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Cultural Context as the Basis for Developing Reading Game Applications

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This research aimed to determine the outcomes of concept analysis and to create and assess the viability of game applications for enhancing reading skills. This is R&D (Research and Development) utilizing the MLDC (Multimedia Development Life Cycle) model. This study was conducted in several elementary schools in Palopo City. The data for the needs analysis was collected from 10 students and two teachers in fourth grade. The number of participants in the effectiveness test phase was 268 students. Observation sheets, documentation, interview guidelines, product validation questionnaires, practicality, and product efficacy were among the data collection instruments. The method of analysis employed is the mixed sequential exploratory technique. The results of the concept analysis determine the type of game application to be developed using contextual media based on local culture and android-based interactivity that promotes independent reading achievement indicator learning. The development of a video game included character introduction features, learning features based on curriculum-based reading, and playing features based on adopting ethnic characters, skin color, clothing, and local genre instrumental music. Through Blackbox testing, the product's feasibility is determined. Practicality test results obtained on average are convenient. The effectiveness test results showed an increase in reading ability by using the developed game product.

Keywords: educational game, media development, reading skills, cultural context, elementary school

INTRODUCTION

Local wisdom can be used to contextualize subject matter in a manner that encourages student interest and autonomy. Using local culture-based media and educational materials makes learning more meaningful and contextual, allowing students to comprehend the subject matter more easily (Anggraini & Kusniarti, 2017; Delima et al., 2018; Jumriani et al., 2021; Laksana et al., 2016; Sugiharto, 2015). Because the subject matter is related to what is already known, media contextualization also aids students in remembering the material. Students can construct meaning from their experiences,

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thereby enhancing learning outcomes and critical thinking abilities (Sung et al., 2015). The use of contextual media makes learning more enjoyable and engages students to participate independently in the learning process. Therefore, it is necessary to develop media utilizing local wisdom in order to foster independence and increase student interest in learning, which directly impacts student learning outcomes.

Students in Indonesia face a huge challenge with their lack of enthusiasm in reading. Based on a survey conducted by the Program for International Student Assessment (PISA) and published by the Organization for Economic Co-operation and Development (OECD) in 2019, Indonesia ranks 62 out of 70 countries or is in the bottom ten nations with low literacy levels. Similarly, the empirical study on learning to read, which focuses on the elementary school level, reveals that students encounter interest and independence issues in online learning. Particularly for fourth-grade elementary school learning materials, students required assistance comprehending the information. It is related to the presentation of up to six-paragraph-long content. Observational data reveals that only a small percentage of individuals are excited about learning. One of the roots of the issue is the need for more learning materials that encourage individual study. As a result, the material is difficult for students to comprehend because it must be contextualized and tailored to their qualities. Thus, it is vital to construct enjoyable learning medium without ignoring the features and achievement issues of students' reading skills. The usage of engaging learning media has a significant impact on the achievement of essential learning competencies (Astatin & Nurcahyo, 2016; Elsa et al., 2021; Risnawati et al., 2018). Lack of interest in reading impacts a person's reading abilities (Kirby et al., 2011; Mize et al., 2020). Specifically, in reading activities, enthusiasm and reading skills require consideration (Syakur et al., 2020). It is demonstrated that reading interest significantly influences cognitive and affective components (Renninger & Bachrach, 2015). When students are interested in the literature they are reading, their comprehension increases compared to when they are reading uninteresting texts. According to Springer et al. (2017), there are four principles for cultivating reading interest in the classroom: (1) cultivating individual interest, (2) cultivating situational interest, (3) selecting texts with interest-enhancing elements, and (4) teaching strategies for self- regulation of interest. It is vital to develop interest and employ text with aspects of attraction, such as local cultural content and entertaining media.

Technology-based learning media contain the interesting qualities of learning media. Technology-based learning material can boost the chances of efficient and effective education (Aljaloud et al., 2019; Bakan & Bakan, 2018; Huang, 2019; Nami, 2020). In addition, the advancement of technology is altering a person's reading paradigm (Mangen & van der Weel, 2016). The majority of students prefer to read using digital media over textbooks.

