Enhancing reading comprehension in Grade 5 students using the Kiddie ReCom app

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ABSTRACT

Reading comprehension is vital for understanding text through word recognition, context understanding, and inference-making. According to the recent data from the Programme for International Student Assessment (PISA) in 2022, the Philippines landed in the bottom 10 out of 81 countries in reading comprehension. Due to the current issue the country is facing, the Kiddie ReCom website app was created to elevate students' reading comprehension across three distinct levels: literal, inferential, and evaluative. The application also includes a computer-based assessment component featuring contextualized stories crafted to capture students' interest, as well as definition and translation tools to enhance vocabulary and understanding. This study aimed to investigate the efficacy of the Kiddie ReCom website application in improving the reading comprehension of Grade 5 students of Apokon Elementary School. Employing a quasi-experimental research design and purposive sampling in choosing 51 participants, the study is a single-case investigation devoid of a control group. Results indicated a significant difference between pre-test and posttest scores, affirming the effectiveness of the Kiddie ReCom website application in enhancing the reading comprehension abilities of Grade 5 students. Moreover, this interactive website application fosters reading comprehension and cultivates computer literacy and vocabulary skills. Recommendations for future research include refining and enhancing the application to provide students with a more engaging and interactive learning experience.

Keywords: Computer-based assessment, contextualized stories, Kiddie ReCom website application, reading comprehension, quasi-experimental design

INTRODUCTION

Reading comprehension requires a thorough cognitive process. This entails readers recognizing and interpreting the content of written material with a profound level of understanding (Kong, 2019; Zhang, 2019). Comprehension is a fundamental requirement, not solely for comprehending textual material but also for facilitating learning and engaging in various social endeavors (Oakhill, 2019). Over the past years, various studies have been conducted, and countless strategies have been developed and employed to enhance reading comprehension. Despite the multitude of studies undertaken and the implementation of various strategies, the issue of reading comprehension in English remains a persistent challenge confronting many educational institutions worldwide that warrants further exploration and investigation as to how it can be addressed (Torppa et al., 2019)

Thai students' English reading comprehension proficiency in Thailand has been deemed unsatisfactory, as the Organization for Economic Cooperation and Development (OECD) reported in 2019 (Oranpattanachai, 2023). Meanwhile, in the Cambodian context, the predominant challenges impeding English reading comprehension are rooted in insufficient language proficiency and motivation among students (Dara, 2019). Furthermore, in Indonesia, the most prominent barriers that hinder students' reading comprehension capabilities encompass a lack of motivation for reading, limited employment of effective reading strategies, inadequacies in background knowledge about the reading material, deficiencies in language proficiency, and shortcomings in executing an efficient and effective reading comprehension process (Sari et al., 2020). Additionally, many students from Grade 3 through Grade 5 struggle to read with comprehension as the text becomes more complex and background knowledge and linguistic skills become increasingly central to constructing a coherent representation of text. The challenges are even more significant for English learners (ELs) tasked with developing literacy skills while also developing English language proficiency (Cho et al., 2019)

In Vietnam, linguistic barriers, the absence of effective reading strategies, and psychological factors collectively contribute to the challenges encountered in reading comprehension (Nguyen and Kim, 2021). Moreover, Ha Le (2021) found that the predominant challenges confronting Vietnamese students in reading comprehension are the limitations in vocabulary and the absence of requisite background knowledge. Meanwhile, in Malaysia, insufficient knowledge of the proper reading process, reading difficulties, a dearth of effective reading strategies, background knowledge limitations, and deficiencies in language proficiency and motivation all contribute to the prevalent reading comprehension difficulties they encounter (Chandran and Shah, 2019). A study by Chua and Sulaiman (2021) also established that English reading comprehension problems among Malaysian primary year 4 ESL pupils are associated with deficiencies in word knowledge, content knowledge, motivation, reading strategies, and the reading process.

