



## The effects of interactive multimedia on students' reading skills

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KEYWORDS	ABSTRACT
Indonesian language; Interactive Multimedia; Reading Skill; Students	Mastering reading skill has an important role in the educational field. Therefore, the purpose of this study is to determine the effect of the interactive multimedia application on the reading skill in Indonesian language. This study is categorized as an experimental research design type, namely One Group Pretest Post-test Design. The population in this study is the students of Primary School Teacher Education Department in Yogyakarta and Klaten. Then, the sample is the second-semester students of Widya Dharma University in Klaten and Sarjanawiyata Tamansiswa University in Yogyakarta. The students involved in this research are 60 students. Then, data are collected by using the Indonesian reading skill test in way applying interactive multimedia in learning Indonesian reading skills, which is conducted into two stages namely before (pretest) and after (post-test). Then, data were analyzed using paired t-test. The results of this study show a significant increase in students' reading skills, which is evident in the average score, namely a pretest score of 70.03 and an average post-test score of 80.13. Also, the results of the paired t-test show a significance value of 0.000 less than 0.05, it indicates that there is a significant difference between the pre-test scores and the post-test students reading scores. These results show that the application of interactive multimedia has an impact on improving students' reading skills, this is because interactive multimedia is not only a conventional learning media but is a technology-based learning media that is able to attract interest in learning and is interactive

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## Introduction

The education always develops together with the technological developments, as well as several learning devices such as learning media. The learning media has not only traditional characteristic but also has the computer-based characteristic. One of the PowerPoints used which is often used in serving of learning materials by teachers. However, the development of media always develops together with technological development. Therefore, there is a need for innovation in purpose the learning process becomes more effective and efficient. Those needs also happened in learning to read. The reading skills are part of language skills, and this skill has related to other language skills such as writing, speaking, and listening.

The implementation of interactive multimedia significantly impacts students' reading skills across various educational contexts. Several studies indicate that multimedia resources enhance comprehension, engagement, and learning outcomes. For example, an analysis by Nurmahanani et al. shows that an interactive multimedia-aided social cognitive model effectively improved early reading skills among elementary students in Indonesia (Nurmahanani et al., 2021) (Praheto et al., 2017, 2020). Similarly,

multimedia storytelling integrated with mind maps has demonstrated effectiveness in enhancing reading comprehension for learners with disabilities (Pannim et al., 2022).

Additionally, a systematic review by Johannes and Hashim emphasizes that utilizing multimedia resources fosters better comprehension and retention of information compared to traditional methods (Johannes & Hashim, 2023). Meanwhile, Fitrawati et al. highlight the importance of incorporating technology in developing critical reading materials, underscoring the adaptability of current educational practices (Fitrawati et al., 2023). Thus, interactive multimedia serves as a transformative tool in reading instruction, promoting not only skill enhancement but also greater student motivation and engagement in learning processes (Novitasari et al., 2020).

Reading skills become an integral part of learning language skills, especially in Primary School Teacher Education Department. In learning to read Indonesian text, students are not only required to understand theories related to reading skills but also, they must be able to read smoothly. The reading skill has an important role in education. The importance of the reading can be seen from, by the reading students can find out various information from various sources and fields. Reading is a complicated process involving many things, not only reciting the text, but also involves the thinking process, visual, psycholinguistic, and metacognitive activities. The visual process is the process of translating written symbols/letters into spoken words. As a thought process, the reading process includes word recognition activities, literal understanding, interpretation, critical reading and creative understanding (Crawley & Mountain, 1995). Then, reading is a receptive language skill that involves the processes of receiving, processing, and constructing (Hwang & Duke 2020; Kim, 2020). In addition, reading skills are an active process of interpreting linguistic symbols (letters, words, sentences) into meaning that involves decoding visual symbols, constructing meaning, and cognitive processes (Castles, 2018; Rayner, 2021; Share, 2021). Reading is also considered as a process to understand what is implied in written text to understand the thoughts contained in written words (Zuchdi, 2013). Then, Reading is a complex activity involving multi-level processing such as visual decoding, phonological processing, semantic comprehension, and context integration (Dahaene, 2020; Duke & Cartwright, 2021). These activities include: linking the knowledge and experience they have with the reading text to gain an understanding of the reading material; make conclusions and assess readings; focusing the attention while reading, arising reading fondness, and foster motivation to read; observing a set of images and sounds according to a particular orthographic system (writing); memorize things that have been learned in the past and to draw them from new ideas and facts obtained from reading to gain new knowledge; interpret words as sound symbols that refer to certain concepts; following a series of writings arranged in a linear, logical, and systematic manner according to the rules of the Indonesian language; understanding the relationship between images and sounds, and the relationship between words and their meanings.