Educational games are one form of technology-based educational media. Educational game media focus on interactive games as attention-getters and include learning elements that can be comprehended (Grimley et al., 2012; Nami, 2020; Risnawati et al., 2018). Students can build enthusiasm for independent study using these instructional

materials (Laurillard, 2016). This form of educational gaming media is prevalent in modern culture and is ideally suited for online and offline learning (Acosta-Medina et al., 2021; Laurillard, 2016; Rincon-Flores & Santos-Guevara, 2021; Trisna et al., 2014). Creativity, enjoyment, adventure, motivation, play, skill, autonomy, education, passion, independence, and logic are incorporated into educational games (Arif, 2016; Hsiao et al., 2014; Huang, 2019; Hung et al., 2014; Matute-Vallejo & Melero-Polo, 2019). However, the greatest challenge in building educational games is to strike a balance between variables that encourage motivation to play and do not hinder the learning process (Laine & Lindberg, 2020; Minovi et al., 2013). Moreover, it is important to select motivational features in games in a way that promotes and does not interfere with the fundamental psychological mechanisms of learning (Minovi et al., 2013; Pellas et al., 2021). Based on this, it is necessary to develop educational media to facilitate the delivery of material that impacts the achievement of essential learning competencies while still paying attention to student characteristics.

Despite the era of globalization, the development of instructional gaming media that adopts a local context can help students understand their surroundings (Anggraini & Kusniarti, 2017; Hidayat, 2013; Pornpimon et al., 2014; Tosida et al., 2020). In addition, kids can be taught about their cultural identity/characteristics in the local cultural environment in order to develop reading proficiency (Anggraini & Kusniarti, 2017; Hidayat, 2013; Pornpimon et al., 2014). Additionally, it can filter against harmful culture (Qodariah & Armiyati, 2013). Referring to this possibility, academics are interested in adapting the local cultural environment in the form of I Lagaligo's content, personality qualities, and game decorations. It is an Indonesian creation myths manuscript written in the modern-day Bugis, South Sulawesi. The reading text includes inventors from regional and national figures as well as foreign leaders.

Several research pertinent to this topic, including Kharisma and Arvianto (2019), looked at the use of local culture-based educational games for early reading skills in primary schools and found them to be effective. Van de Ven et al. (2017) examined the efficacy of a reading game intervention that enhanced students' reading skills. The research by Mahalingam et al. (2019) showed the necessity of analyzing interactive games in order to increase students' reading literacy. Little to no studies evaluated the impact of cultural context-based educational games on the development of reading competency as a result of student learning interest and independence in this research. Therefore, this research aimed to determine the outcomes of concept analysis and to create and assess the viability of game applications for enhancing reading skills.

METHOD

Research Design end Procedures

This type of research called R&D (Research and Development). The utilized development model is a version of the MDLC (Multimedia Development Life Cycle), which consists of six iterative stages: concept, design, material collection, assembly, testing, and distribution (Luther, 1994). This model was selected because it follows the characteristics of produced multimedia learning products and allows for ongoing

improvement, such as the study Martono (2015) that led to the development of multimedia learning media. Additionally, the MDLC approach is used to generate instructional game media for elementary students with Dina and Doni character (Rahayu et al., 2019). The following MDLC phases were evaluated in this study:

The idea phase consists doing a needs analysis and gathering basic game development data. This analysis identifies the sort of application built in the form of interactive, contextual media based on local customs and Android for the aim of reading skills. Learning was complemented with the difficulty of answering reading-based practice questions in order to access the game. The type of literature assigned relates to the theme "world-changing inventors." During the design phase, the concept was translated into the shape of the product design being developed. The design began with the creation of an application flowchart. The flowchart as a development flow detailed in Figure 1.