The recent data from the Programme for International Student Assessment (PISA) in 2022 showed that the Philippines landed in the bottom 10 out of 81 countries in reading comprehension (Bautista, 2023). This data is aligned with the study conducted by Ditona and Rico (2021) on the reading proficiency of Grade II pupils in the Eastern Schools of Botolan North and South District, Division of Zambales, particularly in terms of silent reading comprehension and listening comprehension, is at a frustration level.

Moreover, Paguyan and Taoc (2022) found that the Grade 3 pupils in Central Elementary School in Boston Davao Oriental exhibited a reading performance level categorized as a reader without comprehension. This assessment was based on data collected from Grade 3 advisers through their monthly reading reports Phil-IRI, a tool the Department of Education (DepEd) provided to track students' reading progress. Regarding the level of practice, the study revealed that background knowledge, teacher influence, reading fluency, and vocabulary knowledge were not firmly established among Grade 3 pupils, as indicated by a "sometimes" remark. This lack of establishment in these areas aligns with the observed deficiency in reading comprehension among the students.

The prevalent issues on reading comprehension imply the need for a thorough investigation to be addressed; this leads researchers, administrators, and educators to find solutions to address the issues of reading comprehension by incorporating technology-based tools in informing instructional practices and curriculum development. Computer-assisted language learning (CALL) and mobile-assisted language learning (MALL) were used in the study of Hassan Taj et al. (2017) to enhance English Foreign Language (EFL) reading comprehension. The study shows the effectiveness of the said technology in reading instruction. The technology works best when integrated into the instructional scheme. The finding of Keelor et al. (2020) highlights that the reading comprehension of students with text-to-speech (TTS) intervention was higher compared to students with no (TTS) condition.

In this study, a website application known as Kiddie ReCom was developed. It is an innovative technology-based learning tool that can help in addressing the issue of reading comprehension among students who struggle to comprehend the text. Through this study, the Kiddie ReCom was administered to evaluate the potential of this innovative solution in enhancing the reading comprehension of Grade 5 students.

METHODOLOGY

Research design

This study utilized a one-group pre-test-post-test design, a quasi-experimental research design that behavioral researchers most often use to determine the effect of an intervention on a given sample. The researchers decided to use a quasi-experimental design in which they dealt with the ideal for initial exploratory studies that seek to collect preliminary evidence on the effectiveness of an intervention before moving to more rigorous experimental methods. It facilitates quicker implementation and evaluation of interventions, which is especially useful in fast-paced or changing environments where timely results are essential. The use of a pretest establishes a baseline measurement, making it easier to attribute changes in the dependent variable to the intervention, even without a control group. Additionally, the one-group pre-test-post-test design is adaptable and flexible, allowing for interventions to be customized for a specific group or context. This design offers a practical and efficient way to evaluate interventions when more stringent experimental designs are not feasible. In this study, the chosen respondents were part of the experimental group, which received the same assessment for reading comprehension (a dependent variable) in the pre-test and post-test and the intervention of Kiddie Recom.

This research design uses a single group of participants receiving the same intervention and assessing the dependent variable. The impact of the intervention is determined by calculating the difference between the first assessment of the dependent variable (pre-test) and the second assessment of the dependent variable (post-test) (Cranmer, 2017).

When randomly assigning people to treatment and control groups is impractical or unethical, quasi-experimental methods are frequently chosen. Group assignment at random may raise ethical questions regarding excluding some participants from an intervention that may be useful, mainly if the intervention is beneficial. Researchers must carefully examine the rights and well-being of participants while making ethical decisions (Goodman and Thompson, 2017).

Pre-test and post-test measurements assist in controlling for progress effects, which are changes in participant outcomes that happen over time regardless of the intervention (Boruch and Turner, 2023). One can assign any changes one sees to the intervention instead of normal developmental processes by looking at outcomes within the same group.