However, learning to read is not an easy thing to do. In its implementation there are various obstacles faced by students and lecturers as instructors. Reading is a passive skill that requires an interactive process of understanding the meaning to get information or ideas from written texts (Nur & Ahmad, 2017). Also, the focus in learning to read is not only students have to understand theoretical material, but also the students must be able to practice reading smoothly. Inside of the Primary School Teacher Education Department curriculum, some reading materials must be mastered by students both theoretically and practically. These materials include intensive reading, extensive reading, and loud reading. However, in some types of intensive reading. There are still many sub-materials that must be mastered by students such as reading comprehension, speed reading, smooth reading, and so on.

The very complex material required a learning media that can facilitate and provide information to students related to various learning materials in reading Indonesian language skills. The media is interactive multimedia. The fact that media can be integrated using computers triggers an explosion in the use of computer-based multimedia learning applications. This application runs everything from serious computer-based tutorials for adults to a Children category called "edutainment." This multimedia application will share various information's that helps the user to learn. Multimedia is a digital-based media that integrates various elements such as text, sound, graphics, images, animation, video, or games and is interactive in nature which is designed to facilitate two-way interaction between users and systems so that it can be said that interactive multimedia is user-centered (Mayer, 2022; Clark & Mayer, 2023; Shneiderman, 2022; Plass, 2023; Norman, 2023; Munir, 2012; Vaughan, 2011). Multimedia is very useful in learning because multimedia can increase learning motivation and improve teaching efficiency (Ruomei & Feng, 2012). Then, teaching uses multimedia devices will enrich teaching content and the time can be utilized as well as possible in the classroom, and make student-center learning and fundamentally improve classroom efficiency (Patel, 2013). Also, interactive multimedia does not only display the reading theory material but also is equipped with examples, practices and it is completed with the various other complement menus such as games and music. In line with this, Mayer also defines multimedia as a learning material using words

as well as images (Mayer, 2022). Then, interactive multimedia is the multimedia that is equipped with a controller that can be operated by the user, so that the users can choose what they want for their learning process (Daryanto, 2013). The control tool in question is the presence of menu buttons that can be selected by the user. Based on the characteristics of reading skills which are complex activities, interactive multimedia is needed which aims to improve reading skills and make learning fun, innovative, and student-centered. It is expected that the development and interactive multimedia application in learning to read Indonesian can have a significant influence on students' reading skills.

## Method

This research is an experimental research design with the type of One Group Pretest Post-test Design. The design of this study included one group that was observed in the pretest stage, which was then continued with treatment and post-test (Creswell, 2014). The observed group consisted of students from two universities, namely Widya Dharma Klaten University and Sarjanawiyata Tamansiswa University Yogyakarta. This study's population was students of the Primary School Teacher Education Study Program at Widya Dharma University Klaten and Sarjanawiyata Tamansiswa University Yogyakarta. The sample was 60 second-semester students from the two universities, with an average age of 18. In that group Indonesian pre-test language reading skills, then treatment was carried out by implementing interactive multimedia in the initial stage of learning and the final stage with the post-test. The data obtained before (pretest) and after (post-test) the treatment were compared to determine the effect of the application of interactive multimedia in applied Indonesian reading skills. Data which is obtained from the pretest and post-test were then analyzed descriptively with a focus on the analysis of central trends (mean, median, mode, range, standard deviation, and variance). Furthermore, the data obtained were conducted through prerequisite tests in the form of normality and homogeneity tests and continued with the paired t-test to determine the effect and differences in the results of reading skills between the pretest and post-test.

