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Research Article

Bridging Tradition and Technology: QR Code Integration in Lontara Script Learning Book to Improve Writing and Language Skills

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Abstract

This study examines the creation and assessment of a Lontara Script Learning Book augmented with QR Code technology to boost students' Lontara script writing abilities and their proficiency in the Makassar language. Nineteen first-grade students from SD Inpres Kera-Kera in Makassar city participated in the study. The research unfolds into three stages: 1) Preparation, which includes initial observations and interviews, literature review, discussions, and research tool preparation; 2) Implementation, involving the introduction of the learning media, pretest, implementation of Lontara Script Learning Book based on QR Code, summarizing and posttest; 3) Evaluation based on observation, pretest and posttest results serves as the data source. The findings revealed a notable average enhancement of 50.37 in the students' Lontara script writing skills. Moreover, there was an average increase of 44.21 in Makassar language proficiency through picture guessing exercises and a 37.90 improvement via folklore comprehension. These results signify a substantial advancement in both script learning and language abilities. This innovative educational medium has proven to be effective in enriching the writing and language skills of elementary school students.

Keywords: Lontara, Makassar language, QR Code, Education Technology, South Sulawesi.

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1. Introduction

Lontara script is an ancient writing system that has been used in South Sulawesi, Indonesia, for centuries (Smith, Rikarno, & Sabandar, 2018). It is primarily used for recording religious texts, historical records, local knowledge, myths, and literature in various languages, including Makassar and Bugis (Amalia, Syamsurijal, & Rahman, 2020). The richness of these records highlights the script's importance in preserving the cultural heritage of these communities. The Makassar language, on the other hand, is one of the major languages spoken in South Sulawesi and is used in daily communication, education, and various cultural activities (Doe & Rahim, 2020).

The Makassar language, an Austronesian language, is spoken by the Makassar tribe in South Sulawesi. The Makassar tribe is very rich in culture, language and literature, for example, the *Pappasang* as one of the literatures of Makassar which can be used as a medium for educating children about moral values (Yusuf Yusuf, Saleh, Yusuf, Haeruddin, & Fitrahwahyudi, 2022). Not only that, the Makassar tribe has a local knowledge system which has become the local wisdom of its people. Moreover, the cultures of politeness in Makassar and Bugis are highly significant to be taught and internalized by the younger generation through the use of language and writing (Gusnawaty et al., 2022). In terms of oral and written tradition, preserving the Lontara script and Makassar language is essential. Efforts to maintain and promote these linguistic traditions contribute to the broader understanding of the region's history and help to sustain the unique cultural heritage of the Makassar people.

The phenomenon of local language extinction in Indonesia is becoming increasingly concerning. According to data from the Language Development and Enhancement Agency of Indonesia (2020), there are 11 local languages that have already become extinct, and geographically, all of these languages originated in the eastern part of Indonesia. Furthermore, the Makassar language is currently one of the endangered regional languages in Indonesia. According to the research conducted by Lukman & Gusnawaty (2015), the usage of the Makassar language is alarming as it is reported to be below 50% among parents communicating with their children. However, the mother tongue plays a crucial role in preserving local languages and serves as an identity for its users. If this situation is left unaddressed without preservation efforts, the Makassar language is at risk of extinction.

Similarly, the existence of the Lontara script among the people of South Sulawesi is declining (Kilawati & Yanti, 2021). However, the Lontara script is a distinctive feature of the South Sulawesi community. Moreover, if the Lontara script is no longer known by the younger generation, then all ancient Makassar manuscripts containing various fields of knowledge will no longer be studied and known by future generations. Therefore, the South Sulawesi Provincial Government through Law No. 3 of 2020 concerning the preservation and promotion of intangible cultural heritage has designated local languages as subjects from elementary to high school levels.