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Instrument

Pre-test and Posttest questionnaire

Pre-test and posttest questionnaires were made by the researcher which were developed specifically for this study containing 1 paragraph contextualized story and 5 questions each comprehension level. To establish its validity, it undergone face and content validation among 3 experts in the field. It also underwent pilot testing to establish its reliability. The pre-test and posttest questionnaires were given to the students to assess their reading comprehension and were validated to be considered a reliable data collection tool. More than merely having a highly reliable instrument is required; additional validity measures are necessary to confirm the credibility of the research. In research, validity indicates how accurately a study addresses its question or supports its conclusions. Surveys or tests signify measurement accuracy, measuring the intended outcomes effectively. Validity is not inherent to the tool but depends on its use, context, and audience (Sullivan, 2011).

When creating assessments, it is essential to ensure validity; the test accurately measures what it is supposed to measure (Galaczi, 2020). Three expert panels validated pre-test and posttest questionnaires, and the validity type (content, construct, criterion, or face) was chosen based on study objectives. After establishing the validity of the questionnaire, pilot testing was carried out to ensure its reliability (Radhakrishna, 2007). Reliability means a test consistently gives the same result when taken multiple times in the same conditions (Shuttleworth and Wilson, 2019).

Before starting the intervention, students took a pre-test (N=51) to assess their reading comprehension abilities, and a posttest was done to see how multimedia learning improved their reading comprehension (Bin Abdul Samat and Abdul Aziz, 2020). The pre-test and posttest involved a sequential approach, where a dependent variable (knowledge or attitude) is assessed both before and after an intervention featuring an independent variable (training or information presentation session) (Stratton, 2019).

Kiddie ReCom website application

The application was created to enhance students' reading comprehension. It consists of different passages for the students to read and listen to, with translation features for every problematic word they encounter. Applying Mayer's Multimedia Learning Theory describes multiple simultaneous techniques in instructional message design, such as combining narration and visuals in a presentation (Ramlatchan, 2019). It is important to note that teachers and students can only use the website application if it is installed on their computer/laptop rather than on devices or tablets.

The Kiddie ReCom website application has unique features that other applications lack. Epic, a website application developed in 2013 by Suren Markosian and Kevin Donahue, has features similar to those of the Kiddie ReCom website application. Epic also contains books, stories, and quizzes and provides definitions and audio pronunciations for difficult words clicked by students. However, Kiddie ReCom offers a feature that Epic needs: translation. Kiddie ReCom provides definitions and pronunciations for difficult words and also offers Tagalog and Bisaya translations to help students improve their vocabulary and understand the story's context. Additionally, Kiddie ReCom includes a summary and moral lesson of the story translated into English and Tagalog. This allows learners to recall the story and understand its moral lesson without requiring the teacher to explain and review it.

Another website application with similar features to Kiddie ReCom is Raz-Kids. Raz-Kids also offers stories with visual presentations and quizzes/assessments, and it has a translation feature for entire stories into Spanish and French as well as a narration feature. However, unlike Kiddie ReCom, it does not provide definitions or translations for individual difficult words that students encounter. It also lacks a summary and moral lesson feature.

In summary, what makes the Kiddie ReCom website application unique compared to other apps is its definition and translation features, summary and moral lesson at the end of each story, contextualized

stories, and the use of natural human voice for audio with no AI involved.

Phil-IRI (Philippine Informal Reading Inventory)

The revised Phil-IRI assessment tool consists of graded passages administered to the entire class and individual students, designed for classroom use, measuring and describing students' reading performance (Llego, 2019). This tool was used to choose those students who identified as having independent level fluency and still having instructional-level comprehension based on their Phil-IRI results. Aside from that, the Phil-IRI also became the basis for creating contextualized stories, considering the simplicity and length of the story, which contained only 2–3 paragraphs.

Data collection

Before initiating data collection, informed consent was obtained from various stakeholders, including the Department of Education (DepEd), school administrators, and teachers. The respondents were fully informed about the study's purpose, their rights, and the confidentiality measures for their responses. To ensure the protection of participants' rights and the security of their data throughout the study, the following measures were implemented: Informed consent was obtained from the principal, adviser, and the parents of the chosen participants. Additionally, informed assent was sought from the participants themselves, ensuring they understood and agreed to participate in the study. The consent and assent processes clearly outlined the study's purpose, procedures, and benefits, ensuring that all parties were fully informed. It was emphasized that participation in the study is entirely voluntary, and both participants and their guardians were informed that they could withdraw from the study at any time without any penalty.

