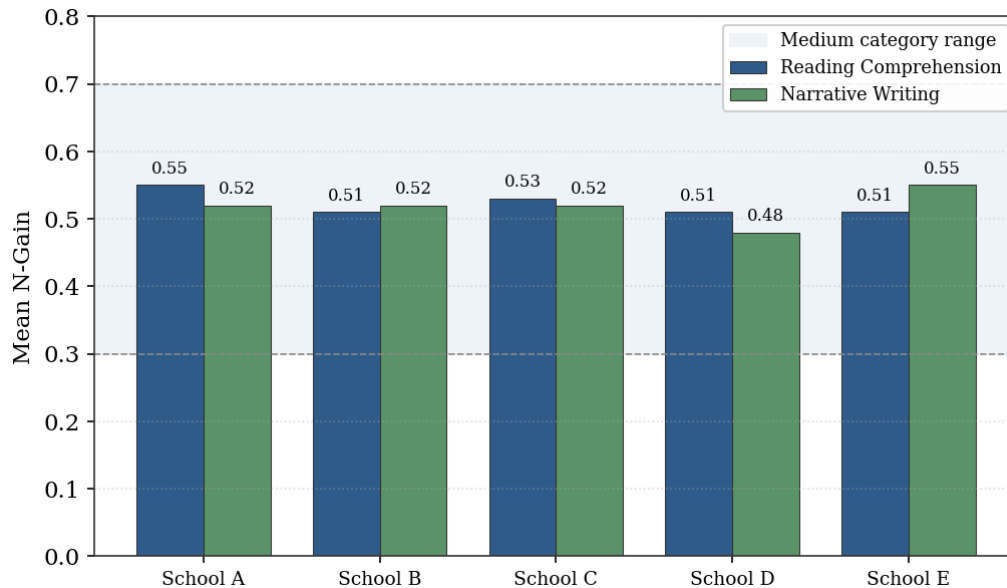


Figure 3. Mean N-Gain of Reading Comprehension and Narrative Writing per School

Discussion

The attainment of the very feasible category in the expert validation indicates that the developed application possesses a high level of instructional quality as a multimedia learning resource. Improvements made following expert recommendations, particularly regarding the contextual relevance of the folktale content and the suitability of the illustrations, demonstrate the iterative refinement process that characterizes the ADDIE instructional design model. Such revisions contributed to improving both the pedagogical quality and the usability of the application before classroom implementation. Meaningful learning is facilitated when verbal and visual information are presented in an integrated manner, allowing learners to process information through complementary cognitive channels (Mayer, 2024; Staneviciene & Žekienė, 2025). The integration of folktale texts with supporting illustrations within the application therefore facilitates the construction of meaningful mental representations before and during reading activities.

The consistent improvement in reading comprehension across all participating schools demonstrates that the developed application effectively supports students' active construction of meaning during literacy learning. Reading comprehension is widely recognized as a process in which new textual information is interpreted through learners' existing knowledge and prior experiences. The use of culturally relevant Priangan folktales provides meaningful contexts that activate students' background knowledge and strengthen their interpretation of the reading materials. Furthermore, the sequential implementation of the SQ4R strategy systematically guides learners from activating prior knowledge to organizing and reviewing newly acquired information (Bulut & Yıldız, 2024; İncirkuş & Beyreli, 2020). Active cognitive engagement throughout the reading process is promoted by requiring students to question, summarize, record, and review important ideas rather than reading passively (Le & Nguyen, 2024). The interactive quiz activities incorporated into the application reinforce these learning processes by encouraging students to verify and consolidate

their understanding continuously. Consequently, the observed improvement in reading comprehension reflects the combined contribution of structured instructional guidance, meaningful learning activities, and interactive digital support. Similar improvements in students' reading comprehension have also been reported in previous studies investigating the implementation of the SQ4R strategy.