Figure 1
Flowchart as a development flow

After creating a flowchart, the appearance and material needs, menus, characters, and symbols that are carried are specified in greater detail. In addition to designing the storyboard pages, character and symbol designs are also executed. The developed characters and symbols are suited to indigenous Luwu customs. The Infinity design help

tool was utilized during the design process. The design is then completed with the assistance of the Photoshop (Figure 2).

Figure 2
Symbol and character design

At the stage of material collection, developers do not design the collection of required elements. The following steps are taken sequentially for this step: The accompanying music for the song "Lembata Tana Luwu" was obtained from the Tengku Ryo YouTube channel, sound effects were obtained from http://www.epidemicsound.com/sound-effects/, font types were obtained from http://www.dafont.com/, and graphics were obtained from http://assetstore.unity.com/. Following the design stage was assembly, which involved converting the design into an Android-compatible learning game application. Having completed the prototype, the next step was to test it to determine whether or not it would be practical. Three stages of testing were carried out: black box testing (alpha test) by the developer, practicality testing by the users, and expert testing by experts in the fields of information technology, media, and learning content. Following the completion of product corrections and deeming it final, distribution took place. The Google Play Store app market is used for product distribution. The RUNNING game (BERLARI) was picked as the icon's name (Learn and Play with Tara and Tenri) which can be seen in Figure 3.

Figure 3
Distribution stage

To determine the effectiveness of the product prior to distribution, a quasi-experimental pre-test and post-test control group design was used. Controlling the measurements in the experimental and control groups is the first step in implementing the experiment. The experimental group used reading material internalized in the product development

of the RUN game media. In contrast, the control group used reading sourced from textbooks teachers have used to teach reading. After learning, then do the post-test. Referring to this, the design of this experiment was carried out with the design in Figure 4.

Groups	Pre-test	Treatment	Post-test
Experiment	O	X	O
Control	O	-	O

Figure 4
Experimental design (Creswell, 2014)

Participants

The participants grew up in the Bugis-majority Luwu village. Students in class VI ranged in age from 11 to 13 years. The elementary school of the research is chosen and determined based on the stage of development. Participants ranged from concept analysis through testing and included ten students and two teachers. The research was conducted at that time at SD Negeri 4 Malimongan Jl. Mannennungeng, Amassangan, Kec. Wara, Palopo City, South Sulawesi, Indonesia. Under the research characteristics, the school was chosen because it was located in the city center and cultural center (kedatuan) of Luwu in Palopo, Indonesia. Participants in the efficacy test phase came from six primary schools in Palopo, totaling 268 students, including 134 in the experimental group and 134 in the control group. There were 176 females and 92 males among the participants. Random cluster sampling was used to identify participants during the distribution stage.

Instrument

Observation sheets, paperwork, and interview protocols are utilized to collect data needs throughout the concept formulation stage (teachers and students). The testing instruments are classified as product validity, practicality, and effectiveness instruments. The expert validation sheets served as the product validity instrument (learning technology, learning media, and learning content). The practicality measure consists of 12 items with indicators of attractiveness, convenience, and usefulness/purpose. The content validity step was completed before the instrument was employed. Similarly, practicality instruments are carried on to the external validity step. All 12 practicality instruments receive a moderate level of validity with a value range of .67-.89 and a high level of dependability with a value range of .85. The indicators and amount of items for each practicality instrument are shown in the Table 1 below:

Table 1
Test blueprint for practical experiment

No	Assessment Indicators	Number of Questions
1.	Attractiveness	4
2.	Convenience	4
3.	Usefulness/Purpose	4

The effectiveness of games designed to implement learning was measured using indicators such as finding information, understanding, interpreting, and integrating, assessing and reflecting, and responding and creating. Each indicator has five questions: finding information, understanding, interpreting, and integrating. Unlike the indicators of evaluating and reflecting, responding, and creating each have two points. It can be seen at Table 2. Despite the number of items varies, each indicator has a total score of 20. Expert validity and inter-rater reliability are measured during instrument testing.