Even though the Makassar language and the Lontara script have been taught in schools, their existence continues to decline until now (Aldy et al., 2019; Arsyad & Suryadi, 2019; Munir, 2018). This trend is alarming as it may result in the loss of cultural heritage and identity (Lee, Lee, & Kim, 2017). In fact, language learning is very important for the younger generation because in this way children can be taught how to use polite and communicative language so that communication can be effective pragmatically. The monotonous and lack of variety in teaching methods have

been identified as one of the primary causes of this decline, particularly in primary education (Kartika, 2017). As a result, there is a growing concern about the preservation of the Lontara script and Makassar language in South Sulawesi and the broader context of language preservation (Jones & Susanto, 2019).

Traditional teaching methods in South Sulawesi for Lontara script and Makassar language often involve rote learning, memorization, and repetitive practice (Kartika, 2017). However, these methods have limitations, as they may not be engaging or effective in improving students' writing and language skills (Munir, 2018). Additionally, the lack of technology integration in the learning methods makes the learning process increasingly tedious. However, technology in the education sector has rapidly advanced, and this progress should be an opportunity to preserve cultural values (Ramadhana, Al Muhdhar, & Sulistijiono, 2023).

Technology plays an increasingly crucial role in language learning, as it offers new opportunities for innovative teaching methods and interactive learning experiences (Lin, 2012). For example, computer-assisted language learning (CALL) programs have been shown to improve students' language skills and motivation, by providing personalized and engaging learning environments (Golonka, Bowles, Frank, Richardson, & Freynik, 2014). These programs can adapt to individual learners' needs and preferences, leading to more effective and enjoyable learning experiences.

Similarly, mobile learning technologies, such as smartphones and tablets, can facilitate access to learning materials and enable collaborative learning experiences (Kukulska-Hulme & Viberg, 2018). The ubiquity of these devices allows learners to access educational resources anytime and anywhere, fostering a sense of autonomy and self-directed learning. Furthermore, mobile technologies can support communication and collaboration among learners and educators, leading to the development of a dynamic and supportive learning community.

Integrating technology into teaching methods has been shown to enhance students' learning experiences and outcomes (Brown & Green, 2016). In particular, the use of QR Codes has been proven to be effective in various educational settings (Sondhi & Kumar, 2022). However, the potential of this technology to support the preservation of indigenous scripts and languages, such as the Lontara script and Makassar language, has yet to be explored in depth.

QR (Quick Response) Codes are two-dimensional barcodes that can store a variety of information, including text, website URLs, and multimedia content (Chen, Li, & Yang, 2022). In education, QR Codes have been employed to provide instant access to learning resources, reducing the time and effort required to search for relevant materials. Furthermore, accessing it is very easy because it only requires using a smartphone, then the learning materials can already be opened. This ease of access promotes a more efficient and streamlined learning process, allowing students to focus on the content itself rather than spending time searching for resources (Susono & Shimomura, 2006; Chen et al., 2022).

Furthermore, QR Codes can enhance interactivity and support personalized learning experiences by connecting students with tailored content based on their individual needs and preferences (Crompton & Burke, 2018). Studies have shown that integrating QR Codes into educational materials can lead to improved student engagement, motivation, and learning outcomes (Rikala & Kankaanranta, 2012). This is because QR Codes enable a more dynamic and interactive learning

environment, fostering greater student involvement and encouraging active participation in the learning process. Therefore, the use of QR Codes in learning media presents a significant opportunity to enhance the effectiveness of the learning process.

Lontara Script Learning Book based on QR Code is one of the latest innovations in learning the Makassar language and Lontara script in the Makassar city (Yusuf et al., 2023). The book contains 6 learning methods: writing based on Lontara script patterns, letters matching, picture guessing, pictures matching, storytelling (folklore), and writing practice. All learning methods are integrated with QR Codes containing game and audio-visual-based learning materials.

The purpose of this study is to bridge the gap in the literature by developing and evaluating the effectiveness of the Lontara Script Learning Book based on QR Code to improve the abilities of elementary school students in Lontara writing skills and Makassar language proficiency. By examining the impact of this innovative approach on students' performance, this research will provide valuable insights into the potential of technology-enhanced learning to preserve the Lontara script and Makassar language as cultural heritage and the importance of incorporating student competencies into teaching practices.