The data collected was limited to the participants' Phil-Iri results, their names, and their assessment outcomes, avoiding the collection of any additional personal information. This data was securely stored with strict access controls in place. Only authorized personnel were granted access

to the data, ensuring confidentiality and protection against unauthorized access or misuse. These measures were carefully designed to uphold ethical standards and protect the participants' rights and data integrity throughout the study.

Participants. The subjects of this study were Grade 5 students from one of the schools in Tagum City. This study employed a purposive sampling technique in choosing the subject for this study in which 51 students who were under the independent level in fluency but still at the instructional level in comprehension were chosen to be part of this study based on their Phil-IRI results. According to Hassan (2022) Purposive sampling is appropriate when researchers need to select participants with specific characteristics that are relevant to the research question. This sampling also allows researchers to select participants who are most relevant to their research question or objectives, ensuring that the data collected is of high quality and useful for the research.

Pilot testing and instrument refinement. To ensure the validity and reliability of the data collection instruments, the researchers employed a questionnaire, which underwent a validation process by three experts in the field of reading comprehension assessment, specifically in the literal, inferential, and evaluative levels of comprehension. In addition, a pilot testing phase was conducted. During this phase, 51 students from a similar demographic to the target respondents participated in a trial run of the pre-test, posttest, and intervention (Kiddie ReCom Website Application). Feedback from the pilot test respondents was gathered to identify any ambiguities, difficulties, or potential instrument improvements.

Pre-test administration. The research began with administering a pre-test to Grade 5 students at Apokon Elementary School. The pre-test consisted of various reading comprehension questions (Multiple Choice Questions) designed to assess students' understanding at different levels (literal, inferential, and evaluative). Respondents completed the pre-test individually under the supervision of the researchers.

Intervention: Kiddie ReCom app introduction.

Following the pre-test, the researchers introduced the Kiddie ReCom website application to the respondents. Students could interact with the application on laptops or computers provided in the computer lab (with 51 available). The researchers first provided a guided orientation to ensure familiarity with the app. This included demonstrating how to log in, selecting appropriate reading materials based on student needs, and navigating the different exercises (multiple choice, identification, fill-in-the-blanks, and true or false). After this initial introduction, students could independently explore and interact with the Kiddie ReCom app at their own pace.

Post-test administration. After interacting with the Kiddie ReCom website application for a designated period, the students were administered a posttest. Like the pre-test, the posttest consisted of reading comprehension questions 35 (Multiple Choice Questions) at different levels (literal, inferential, and evaluative). This allowed for comparing students' reading comprehension skills before and after using the app.

Data analysis

To interpret the result of the Grade 5 students' reading comprehension, the following table was used:

Table 1. Table of interpretation.

Parameter limits	Descriptive equivalent	Interpretation
4.20-5.00	Very high	This means that the student's reading comprehension is excellent.
3.40-4.19	High	This means that the student's reading comprehension is very satisfactory.
2.60-3.39	Moderate	This means that the student's reading comprehension is satisfactory.
1.80-2.59	Low	This means that the student's reading comprehension is fair.
1.00-1.79	Very low	This means that the student's reading comprehension is poor.

The study employed three statistical tools to analyze the collected data:

Mean. The mean, or average, is the sum of all values in a sample divided by the number of values (Hurley and Tenny, 2022). It was used to calculate the average pre-test and posttest scores of Grade 5 students.

Standard Deviation (SD). SD measures the extent of variation or dispersion in a set of values compared to the mean (Omda and Sergent, 2023). It was utilized to support hypothesis testing and visualize data effectively.