Table 2
Test blueprint for effectiveness instrument

No	Assessment Indicators	Number of Questions
1.	Finding information	5
2.	Understanding	5
3.	Interpreting and integrating	5
4.	Assessing and reflecting	2
5.	Responding and creating	2

Data collection, analysis, and Interpretation

In this study, data was collected using a mixed-method sequential exploratory approach (Creswell, 2014). The Table 3 depicts the interweaving of the data collection phase and the development phase:

Table 3
Data collection procedure

Data collection of mixed method sequential exploratory		MDLC development model
Phase I	Exploration	Concept
Phase II	Product development	design, material collecting, assembly
Phase III	Testing and product distribution	testing and distribution

The analysis phase follows the model's development and implementation. The stage of concept analysis consists of the steps of goal analysis, user analysis, and content analysis in order to determine applications for learning to read with the theme "world-changing inventors." The design analysis stage, material collection, assembly with repeated cross-checks related to the accuracy of the development procedures carried out, and material availability. The testing results were analyzed in three steps: black box testing with compatibility parameters, sensitivity/according to commands, navigator button functions, sound, and sound effects. The percentage of eligibility from the assessment results of three experts is used to analyze the testing results on the expert test. Similarly, practicality percentages from student assessments as users are used to analyze practicality test results.

The feasibility and practicability of the resulting product were assessed using a questionnaire instrument and based on validators' and users' suggestions and criticisms. The total product practicality score is 880. The score was calculated using a maximum score of 88 and 10 respondents. The questionnaire used has a scoring range of 1 to 5. The obtained answers were then interpreted using the Table 4.

Table 4
Product feasibility and practicality interpretation

Achievement Levels (%)	Qualifications	
	Feasibility	Practicality
90 – 100	Very feasible	Very practical
80 – 89	Feasible	Practical
65 – 79	Less feasible	Less practical
55 – 64	Infeasible	Impractical
0 – 54	Very infeasible	Very impractical

The normality and homogeneity conditions were tested first when analyzing the effectiveness of the application of game products using an experimental design. The pre-test normality test for reading competence data in the experimental group was .075, and the post-test normality test was .112. Similarly, the control group had a pre-test of .118 and a post-test of .087. The experimental and control groups had homogeneity test results of .916 and .515, respectively. The significance value from all calculations was greater than 0.05, indicating that the reading competence scores in the experimental and control classes were distributed and homogeneous. As a result, the data in this study can be subjected to parametric statistical analysis. The normality and homogeneity calculation tables are presented in Table 5 dan Table 6.

Table 5
Tests of normality

READING COMPETENCE		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Pre_Test	Eksperimen	.089	134	.012	.982	134	.075
	Kontrol	.091	134	.008	.984	134	.118
Post_Test	Eksperimen	.099	134	.002	.984	134	.112
	Kontrol	.092	134	.007	.983	134	.087

a. Lilliefors Significance Correction

Table 6
Test of homogeneity of variance

READING COMPETENCE		Levene Statistic	df1	df2	Sig.
Pre_Test	Based on Mean	.011	1	266	.916
	Based on Median	.010	1	266	.921
	Based on Median and with adjusted df	.010	1	265.110	.921
	Based on trimmed mean	.010	1	266	.921
Post_Test	Based on Mean	.424	1	266	.515
	Based on Median	.340	1	266	.560
	Based on Median and with adjusted df	.340	1	254.025	.560
	Based on trimmed mean	.405	1	266	.525

FINDINGS

Cultural Context in the development of learning to read

The findings of a concept analysis of learning objectives from curriculum documents in grade VI of elementary school revealed the requirement for reading literacy on the sub-theme "world-changer inventors." The observation results showed that when learning took place, student learning activities are minimal, and interaction is limited to teacher to student. Cell phones frequently divert students' attention. Furthermore, interviews with homeroom teachers indicated:

> *"I hope that the material provided can be understood. Students are also expected to be able to learn independently."*