The improvement in narrative writing can be attributed to the instructional design that systematically guides students from reading activities toward independent text production. The folktales presented within the application function as authentic narrative models that demonstrate effective story structure, coherence, and language organization. Exposure to high-quality narrative texts provides learners with examples of vocabulary usage, narrative sequencing, and discourse organization that can subsequently be transferred into their own writing. The inclusion of structured pre-writing activities enables students to organize ideas before composing complete narrative texts, thereby facilitating more coherent written expression. Structured instructional support provided throughout the learning process gradually assists students in developing independent writing competence through successive stages of guidance. The transition from reading, to guided pre-writing, and finally to independent writing reflects the implementation of scaffolded literacy instruction that supports progressive skill development. Reading and writing are recognized as mutually reinforcing literacy processes, making their integration within a single digital learning environment particularly beneficial for literacy development. Furthermore, the My Work feature increases students' motivation by allowing them to review, revise, and monitor the progress of their own written work over time. These integrated learning activities therefore contribute not only to writing quality but also to students' confidence and engagement throughout the writing process.

The slightly lower narrative writing N-Gain observed in School D deserves further consideration. The relatively wide variation in students' initial abilities indicates that learners with lower baseline performance required additional instructional support and a longer adaptation period before demonstrating substantial improvement. The four instructional meetings implemented in this study may have been insufficient for students with weaker literacy foundations to fully develop their narrative writing competence. Nevertheless, the obtained N-Gain remained within the moderate category, and statistically significant differences between pretest and posttest scores were consistently observed. These findings suggest that the developed application was capable of producing meaningful learning improvement despite the relatively short implementation period. Compared with interventions conducted over longer durations or under different instructional conditions, the moderate learning gains obtained in the present study represent realistic and educationally meaningful outcomes for short-term classroom implementation.

The consistency of positive learning outcomes across five elementary schools represents one of the most significant findings of the present study. Significant improvements were observed in both reading comprehension and narrative writing across all participating schools, indicating that the application functioned effectively under different classroom conditions (Capodieci et al., 2020; Gillam et al., 2023; Hsieh & Huang, 2020; Kim, Burkhauser, et al., 2021; Proctor et al., 2020). Student engagement was further strengthened through gamification elements, including the Medal feature and tiered quiz activities, which maintained students' motivation throughout the learning process. In addition, the integration of culturally relevant Priangan folktales enhanced students' sense of familiarity and ownership toward the learning materials, thereby facilitating more meaningful literacy experiences. The combination of interactive digital learning, culturally responsive content, structured SQ4R instruction, and integrated reading-to-writing activities appears to provide a more comprehensive instructional approach than teaching these literacy components separately. Therefore, the principal contribution of the developed application lies in its ability to integrate

multiple evidence-based instructional components within a single technology-enhanced learning environment capable of simultaneously improving reading comprehension and narrative writing among elementary school students.

Implications

The findings of this study provide important theoretical and practical implications for elementary literacy education by demonstrating that integrating culturally responsive learning content, structured reading strategies, and interactive digital technology can effectively improve reading comprehension and narrative writing simultaneously. The developed application illustrates that literacy learning becomes more meaningful when reading and writing are designed as interconnected processes rather than separate instructional activities. The integration of Priangan folktales within the digital learning environment also highlights the educational value of local cultural resources in promoting contextual and engaging literacy experiences for young learners. From a pedagogical perspective, the incorporation of the SQ4R strategy offers a systematic framework that actively guides students through the processes of exploring, understanding, organizing, and reconstructing textual information before producing written narratives. The multimedia features embedded in the application further demonstrate that combining textual, visual, and interactive elements can increase students' engagement and facilitate deeper cognitive processing during literacy learning. For classroom teachers, the application provides an alternative instructional resource that supports student-centered learning while reducing reliance on conventional teacher-dominated approaches. For curriculum developers, the findings suggest that integrating local cultural content with evidence-based literacy strategies into digital learning resources can strengthen both literacy achievement and cultural appreciation among elementary school students. The positive responses from teachers and students further indicate that interactive digital applications have strong potential to enhance learning motivation, classroom participation, and the overall quality of literacy instruction. The consistency of learning improvements across five schools also suggests that the developed application can be implemented in diverse elementary classroom settings with different student characteristics. Furthermore, this study contributes to the growing body of research on technology-enhanced literacy education by demonstrating the instructional benefits of combining digital learning, culturally relevant materials, and structured reading-to-writing instruction within a single learning platform. The proposed instructional model may therefore serve as a reference for future development of integrated digital literacy media that simultaneously supports multiple language competencies instead of addressing reading or writing in isolation. Ultimately, these findings reinforce the importance of designing comprehensive digital learning environments that integrate pedagogy, technology, and local culture to foster meaningful, sustainable, and contextually relevant literacy development in elementary education.