Paired Sample T-test. This test compares the means of two measurements from the same individuals or related units, such as pre-test and posttest scores (Kent State University, 2018). It was used to determine if there was a significant difference between the pre-test and posttest scores of Grade 5 students.

RESULTS AND DISCUSSION

Below, table 2 shows the pre-test mean scores of students in three levels of reading comprehension: literal, inferential, and evaluative. Students excelled in literal comprehension (M=4.55, SD=0.73), compared to lower scores in inferential (M=2.02, SD=1.24) and evaluative (M=2.27, SD=1.25) levels. The overall pre-test (M=2.95, SD=1.07) indicating satisfactory comprehension before the Kiddie ReCom website intervention. The posttest mean scores in three levels of reading comprehension - literal, inferential, and evaluative. Results revealed high comprehension at the literal level (M=4.67, SD=0.55) compared to lower scores in inferential (M=2.57, SD=1.04) and evaluative (M = 2.57, SD = 1.10) levels. The

overall posttest mean was (M=3.26, SD=0.89), indicating satisfactory comprehension post-intervention with the Kiddie ReCom website application.

Literal comprehension is simpler as it deals with explicit information in the text, while inferential and evaluative comprehension require deeper analysis to infer implicit meanings and assess the text's quality or effectiveness, demanding higher-order thinking skills. The study by Kamagi (2020) revealed that students find inferential comprehension more challenging than literal comprehension. Their performance on inferential comprehension tasks, with an average score of 63.58%, indicates significant difficulty. In contrast, students perform better on literal comprehension tasks, achieving an average score of 81.47%, which is considered a good level of identification. In their study, the participants of Dirgantari and Susantiningdyah (2020) reported finding literal questions easier than inferential and evaluative ones. Literal comprehension is generally easier than inferential or critical comprehension across different text genres (Saadatnia et al., 2017).

Findings of Chu (2017), the correlation between English proficiency and literal comprehension was the highest among the three levels regardless of providing questions in first language (L1) or second language (L2). This finding was expected because the literal level demands comprehension at the word level, which matches the general English education environment at the elementary level, emphasizing vocabulary and sentence structure. On the inferential level, it was surprising to discover that the correlation between English proficiency and the responses to first-language questions was much higher than the correlation with the reactions to second-language questions. In other words, when questions involving inferential comprehension in a reading assessment were provided in the first language, it was more likely for students with high English proficiency to perform well than when questions were provided in a second language. This statement also applies to the evaluative level, particularly on evaluative open-ended questions. Therefore, these results imply that student's English proficiency is better reflected on the inferential and evaluative level in reading comprehension assessments when questions, options, and responses for open-ended questions are in a second language.

It is important to note that the constraints faced by the researchers influenced these findings. First, the incompetence of the initial IT specialist and the delay in developing the website application was partly due to the incompetence of the first IT specialist hired for the project. Second, the number of sessions was rushed, and to make up for the lost time during the development process, the researchers decided to increase the number of sessions. Instead of having one session per day for two weeks, they opted for two sessions per day for one week. This accelerated schedule aimed to cover the time lost during the initial stages of development. When an intervention session is rushed, it may need to provide more practice and reinforcement for students to solidify their understanding of reading comprehension strategies (Sohn et al., 2023). This can result in students needing more essential skills and techniques for improving reading comprehension. Rushed sessions may lead to a lack of depth and thoroughness in instruction. This can hinder students' ability to fully grasp and apply the concepts and strategies taught during the intervention (Vaughn, 2022).

The limited availability of devices was another challenge faced by the researchers. The researchers had to devise a solution with only four devices available for 51 students and no computer lab in the school. They decided to group the students into four groups, each with 12 sharing one device. Jamshidifarsani et al. (2019) stated that various technologies were found to provide equal or more significant benefit than traditional means for aiding struggling and at-risk readers with reading comprehension, with limited availability of devices can impact students' engagement and interactivity during the intervention sessions and may have limited opportunities to participate in digital activities actively.

Table 2. Pre-test and Posttest mean scores of students in reading comprehension.