> *"Students prefer to play when told to read or do assignments."*

According to the findings of the document review and interviews, the objects required to support learning to read promote students' independence and interest in reading. Furthermore, the significance of engaging in technology-based learning media is determined during the user analysis while keeping the student's cultural context in mind. These requirements were determined through interviews with teachers:

> *"Interesting learning media is needed because most students are less responsive during the learning process."*

> *"Students prefer familiarity in their learning environment. It is hoped that the developed media will also be able to expose students to local culture."*

Because the questionnaire results showed that students have different favorite colors, user data for color selection focused on more than one themes/colors. Green, yellow, red, blue, and purple are the colors mentioned, and each is 20%. As a result, the media must use bright but gentle colors (pastels). In order to meet students' environmental needs, the game designed two main characters named Tara (boy) and Tenri (girl) (girl). In terms of naming, it is adapted to the Luwu Ethnic naming system. Tara was derived from the name Batara (cuts of Batara Guru and Batara Lattu in the La Galigo manuscript), and Tenri was derived from the name Wetenriabeng (also based on the La Galigo manuscript). In terms of appearance, skin color (tan and fair) is adjusted to match the skin color of the locals. At the same time, the clothes worn are bodo and tutu' (both red), which have been adjusted to age and traditional Bugis clothing. The cultural context is also manifested in the musical accompaniment, which attached a folk song called lembata tana Luwu. As stated in the lyrics, the music rekindles one's love for the lovely Luwu. Introduction (‘kenalan’), learning (‘belajar’), and playing (‘bermain’) are the three types of requirements related to the main features/menus (‘menu pilihan’) that must be provided in game applications. The display of the options menu can be seen in Figure 5.

Figure 5
Learning page menu

According to the character introduction menu, 70% of students chose media with a storyline based on interview results. In this regard, it is necessary to have a character who can act out the storyline in the game. The second required feature is a learning menu divided into two submenus: material and questions. The information in the submenu was derived from electronic school books and internet pages that can be scientifically verified. The material referred to in the sub-theme "world-changer inventors" was chosen based on the findings of a review of curriculum documents that included indicators to help students improve their reading literacy. Meanwhile, 80% of students preferred practice questions in educational games for the question submenu.

The play menu includes two simple games: flappy Tara and picture matching. According to 50% of students' demand, Flappy Tara is a game with a storyline and a supporting role for the enemies in the form of monsters. This game was designed to provide children with an easy mode game while also teaching them about their cultural context. The picture matching game was designed for advanced players and includes educational elements related to previously studied material. 90% of students want this so that the lessons in the game correspond to what is taught in school and include pictures. According to the context of the local environment, the game uses a scenic background with green grass. The game served as a reward for students who achieve a score of 80, and it can stimulate students' reading discourse. The analysis of the concept's needs revealed that the competency required by students is reading informational texts. The educational game's informative text is a text about world discoverers. Based on student responses, the Table 7 provided more information about common problems and the needs to learn to read.

Table 7
Problems and the needs to learn to read

Indicators	Needs				Descriptors	Problems			
	Unsure	Unneeded	Needed	Urgently Needed		Never	Once	Frequently	Always
Reading Competence	0	0	30	70	Finding Information	0	40	50	10
	0	0	20	80	Understanding	0	80	10	10
	0	0	90	10	Interpreting and Integrating	0	0	10	90
	0	0	40	60	Assessing and Reflecting	0	10	10	80
	0	0	50	50	Responding and Creating	0	0	10	90
Question Form	0	0	70	30	Answering Multiple choice questions	0	50	20	30
	0	0	80	20	Answering Complicated Multiple choice questions	0	10	20	70
	0	0	90	10	Matching	10	50	30	10
	0	0	30	70	Answering Brief Questions	0	30	50	20
	0	20	70	10	Answering Essay Questions	0	30	20	50

The data showed that in learning games, assessment questions with descriptions are optional. Only 10% of students had no problems with the form of matching questions, and students frequently require assistance with all other descriptors. As a result, game development is adjusted based on the competency level's problems and needs, as well as the type of assessment.