Limitations and Suggestions for Future Research

This study has several limitations that should be considered when interpreting the findings and planning future investigations. First, the implementation period was limited to four instructional meetings, which may not have provided sufficient time for students, particularly those with lower initial literacy abilities, to fully develop their reading comprehension and narrative writing skills. Second, the study involved fourth-grade students from only five elementary schools in one regency, thereby limiting the generalizability of the findings to other educational contexts, regions, and student populations. Third, the cultural content incorporated into the application was

restricted to Priangan folktales, which may reduce its applicability in areas with different cultural backgrounds and local traditions. Fourth, the effectiveness evaluation focused primarily on reading comprehension and narrative writing, while other important literacy outcomes, such as critical reading, creative writing, digital literacy, vocabulary development, and reading motivation, were not examined. In addition, the study evaluated students' learning outcomes immediately after the intervention and therefore did not investigate the long-term retention or sustainability of the acquired literacy skills. Future research is recommended to implement the application over a longer instructional period to determine its sustained impact on students' literacy development. Further studies should also involve more diverse participants from different geographical regions, grade levels, and school characteristics to improve the external validity of the findings. Expanding the application by incorporating folktales from various cultural regions would enable broader implementation while strengthening multicultural literacy and cultural awareness among elementary students. Moreover, future versions of the application should integrate more higher-order thinking activities, adaptive learning features, and AI-supported formative feedback to further enrich students' literacy learning experiences. Researchers are also encouraged to investigate the effectiveness of the application using experimental or longitudinal research designs and to compare its performance with other technology-enhanced literacy interventions. Ultimately, continued refinement and broader empirical evaluation of this integrated digital learning application will contribute to the development of more effective, culturally responsive, and sustainable literacy learning models for elementary education.

CONCLUSION

This study successfully developed an interactive folktale-based digital learning application integrating the SQ4R strategy to support elementary students' literacy learning through the ADDIE instructional design model. The findings demonstrate that the developed application achieved a very feasible level of quality based on comprehensive evaluations conducted by material, language, and media experts, indicating that it satisfies pedagogical, linguistic, and technological standards for classroom implementation. The application also proved effective in improving fourth-grade students' reading comprehension, as evidenced by consistent medium-category N-Gain scores and statistically significant improvements across all participating schools. Similarly, students' narrative writing skills improved significantly following the implementation of the application, demonstrating that integrating reading and writing within a single digital learning environment can strengthen productive literacy development. Positive responses from both teachers and students further indicate that the application is practical, engaging, and easy to use within authentic elementary classroom settings. The integration of culturally relevant Priangan folktales with the structured SQ4R strategy enabled students to engage more actively in constructing meaning from texts before transforming their understanding into coherent written narratives. The inclusion of multimedia features and interactive learning activities further supported students' motivation, participation, and meaningful engagement throughout the literacy learning process. The consistency of positive learning outcomes across five elementary schools with different classroom characteristics suggests that the developed application possesses considerable potential for broader implementation in elementary literacy education. These findings also reinforce the importance of combining evidence-based instructional strategies, culturally

responsive learning materials, and educational technology to create integrated literacy learning environments that simultaneously support reading comprehension and narrative writing. Beyond improving students' literacy achievement, the developed application contributes an innovative instructional model that connects reading, comprehension, pre-writing, and writing within a coherent and technology-enhanced learning framework. The study therefore provides empirical evidence that culturally responsive digital learning applications can serve as effective instructional resources for strengthening elementary literacy education while promoting meaningful and contextual learning experiences. Overall, this research contributes to the growing field of technology-enhanced literacy education by demonstrating that the integration of digital pedagogy, local cultural resources, and structured literacy instruction offers a promising direction for improving the quality and sustainability of literacy learning in elementary schools.