Furthermore, this research contributes to the current literature by exploring the effectiveness of integrating technology in improving language proficiency and script-writing skills among younger generations, particularly in non-Western contexts. By doing so, this study may provide useful insights for educators, policymakers, and researchers who are interested in preserving and promoting indigenous scripts and languages worldwide.

The study aims to investigate the effectiveness of the Lontara Script Learning Book in improving students' abilities in the Makassar language and Lontara script in matchmaking, picture guessing, and folklore understanding. Specifically, the research questions are:

1. Does the use of QR Code technology in the Lontara Script Learning Book significantly improve students' abilities in Makassar language and Lontara script in matchmaking, picture guessing, and folklore understanding?
2. How do the improvements in students' abilities of Makassar language and Lontara script in matchmaking, picture guessing, and folklore understanding differ after integrating QR Code technology in the Lontara Script Learning Book?
3. Are there significant differences between students' abilities of Makassar language and Lontara script in matchmaking, picture guessing, and folklore understanding before and after integrating QR Code technology in the Lontara Script Learning Book?
4. How is the distribution of students' improvement of the Makassar language and the Lontara script in matchmaking, picture guessing, and folklore understanding after integrating QR Code technology?

2. Methodology

The research method used is qualitative with the type of Classroom Action Research (CAR). Classroom Action Research is a form of research conducted within the classroom context and is

reflective in nature, with the aim of improving and enhancing professional teaching practices in the classroom (Hanifah, 2014). In this study, the author aims to examine the improvement of students' ability in writing Lontara script and the Makassar language using Lontara Script Learning Book based on QR Code as an innovative local language learning media.

This study was carried out at SD Inpres Kerakera, located at Jalan Perintis Kemerdekaan No. 49 Tamalanrea Indah, Tamalanrea District, Makassar City. This school is an elementary school that has implemented Makassar language and Lontara script learning, which is included in the local language subjects. Furthermore, the sample in this study consists of 19 first-grade students selected through a purposive sampling technique. This sample is also adjusted to the essence of Lontara Script Learning Book, which is a learning media specifically designed for first-grade or beginner students. The writing took place from June 23th to August 10th, 2022, adhering to health protocols such as wearing masks, washing hands before and after entering the classroom, using hand sanitizer, and maintaining social distance.

The implementation method in this research consisted of 3 stages: preparation, execution, and evaluation which will be elaborated as follows:

First, the preparation was conducted by 5 stages: 1) Initial observation and interviews were conducted to identify the students' current writing and language skills; 2) The research problem was identified based on the observation and interview; 3) A literature review was conducted to identify previous studies related to the use of Lontara script in writing and language learning; 4) Coordination was made with supervising lecturers to obtain guidance and feedback; 5) Tools and materials were prepared for the learning activities.

Second, the execution was carried out in 5 stages: 1) Introduction of learning media and conducting a pretest for the first-grade students with the aim of assessing their initial abilities in writing Lontara script and the Makassar language.; 2) Writing exercises were conducted based on Lontara script patterns; 3) Letters matching, picture guessing, and pictures matching activities were carried out to improve the students' writing and language skills; 4) Storytelling of Makassar's folklore and Lontara script writing practice were conducted to reinforce the students' learning; 5) Summarizing the students' progress and giving posttest.

Lastly, the evaluation of students' writing and language skills was conducted through observations, pretest, and posttest assessments. Observations were carried out to observe the learning process, including students' ability in writing the Lontara script and the success of each teaching method. Subsequently, pretest and posttest were implemented to measure students' ability to learn the Lontara script and their Makassar language proficiency. The pretest and posttest tools consisted of matchmaking, picture guessing, and folklore understanding.

Data in this study were obtained using three measurement tools: observation, pretests, as well as posttests. The improvement of students' ability to write the Lontara script and the Makassar language was measured by comparing the results of pretests and posttests and through observations made during the learning process. The data were analyzed using descriptive statistics and inferential statistics such as t-test to examine the significance of the differences between pretest and post-test results.