Development of reading-learning game applications

After determining needs, creating designs, and collecting materials, the application is assembled so that it is ready for testing (Figure 6). It was accomplished by utilizing the unity application as a game application builder.

Figure 6
Assembly process

Figure 7 illustrates some results from the BERLARI game application as a product that is ready to be tested:

Figure 7
Game product

The first submenu, Introduction, contains biographical information about Tara and Tenri in the form of narration and dubbing. The second submenu, Learning, contains two additional submenus, Material and Questions. The material menu contains ten brief inventor biographies accompanied by photographs and dubbing. The question menu contains ten questions in the form of interactive multiple-choice choices. The third submenu, Play, contains two simple minigames referred to as flappy Tara and picture matching (‘mencocokkan gambar’) (Figure 8).

Figure 8
Play menu page

The feasibility of the developed reading-learning game applications

The testing phase carried out by the author is divided into two stages. The first was black box testing which the author himself carried out. The second was a test conducted by three experts (information technology, learning media, and learning content). The three experts assessed the number and content of different aspects, namely aspects of software engineering, visual communication, and instructional design. The results of tests conducted by the author can be seen in the Table 8:

Table 8
Black box testing results

Parameters	Results	Information
Compatibility	Compatible to wide ranges of device	Devices Redmi Note 8, Realme 5, and Samsung Galaxy J3 (2016) were subjected to tests.
sensitivity/in response to the command	Well-functioned	-
Navigator Button	Well-functioned	-
Sound and sound effect	Well-functioned	-

The results of the application feasibility test conducted by three experts revealed that 89.5% of the manufactured products were deemed feasible on average. On a scale of 1 to 4, learning media professionals evaluate seven features of assessment. The final percentage of product value obtained from learning media specialists is 85.8 percent, with an utilization category. Experts in information technology evaluated a total of eight factors and determined a percentage value of 87.5%, which was included in the category of proper distribution. Meanwhile, learning content specialists evaluated eleven aspects. They received a percentage score of 95.45%, placing them in the category of feasible distribution. The final results of the three expert examinations are displayed in Table 9.

Table 9
Expert feasibility percentage results

Experts	Feasibility Persentage
Information Technologists	87,5% (feasible)
Learning Media Specialist	85,8%(feasible)
Learning Content Specialist	95,45% (very feasible)
Final Percentage	89,5%(feasible)

According to the data above, BERLARI game application that developed by the author is categorized as feasible.
Table 10 displays displayed the practicability test results obtained from the student response questionnaire.

Table 10
Practicability testing results

Respondents Code	Scores Obtained	Practicability Percentage	Categories
1BN	75	85,1%	Practical
2MA	77	87,5%	Practical
3Mag	88	100%	Very Practical
4AN	77	87,5%	Practical
5AA	76	86,2%	Practical
6MR	78	88,7%	Practical
7ST	85	96,5%	Very Practical
8NA	76	86,2%	Practical
9And	88	100%	Very Practical
10AP	77	87,5%	Practical
Totals	797		
Average		90,5%	Very Practical

The Table 10 depicted that, of the ten students sampled for the practicality test, seven obtained practical results and three obtained very practical results. The total number received a score of 797 out of a maximum of 880, or 90.5%, placing it in the category of being very practical. The results indicated that the final product is effective for reading instruction.

The results of the calculation of the total pre-test score for the experimental and control groups before treatment showed that there was only a slight difference with a difference in score of 91. The mean pre-test score for the experimental group was 64.04, while the control group was 63.37. After treatment, scores were significantly improved in both groups (Figure 9). The experimental group scored 11440, while the control group scored 10501, for a difference of 939. The difference was much more significant than the results of the pre-test. The mean of the experimental group is 85.37, while the mean of the control group is 78.37. It revealed that the increase in reading ability scores in the experimental group using game products was greater than in the control group using textbooks.