AUTHOR CONTRIBUTIONS STATEMENT

N. Yuniar Rizki Siti Amalia contributed to the conceptualization of the study, research design, application development, instrument development, data collection, data analysis, interpretation of the findings, and manuscript preparation. Angga Hadiapurwa contributed to the research supervision, methodological guidance, validation of the instructional design, interpretation of the results, and critical revision of the manuscript. Rina Heryani contributed to the theoretical framework development, validation of the research instruments, evaluation of the developed learning media, interpretation of the findings, and manuscript review. All authors read, revised, and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

REFERENCES

- Abdulrahman, M. D., Faruk, N., Oloyede, A. A., Surajudeen-Bakinde, N. T., Olawoyin, L. A., Mejabi, O. V., Imam-Fulani, Y. O., Fahm, A. O., & Azeez, A. L. (2020). Multimedia tools in the teaching and learning processes: A systematic review. *Heliyon*, 6(11). <https://doi.org/10.1016/j.heliyon.2020.e05312>
- Afrilyasanti, R., Basthomi, Y., & Zen, E. L. (2025). Fostering creativity and critical literacy: Transforming EFL classes with engaging critical media literacy integration. *Asian Education and Development Studies*, 14(2), 133–151. <https://doi.org/10.1108/AEDS-06-2024-0124>
- Alanazi, A. A., Osman, K., & Halim, L. (2025). Development of technology-enhanced higher order thinking learning module based on scaffolding and guided discovery approaches. In M. E. Auer & D. May (Eds.), 2024 yearbook emerging technologies in learning (pp. 485–509). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-80388-8_26
- Ansoriyah, S., Attas, S. G., & Saiful. (2026). Weaving literacy and culture: Exploring the interconnected effects of folktale pedagogy on vocabulary depth, reading engagement, and cultural schema building. *ACTA INNOVATIONS*, 59, 132–142. <https://doi.org/10.62441/actainnovations.v59i.532>
- Anthonyamy, L., Koo, A. C., & Hew, S. H. (2020). Self-regulated learning strategies in higher education: Fostering digital literacy for sustainable lifelong learning. *Education and Information Technologies*, 25(4), 2393–2414. <https://doi.org/10.1007/s10639-020-10201-8>
- Anyichie, A. C., Butler, D. L., Perry, N. E., & Nashon, S. M. (2023). Examining classroom contexts in support of culturally diverse learners' engagement: An integration of self-regulated learning and culturally responsive pedagogical practices. *Frontline Learning Research*, 11(1), 1–39. <https://doi.org/10.14786/flr.v11i1.1115>
- Aslan Altan, B. (2022). Students' behavior of asking questions through narrative and informative texts. *Journal of Education*, 202(3), 320–329. <https://doi.org/10.1177/00220574211043054>