3. Findings and Discussion

Findings

As mentioned in the introduction, this study aims to investigate the intervention of QR Code technology in local content learning (Lontara Script Learning Book), specifically at the SD Inpres Kerakera. The students' ability to recognize, identify, and write Lontara script using the Makassar language has significantly improved. Not only that, the students' understanding and proficiency in the Makassar language have also increased through the applied methods. The success is evident based on the results of pretest and posttest using three tools: matchmaking, picture guessing, and folklore understanding. The research findings are presented in the table below.

Table 1: Length Weight of Sections

SCORE						
Stud ID	PRE			POST		
	Matchmaking	Picture Guessing	Folklore Understanding	Matchmaking	Picture Guessing	Folklore Understanding
1	25	20	0	100	60	60
2	30	70	40	100	100	80
3	0	0	0	100	100	100
4	20	80	80	100	100	100
5	36	80	40	60	100	100
6	30	10	20	60	100	100
7	12	60	100	100	100	40
8	20	30	20	100	90	80
9	84	80	80	100	100	80
10	50	30	20	100	100	100
11	0	0	0	60	100	80
12	25	70	40	100	100	100
13	12	70	60	80	100	80
14	100	70	100	100	100	100

15	100	80	80	100	100	80
16	4	10	40	40	40	100
17	25	80	40	100	90	100
18	100	60	100	100	100	100
19	20	40	80	50	100	80
SUM	693	940	940	1650	1780	1660
MEAN	36,47	49,47	49,47	86,84	93,68	87,36
MEDIAN	25	60	40	100	100	100
Standard Dev	33,95	30,08	34,87	21,09	16,05	16,61

The T-Test results show the following scores:

Table 2: T-Test results for matchmaking, picture guessing, and folklore understanding

T-Test	Score
Matchmaking	2,288E-06
Picture Guessing	1,903E-06
Folklore Understanding	0,0007042

A visualization of the T-Test results and improvements can be seen in the figure below.

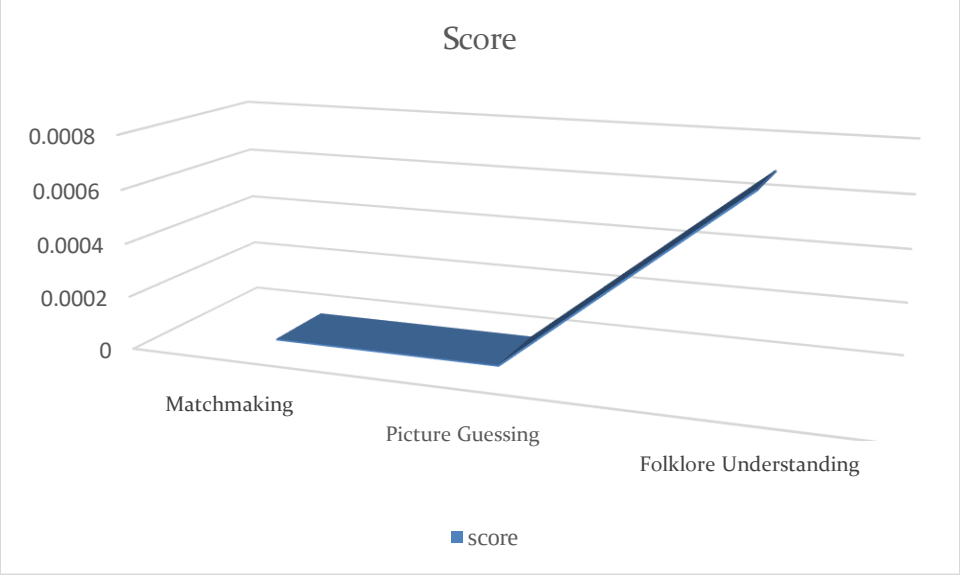

Figure: Progression of Students' Understanding in the T-Test

Discussion

Impact of QR Code Integration on Students' Skills

This section discusses the results obtained from the study on the integration of QR Code technology in Lontara Script Learning Book at the SD Inpres Kerakera. The T-Test results indicate significant improvements in matchmaking, picture guessing, and folklore understanding, with p-values lower than the standard significance threshold of 0.05. These findings suggest that the use of QR Code technology positively impacts students' abilities in these three aspects.