## Results and Discussion

### Descriptive Statistics

Pretest and post-test scores were obtained through reading comprehension tests. Before the action is taken, a pretest is taken to determine the student's initial reading skill. Moreover, post-test is conducted after learning to apply interactive multimedia to determine the student's final reading skill after the experiment is taken. Therefore, the results of pretest and post-test can be seen through descriptive statistics in the table 1.

**Table 1.** Descriptive Statistic

	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>
Reading Pre-test	60	40	90	70.03	9.446
Reading Post-test	60	68	99	80.13	7.453
Valid N (listwise)	60				

Based on table 1, the average score of the reading test on the pretest is 70.03 and there is a change in the average score of the post-test after applying interactive multimedia, it is 80.13.

### Normality Test Result

The analysis of normality is calculated using the Kolmogorov-Smirnov formula, and the results can be seen in the following table 2.

**Table 2.** Normality test result

Group	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Score Reading Pre-test	.119	60	.035	.974	60	.233
Reading Post-test	.124	60	.023	.966	60	.090

a. Lilliefors Significance Correction

Based on table 2 related to the results of the normality test, it can be seen that the pretest and post-test reading data are normally distributed because the significance value is greater than 0.05.

## Homogeneity Test Result

Homogeneity analysis is conducted using the Lavene test, the results of the homogeneity test can be seen in the following table.

**Table 3.** Homogeneity Test Result

Levene Statistic	df1	df2	Sig.
2.355	1	118	.128

Table 3 shows that the two data groups are homogeneous. Those results is obtained because the significance value of the Levene statistic is greater than 0.05.

Based on table 2 and table 3 the data is normally distributed and homogeneous so that the statistics used to calculate differences in the results of the pretest and post-test skills in reading Indonesian language text are parametric statistics in this case Paired t-test.

## Paired t-test result

The differences analysis results on the reading skill between pretest and post-test were calculated using the Paired t-test. The results can be seen in the following table.

**Tabel 4.** Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Reading post -test Reading Pre-test	10.100	7.278	.940	8.220	11.980	10.749	59	.000

Based on table 4 relate to the results of the paired t-test, there are significant differences between the pretest and post-test scores of students' reading ability. That is because the significance value obtained is 0,000 or less than 0.05. This shows that the difference in learning outcomes before and after using interactive multimedia is very significant. Thus, interactive multimedia is proven to be effective in improving students' reading skills.

## Discussion

Multimedia has an important role in learning. In this digital era, learning models utilize technology as a learning medium to provide wider access and opportunities for students to build their own knowledge (Hikmah, 2019). It is included the learning of reading skills in the Primary School Teacher Education Department. As one of the study programs that prepares students as professional elementary school teacher candidates, the ability to read becomes important for students. The existence of multimedia in learning reading skills, lecturers can present information related to reading material in an innovative method, and they can motivate students to learn quickly. Interactive multimedia is a media that combines various elements such as a combination of text, visuals, and audio which has been proven to improve learning outcomes and increase understanding with principles such as the redundancy principle and multimedia principle compared to the use of static media, and variations in media like this can reduce cognitive load and increase learning efficiency and student engagement (Baceviciute, et al., 2021; Kalyuga & Sweller, 2021; Fiorella & Mayer, 2022; Noetel, et al., 2021; Al-Adwan & Smedley, 2022; Pettersson & Scheiter, 2023; Wong, et al., 2024). Therefore, effective multimedia requires careful integration in a reasonable manner that utilizes the unique characteristics of each media in representing the learning content (Asabere & Enguah, 2012). Based on the results of research which is conducted on reading skills there are significant differences between students' reading abilities before and after implementing interactive multimedia in learning a reading skill. The average value of students' reading ability before applying interactive multimedia only reaches 70.03. However, after applying interactive multimedia in learning to read, the average value of reading skills increased to 80.03. Same as the paired t-test results showed a significance value of 0.000 less than 0.05 so that it can be said that there is a real difference between the pre-test scores and the post-test scores of students' reading skills.