- Audrin, C., & Audrin, B. (2022). Key factors in digital literacy in learning and education: A systematic literature review using text mining. *Education and Information Technologies*, 27(6), 7395–7419. <https://doi.org/10.1007/s10639-021-10832-5>
- Beltrán-Palances, V. (2024). Assessing video game narratives: Implications for the assessment of multimodal literacy in ESP. *Assessing Writing*, 60, 100809. <https://doi.org/10.1016/j.asw.2024.100809>
- Berlian, Z., & Huda, M. (2022). Reflecting culturally responsive and communicative teaching (CRCT) through partnership commitment. *Education Sciences*, 12(5). <https://doi.org/10.3390/educsci12050295>
- Bulut, A. (2025). Reading technologies from a temporal perspective: Evolution, adaptation and future vision. *European Journal of Education*, 60(4), e70319. <https://doi.org/10.1111/ejed.70319>
- Bulut, A., & Yildiz, M. (2024). The impact of computer-assisted and direct strategy teaching on reading comprehension. *Journal of Computer Assisted Learning*, 40(6), 3369–3389. <https://doi.org/10.1111/jcal.13068>
- Capodieci, A., Cornoldi, C., Doerr, E., Bertolo, L., & Carretti, B. (2020). The use of new technologies for improving reading comprehension. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.00751>
- Castells, N., Minguela, M., & Nadal, E. (2023). Writing a synthesis versus reading: Strategies involved and impact on comprehension. *Reading and Writing*, 36(4), 849–880. <https://doi.org/10.1007/s11145-022-10341-y>
- Cavanagh, T. M., & Kiersch, C. (2023). Using commonly available technologies to create online multimedia lessons through the application of the cognitive theory of multimedia learning. *Educational Technology Research and Development*, 71(3), 1033–1053. <https://doi.org/10.1007/s11423-022-10181-1>
- Damaianti, V. S., Abidin, Y., & Rahma, R. (2020). Higher order thinking skills-based reading literacy assessment instrument: An Indonesian context. *Indonesian Journal of Applied Linguistics*, 10(2), 513–525. <https://doi.org/10.17509/ijal.v10i2.28600>
- Desai, T. S., & Kulkarni, D. C. (2022). Assessment of interactive video to enhance learning experience: A case study. *Journal of Engineering Education Transformations*, 74–80. <https://doi.org/10.16920/jeet/2022/v35i0/167891>
- Din Eak, A., & Annamalai, N. (2025). Enhancing ESL learners' narrative writing proficiency: The role of multimodal online feedback. *Language Teaching Research*. <https://doi.org/10.1177/13621688251374430>
- Duke, N. K., Ward, A. E., & Pearson, P. D. (2021). The science of reading comprehension instruction. *The Reading Teacher*, 74(6), 663–672. <https://doi.org/10.1002/trtr.1993>
- Fadzil, N. M., Osman, S., Ahmad, J., Jambari, H., & Husain, S. K. S. (2025). Enhancing students' problem-solving skills in algebra word problems: A systematic review of TAPPS and storyboarding strategies. *International Electronic Journal of Mathematics Education*, 20(4), em0850. <https://doi.org/10.29333/iejme/16835>
- Fu, X., & Relyea, J. E. (2024). Exploring the role of mind mapping tools in scaffolding narrative writing in English for middle-school EFL students. *Education Sciences*, 14(10). <https://doi.org/10.3390/educsci14101119>
- Gillam, S. L., Vaughn, S., Roberts, G., Capin, P., Fall, A.-M., Israelsen-Augenstein, M., Holbrook, S., Wada, R., Hancock, A., Fox, C., Dille, J., Magimairaj, B. M., & Gillam, R. B. (2023). Improving oral and written narration and reading comprehension of children at risk for language and literacy difficulties: Results of a randomized clinical trial. *Journal of Educational Psychology*, 115(1), 99–117. <https://doi.org/10.1037/edu0000766>
- Girwidz, R., & Kohnle, A. (2021). Multimedia and digital media in physics instruction. In H. E. Fischer & R. Girwidz (Eds.), *Physics education* (pp. 297–336). Springer International Publishing. https://doi.org/10.1007/978-3-030-87391-2_11
- Hall, C., Vaughn, S., Barnes, M. A., Stewart, A. A., Austin, C. R., & Roberts, G. (2020). The effects of inference instruction on the reading comprehension of English learners with reading comprehension difficulties. *Remedial and Special Education*, 41(5), 259–270. <https://doi.org/10.1177/0741932518824983>