The mean scores for each category increased from the pretest to the posttest, with the most significant improvement in matchmaking. The standard deviation values also decreased from pretest to posttest, indicating that students' performance became more consistent after the intervention.

The purpose of the first research question is to investigate whether the integration of QR Code technology in Lontara Script Learning Book significantly improves students' skills in matchmaking, picture guessing, and folklore understanding. As demonstrated in the data analysis, students' skill showed a significant improvement in all three categories after the implementation of QR Code technology:

Matchmaking: The average pretest score was 36.47, while the posttest score was 86.84, with an average increase of 50.37. The T-Test yielded a p-value of 2.29 x 10^-6, indicating that the change is statistically significant.

Picture guessing: The average pretest score was 49.47, while the posttest score was 93.68, with an average increase of 44.21. The T-Test yielded a p-value of 1.90 x 10^-6, indicating that the change is statistically significant.

Folklore understanding: The average pretest score was 49.47, while the posttest score was 87.37, with an average increase of 37.90. The T-Test yielded a p-value of 0.000704, indicating that the change is statistically significant.

These findings are consistent with previous research on the effectiveness of QR Code technology in education. For instance, Liu et al., (2010) found that the use of QR Codes in language learning improved students' motivation and engagement, leading to better learning outcomes. Similarly, AlNadji (2022) discovered that QR Codes effectively supported students' learning in a mobile environment by providing access to multimedia content and interactive learning experiences.

In summary, the findings of this study align with previous research by (Liu et al., 2010), reinforcing the efficacy of QR Code technology in improving students' proficiency in learning Lontara Script and Makassar Language. The utilization of QR Code technology serves as a testament to its potential impact on enhancing educational practices. These results contribute valuable insights into the effectiveness of modern tools, such as QR Codes, in augmenting traditional learning methods, thereby offering a comprehensive perspective on the advancements in learning script and local language.

Comparison of Improvement in Different Skills

The second research question examines the differences in the improvement of students' skills in matchmaking, picture guessing, and folklore understanding after integrating QR Code technology in the Lontara Script Learning Book. The data show that the most students' skills improve is in matchmaking, followed by picture guessing, and folklore understanding. This suggests that QR Code technology is more effective in enhancing certain aspects of learning in this context.

This finding aligns with prior research on the use of QR Code technology in educational settings, which indicates that the effectiveness of technology may vary depending on the specific learning task or skill. For instance, Al-Khalifa (2008) reported that QR Codes were particularly useful in supporting vocabulary acquisition and recall in a foreign language learning context. Similarly, Susono & Shimomura (2006) found that QR Codes facilitated quick access to information, which enhanced students' abilities to match specific items or concepts in their learning materials.

In contrast, understanding more complex tasks, such as folklore comprehension, may require additional instructional support beyond the use of QR Code technology. According to Hwang et al. (2009), integrating multimedia, interactive activities, and contextualized learning experiences can help students to develop a deeper understanding of complex subjects, such as folklore. This implies that while QR Code technology may offer significant benefits for simpler learning tasks, such as matchmaking and guessing the picture, more comprehensive instructional strategies may be necessary to effectively address more complex learning objectives, such as folklore understanding.

In conclusion, the current study findings, along with those of previous research (Al-Khalifa, 2008; Susono & Shimomura, 2006; Hwang et al., 2009), suggest that the integration of QR Code technology in Lontara Script Learning Book can lead to varying degrees of improvement in different skills. Educators should consider employing additional instructional strategies to enhance more complex learning tasks and ensure the holistic development of students' skills.

Comparison of Skills Before and After QR Code Integration

The third research question investigates the significance of the differences in students' skills in matchmaking, picture guessing, and folklore understanding before and after integrating QR Code technology in the Lontara Script Learning Book. As previously mentioned, the T-Test results indicate that the improvements in all three skills are statistically significant, which suggests that the integration of QR Code technology has a notable impact on students' learning outcomes.