Reading comprehension	Mean		SD		Description	
	Pre-test	Posttest	Pre-test	Posttest	Pre-test	Posttest
Literal	4.55	4.67	0.73	0.55	Very high	Very high
Inferential	2.02	2.57	1.24	1.04	Low	Low
Evaluative	2.27	2.57	1.25	1.10	Low	Low
Over-all mean	**2.95**	**3.26**	**1.07**	**0.89**	**Moderate**	**Moderate**

Table 3 presents the significant difference between the pre-test and posttest scores of Grade 5 students in reading comprehension. The overall result revealed a *p*-value of 0.001, indicating the null hypothesis's rejection. This implies that the reading comprehension of the Grade 5 students was enhanced after using the Kiddie ReCom website application. The main feature of the Kiddie ReCom website application is the computer-assisted language learning gloss (CALL). A common practice involves the provision of a translation within the margins or in a pop-up window when a word is clicked on with a computer or electronic device. It is a practice of providing learners with annotations or explanations of unfamiliar words or phrases in the target language text (Taylor, 2020). In general, the majority of computer-assisted language learning (CALL) glossing techniques are beneficial for both vocabulary acquisition and improving reading comprehension. This technique, as highlighted by Plonsky (2016), can help enhance reader skills such as inferring meaning from context, utilizing background knowledge, and identifying the main idea. CALL glosses provide valuable support by facilitating reading at a more advanced textual level, enabling readers to engage with more challenging and authentic texts, consequently expanding their vocabulary knowledge. Research

suggests that readers with access to CALL glosses may understand the text better than those who need such support. Studies have shown that CALL glossing can enhance vocabulary acquisition, reading comprehension, and language proficiency. By providing immediate access to definitions, translations, or explanations of unfamiliar words, CALL glossing helps learners overcome language barriers and comprehend the text more effectively (Taylor, 2020).

Another feature of the Kiddie ReCom website application is the text-to speech strategy; text-to-speech is paired with a synthesized computer or human recording of that exact text (Bouck, 2015). The finding of Keelor et al. (2020) highlighted that the reading comprehension of students with text-to-speech (TTS) intervention was higher compared to students with no text-to-speech (TTS) condition. Rahman and Hajar (2020) stated that combined visual and auditory cues contribute to improved reading comprehension and motivation among students. Integrating text-to-speech and glossing features in website applications fosters a comprehensive and engaging learning experience for elementary students, as highlighted in the Kiddie ReCom website application.

Table 3. Significant difference between Pre-test and Posttest reading comprehension of Grade 5 students.

Test	Mean	SD	*t*-value		*p*-value	Decision
			Computed	Tubular		
Pre-test	2.95	1.07	3.38	1.67	0.001	Rejected
Posttest	3.26	0.89				

CONCLUSION

The findings of this study show an increase in posttest mean scores of the 3 levels of reading comprehension as compared to the pre-test mean scores, which implied

that Kiddie ReCom App enhances the reading comprehension of the Grade 5 students in literal, inferential and evaluative levels. The students remain excellent in literal level of comprehension, and low in inferential and evaluative level of

comprehension based on its descriptive interpretation even after using Kiddie ReCom App for it is due to the constraints encountered by the researchers which were time constraint and limited available devices. Time constrains leads to rushed session that leads to a lack of depth and thoroughness in instruction. The limited available devices impact students' engagement and interactivity during the intervention sessions and may have limited opportunities to participate in digital activities actively.

Future research is suggested to use Kiddie ReCom App with enough time on intervention session and adequate available devices to determine its potential. It is also suggested that reading comprehension should be reflected more on the inferential and evaluative levels on how it can be enhanced.

RECOMMENDATION

The findings indicated initial strengths in literal reading comprehension skills but identified challenges in inferential and evaluative levels. Post-intervention, while literal comprehension remained strong, inferential and evaluative skills showed less improvement. Recommendations include further quasi-experimental studies with controls and reading comprehension should be reflected more on the inferential and evaluative level on how it can be enhanced.

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