- Hsieh, Y., & Huang, S. (2020). Using an e-book in the secondary English classroom: Effects on EFL reading and listening. *Education and Information Technologies*, 25(2), 1285–1301. <https://doi.org/10.1007/s10639-019-10036-y>
- İncirkuş, F. A., & Beyreli, L. (2020). Effect of metacognitive reading strategies on critical thinking: A mixed methods research. *Education and Science*, 45(202), 173–190. <https://doi.org/10.15390/EB.2020.7857>
- Janebi Enayat, M. (2025). Computationally derived linguistic features of L2 narrative essays and their relations to human-judged writing quality. *Language Testing in Asia*, 15(1), 35. <https://doi.org/10.1186/s40468-025-00374-9>
- Jouhar, M. R., & Rupley, W. H. (2021). The reading–writing connection based on independent reading and writing: A systematic review. *Reading & Writing Quarterly*, 37(2), 136–156. <https://doi.org/10.1080/10573569.2020.1740632>
- Kim, J. S., Burkhauser, M. A., Mesite, L. M., Asher, C. A., Relyea, J. E., Fitzgerald, J., & Elmore, J. (2021). Improving reading comprehension, science domain knowledge, and reading engagement through a first-grade content literacy intervention. *Journal of Educational Psychology*, 113(1), 3–26. <https://doi.org/10.1037/edu0000465>
- Kim, J. S., Relyea, J. E., Burkhauser, M. A., Scherer, E., & Rich, P. (2021). Improving elementary grade students' science and social studies vocabulary knowledge depth, reading comprehension, and argumentative writing: A conceptual replication. *Educational Psychology Review*, 33(4), 1935–1964. <https://doi.org/10.1007/s10648-021-09609-6>
- Le, H. V., & Nguyen, L. Q. (2024). Promoting L2 learners' critical thinking skills: The role of social constructivism in reading class. *Frontiers in Education*, 9. <https://doi.org/10.3389/feduc.2024.1241973>
- Lewis, D. R., III, & Lewis, T. Y. (2021). A multimodal approach to higher order literacy development of low-level EFL university students in Japan. *Innovation in Language Learning and Teaching*, 15(4), 364–383. <https://doi.org/10.1080/17501229.2020.1813736>
- Liang, C., Toyokawa, Y., & Ogata, H. (2025). Optimizing group formation with a mixed genetic algorithm: An empirical study in active reading using marker data. *International Journal of Computer-Supported Collaborative Learning*, 20(4), 519–548. <https://doi.org/10.1007/s11412-025-09452-9>
- List, A., & Sun, Y. (2023). To clarity and beyond: Situating higher-order, critical, and critical-analytic thinking in the literature on learning from multiple texts. *Educational Psychology Review*, 35(2), 40. <https://doi.org/10.1007/s10648-023-09756-y>
- MacArthur, C. A., Traga Philippakos, Z. A., May, H., Potter, A., Van Horne, S., & Compello, J. (2023). The challenges of writing from sources in college developmental courses: Self-regulated strategy instruction. *Journal of Educational Psychology*, 115(5), 715–731. <https://doi.org/10.1037/edu0000805>
- Machimana, P. N. N., & Genis, G. (2025). Language learners as co-creators of knowledge through constructivist peer tutoring interaction. *South African Journal of Education*, 45(2), 1–10. <https://doi.org/10.15700/saje.v45n2a2437>
- Mayer, R. E. (2024). The past, present, and future of the cognitive theory of multimedia learning. *Educational Psychology Review*, 36(1). <https://doi.org/10.1007/s10648-023-09842-1>
- Md Sabri, S., Ismail, I., Annuar, N., Abdul Rahman, N. R., Abd Hamid, N. Z., & Abd Mutalib, H. (2024). A conceptual analysis of technology integration in classroom instruction towards enhancing student engagement and learning outcomes. *International Journal of Education, Psychology and Counseling*, 9(55), 750–769. <https://doi.org/10.35631/IJEPC.955051>
- Nguyen, T.-H., Hwang, W.-Y., Pham, X.-L., & Pham, T. (2022). Self-experienced storytelling in an authentic context to facilitate EFL writing. *Computer Assisted Language Learning*, 35(4), 666–695. <https://doi.org/10.1080/09588221.2020.1744665>
- Nouwens, S., Groen, M. A., Kleemans, T., & Verhoeven, L. (2021). How executive functions contribute to reading comprehension. *British Journal of Educational Psychology*, 91(1), e12355. <https://doi.org/10.1111/bjep.12355>