Interactive multimedia developed and used in learning to read for Primary School Teacher Education Department students has several elements and menus in it. The elements that make up interactive multimedia such as combining some elements namely, the text, images, video, animation, and sound. Lisnawati (2021) stated that the learning media that should be used today is learning media that facilitates

students to become multi-competent, multi-literate, critical-thinking, creative, innovative, and able to work together and collaborate students and graduates. Learning media that have these characteristics are learning media that combine, collaborate, or integrate several learning media, for example images, graphics, audio, and so on (Subramanian, 2024; Rogti, 2024). The menus contained in interactive multimedia reading skills include home menus, semester learning plans, materials, practices, games, music, profiles, and references. The appearance of interactive multimedia in welcoming page for Indonesian reading skills can be seen in the Fig.1.



Fig. 1. Multimedia Welcoming Page

Fig. 1 above shows the display of the welcoming page of the interactive multimedia Indonesian reading skill. In that picture, it can be seen several menus that can be accessed by users or students according to their needs in learning reading skills. Not only the existence of theoretical materials relates to the reading ability in multimedia, but also there are examples of the reading ability in video form and there is a student reading practice video.

Interactive multimedia as a medium in learning has an important role in mastering learning material, especially in reading material which is not only required to understand the reading theory but also must be able to practice reading skills. Through interactive multimedia students can be helped in understanding the material theoretically as well as being helped to improve their reading skills. The interactive multimedia design also influences student learning styles. Multimedia development that integrates with various elements such as video, which makes multimedia more interesting and effective for learning. As Ahmad states that applications in videos are more attractive for users, while the musical background is added to make the application more effective for the users (Ahmad et al., 2015). Moreover, multimedia is proven effective in education. Multimedia provides simple alternative and facilities in education. The effect of multimedia practices triggers students to learn new information (Ilhan & Oruç, 2016) and also that students can obtain knowledge and information that might not be obtained in the traditional method.

This reason also applies to the learning of Indonesian reading skills. Therefore, the application of interactive multimedia in learning to read Indonesian is very influential on students' reading skill towards a better direction, namely a significant in increasing the reading ability of students after implementing interactive multimedia. Interactive Multimedia is also flexible for users, in the sense that interactive multimedia can be used both in the classroom and outside the classroom. Students can use interactive multimedia independently, or they can individually practice for mastering the skill to read Indonesian text.

## Conclusion

This research was conducted to determine the effect of using interactive multimedia on student learning to read for students in Primary School Teacher Education Department. After reading learning using interactive multimedia, students' reading ability is better when applying interactive multimedia than before. That is because interactive multimedia has various elements such as elements of reading theory, examples and various reading skills exercises so that it can help students in learning to read Indonesian language text. The research suggests that **interactive multimedia positively impacts reading skills**, but its success depends on **thoughtful implementation, lecturers support, and equitable access**. Stakeholders-lecturers, developers, and policymakers—must collaborate to harness its full potential while addressing challenges like **cognitive overload and digital inequality**.



## Declarations

- Author contribution** : Biya Ebi Praheto is responsible for the research conducted as a formulator of research ideas and concepts. In addition, he is also responsible for the preparation and writing of research results. Pramudya Cahyandaru & Mark Gabriel Wagan Aguilar assisted in writing and editing.
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