This finding is consistent with other studies that have explored the effects of QR Code technology on various learning domains. For example, Liu et al. (2010) found that QR Code technology promoted higher levels of student engagement, motivation, and collaboration in a science education setting. Similarly, Pratiwi & Indana (2022) reported significant improvements in students' knowledge acquisition and retention when QR Code technology was implemented in a physical education context.

It is essential to consider that the effectiveness of QR Code technology may be influenced by factors such as students' age, prior experience with technology, and the specific learning environment (Crompton & Burke, 2018). Furthermore, it is crucial to ensure that the technology is integrated with pedagogically sound instructional strategies to maximize its potential benefits (W-H. Wu, Hsiao, Wu, Lin, & Huang, 2012).

In summary, the results of this study, along with those of previous research (Liu et al., 2010; Pratiwi & Indana, 2022; Crompton & Burke, 2018; Wu et al., 2012), demonstrate the potential of QR Code technology to enhance students' learning outcomes in various domains, including matchmaking, picture guessing, and folklore understanding. However, it is important for educators to carefully consider the specific context and additional factors that may influence the technology's effectiveness.

Distribution of Students' Skill Improvement

The fourth research question explores the distribution of improvement in students' skills in matchmaking, picture guessing, and folklore understanding after integrating QR Code technology in the Lontara Script Learning Book. As the data analysis suggests, the majority of students experienced significant improvement in all three skill areas. This result highlights the potential of QR Code technology to benefit a wide range of students in a diverse learning environment.

The positive impact of QR Code technology on students' learning outcomes across various skill levels can be attributed to the technology's effectiveness to provide personalized, self-paced learning experiences. According to Hwang et al. (2009), QR Code technology enables learners to access information and resources at their own pace, which can lead to better engagement and increased motivation to learn. Additionally, QR Code technology can facilitate more effective differentiation of instruction, allowing teachers to tailor learning activities to meet the diverse needs of their students (Wen-Hsiung Wu et al., 2012).

It is important to acknowledge that the successful integration of QR Code technology in the classroom depends on several factors, including teachers' skills and competencies, the quality of the learning materials, and the availability of technological resources (Alrasheedi, Capretz, & Raza, 2015). Thus, to fully capitalize on the potential benefits of QR Code technology for diverse

learners, it is essential for educators to receive adequate training and support in the effective implementation of this technology.

In conclusion, the findings of this study, along with previous research (Hwang et al., 2009; Wu, Wu, et al., 2012; Alrasheedi et al., 2015), indicate that the integration of QR Code technology in the Lontara Script Learning Book has the potential to improve learning outcomes for students with varying skill levels. This underscores the value of incorporating QR Code technology in educational settings as a means of promoting more inclusive, equitable learning experiences. The results indicate that such technology can effectively bridge tradition and technology, fostering improved writing and language skills among students.

4. Conclusion

This study aimed to investigate the impact of integrating QR Code technology in the Lontara Script Learning Book on students' skills in matchmaking, picture guessing, and folklore understanding at SD Inpres Kerakera. The findings indicate that the integration of QR Code technology led to significant improvements in all three skill areas, with the most notable improvement in matchmaking. The results suggest that QR Code technology can be an effective tool for enhancing students' learning outcomes in this context. Moreover, the study demonstrated that the improvements in students' skills were not limited to specific aspects of learning, as students experienced significant gains in all three areas after the QR Code intervention. This highlights the potential of QR Code technology to benefit a wide range of students with diverse learning needs. Previous research supports the notion that QR Code technology can facilitate personalized, self-paced learning experiences, leading to better engagement and increased motivation to learn (Hwang et al., 2009; Wu, Wu, et al., 2012).

However, it is essential to acknowledge that the successful integration of QR Code technology in the classroom depends on various factors, such as teachers' skills and competencies, the quality of learning materials, and the availability of technological resources (Alrasheedi et al., 2015). Therefore, to maximize the benefits of QR Code technology for diverse learners, it is crucial for educators to receive adequate training and support in implementing this technology effectively.

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