- Paige, D., Rupley, W. H., & Ziglari, L. (2024). Critical thinking in reading comprehension: Fine tuning the simple view of reading. *Education Sciences*, 14(3). <https://doi.org/10.3390/educsci14030225>
- Proctor, C. P., Silverman, R. D., Harring, J. R., Jones, R. L., & Hartranft, A. M. (2020). Teaching bilingual learners: Effects of a language-based reading intervention on academic language and reading comprehension in grades 4 and 5. *Reading Research Quarterly*, 55(1), 95–122. <https://doi.org/10.1002/rrq.258>
- Rice, M., & Wijekumar, K. (Kay). (2024). Inference skills for reading: A meta-analysis of instructional practices. *Journal of Educational Psychology*, 116(4), 569–589. <https://doi.org/10.1037/edu0000855>
- Roomy, A. A., & Muhammad. (2022). Investigating the effects of critical reading skills on students' reading comprehension (SSRN Scholarly Paper No. 4085855). Social Science Research Network. <https://doi.org/10.2139/ssrn.4085855>
- Sarmiento-Campos, N.-V., Lázaro-Guillermo, J. C., Silvera-Alarcón, E.-N., Cuellar-Quispe, S., Huamán-Román, Y.-L., Apaza, O. A., & Sorkheh, A. (2022). A look at Vygotsky's sociocultural theory (SCT): The effectiveness of scaffolding method on EFL learners' speaking achievement. *Education Research International*, 2022(1), 3514892. <https://doi.org/10.1155/2022/3514892>
- Segundo Marcos, R. I., López Fernández, V., Daza González, M. T., & Phillips-Silver, J. (2020). Promoting children's creative thinking through reading and writing in a cooperative learning classroom. *Thinking Skills and Creativity*, 36, 100663. <https://doi.org/10.1016/j.tsc.2020.100663>
- Shih, Y.-H. (2024). Culturally responsive curriculum: A systematic overview. *Edelweiss Applied Science and Technology*, 8, 6917–6925. <https://doi.org/10.55214/25768484.v8i6.3493>
- Skulmowski, A., & Xu, K. M. (2022). Understanding cognitive load in digital and online learning: A new perspective on extraneous cognitive load. *Educational Psychology Review*, 34(1), 171–196. <https://doi.org/10.1007/s10648-021-09624-7>
- Smith, R., Snow, P., Serry, T., & Hammond, L. (2021). The role of background knowledge in reading comprehension: A critical review. *Reading Psychology*, 42(3), 214–240. <https://doi.org/10.1080/02702711.2021.1888348>
- Songsirisak, P., Jitpranee, J., Saejao, Y., & Singsutin, N. (2024). Ethnic folktale-based materials development for secondary students' learning. *Humanities, Arts and Social Sciences Studies*, 132–144. <https://doi.org/10.69598/hasss.24.1.263505>
- Staneviciene, E., & Žekienė, G. (2025). The use of multimedia in the teaching and learning process of higher education: A systematic review. *Sustainability*, 17(19). <https://doi.org/10.3390/su17198859>
- Stanton, J. D., Sebesta, A. J., & Dunlosky, J. (2021). Fostering metacognition to support student learning and performance. *CBE—Life Sciences Education*, 20(2), fe3. <https://doi.org/10.1187/cbe.20-12-0289>
- Taye, T., & Teshome, G. (2025). The impact of extensive reading on academic writing proficiency in EFL undergraduate students. *Discover Education*, 4(1), 264. <https://doi.org/10.1007/s44217-025-00679-0>
- Taylor, S. V., & Leung, C. B. (2020). Multimodal literacy and social interaction: Young children's literacy learning. *Early Childhood Education Journal*, 48(1), 1–10. <https://doi.org/10.1007/s10643-019-00974-0>
- Tian, Z., Zhang, K., Zhang, T., Dai, X., & Lin, J. (2020). Application of Ausubel cognitive assimilation theory in teaching/learning medical biochemistry and molecular biology. *Biochemistry and Molecular Biology Education*, 48(3), 202–219. <https://doi.org/10.1002/bmb.21327>
- Tinmaz, H., Lee, Y.-T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy. *Smart Learning Environments*, 9(1), 21. <https://doi.org/10.1186/s40561-022-00204-y>
- Toyokawa, Y., Majumdar, R., Kondo, T., Horikoshi, I., & Ogata, H. (2024). Active reading dashboard in a learning analytics enhanced language-learning environment: Effects on learning behavior and performance. *Journal of Computers in Education*, 11(2), 495–522. <https://doi.org/10.1007/s40692-023-00267-x>

- Vaknin-Nusbaum, V., & Nevo, E. (2026). Understanding the impact of changing text structure on reading comprehension among third and fourth graders: From informative to narrative structure. *Reading and Writing*. <https://doi.org/10.1007/s11145-026-10791-8>
- Vandermeulen, N., Van Steendam, E., & Rijlaarsdam, G. (2023). Introduction to the special issue on synthesis tasks: Where reading and writing meet. *Reading and Writing*, 36(4), 747–768. <https://doi.org/10.1007/s11145-022-10394-z>
- Wong, J. T., & Hughes, B. S. (2023). Leveraging learning experience design: Digital media approaches to influence motivational traits that support student learning behaviors in undergraduate online courses. *Journal of Computing in Higher Education*, 35(3), 595–632. <https://doi.org/10.1007/s12528-022-09342-1>
- Wyse, D., & Hacking, C. (2024). Decoding, reading and writing: The double helix theory of teaching. *Literacy*, 58(3), 256–266. <https://doi.org/10.1111/lit.12367>
- Yow, H. Y. (2022). A case study of virtual anatomy museum: Facilitating student engagement and self-paced learning through an interactive platform. *International Journal of Information and Education Technology*, 12, 1345–1353. <https://doi.org/10.18178/ijiet.2022.12.12.1758>