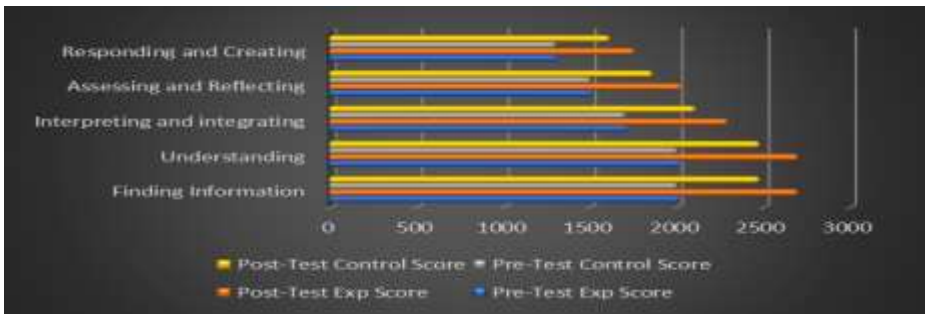

Figure 9
The increase in each indicator's score in the experimental pre-test and post-test control group design

The increase in the total score of reading ability as a result of the application of the developed game product is inseparable from the contribution of each reading indicator (Table 11). The results of the calculation of students' abilities on indicators of finding information and understanding reading are 23.53% each, Interpreting and integrating reading is 20.00%, evaluating and reflecting on reading is 17.65%, and responding and creating from reading is 15.29%. The percentage level showed the superior effectiveness of using developed games in finding information and understanding reading. However, further, development is needed to achieve indicators of evaluating and reflecting, as well as responding and creating.

Table 11
Calculation of the percentage gain for each indicator of reading ability

Descriptors	Finding Information	Understanding	Interpreting and integrating	Assessing and Reflecting	Responding and Creating	Total
Pre-Test Exp Score	2019.29	2019.29	1716.40	1514.47	1312.54	8582
Post-Test Exp Score	2691.76	2691.76	2288.00	2018.82	1749.65	11440
Percentage	23.53%	23.53%	20.00%	17.65%	15.29%	100.00%

The effectiveness of additional treatment as determined by differences between post-test and pre-test values for the experimental group is demonstrated in the Table 12.

Table 12
Paired samples test pre and post-test in experimental group

Reading Skills		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre-test group experiment - Post-test group experiment	-21.328	6.436	.566	-22.428	-20.229	-38.360	133	.000

The significance level for the test comparing pre-test and post-test values for the experimental group was .001 p<.05. The null hypothesis, H0, was therefore rejected, indicating that there was a statistically significant difference between the post-test and pre-test scores in the experimental group. Consequently, it can be concluded that reading skills acquired through the media game BERLARI were more significant than their previous abilities.

Similarly, a difference test was conducted with the control group to determine the efficacy of learning to read without using the developed BERLARI game media. The Table 13 shows the results obtained from the pre-test and post-test values of the control group.

Table 13
Paired samples test pre and post-test in control group

Reading Skills		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pre-test group experiment - Post-test group experiment	-15.000	5.354	.462	-15.915	-14.085	-32.433	133	.000

Based on the test results in the control group, it was found that there was a difference in the significance of .001 p<.05. Therefore, H0 is rejected, meaning there was a significant average difference between the pre-test and post-test scores in the control group. It meant that the reading skills without using the media game BERLARI developed were also more significant than their initial abilities.

In addition, in regards to the results of the paired samples test in the experimental and control groups, which both increased, it is necessary to test the similarity of the two means after treatment between the experimental and control groups (Table 14).

Table 14
Independent samples test table

		Equality of variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. Error Difference	Lower	Upper
Reading Skills	Equal variances assumed	.424	.515	-11.415	266	.000	-7.007	.164	-8.216	-5.799
	Equal variances not assumed			-11.415	262.587	.000	-7.007	.164	-8.216	-5.799

Based on the test results, it is known that there is a significant difference in the average learning outcomes of the experimental group and the control group, with a calculation of p = .001 <.05. It meant a significant difference in the average post-test between the two groups. The reading skills of the control group (M=78.37, SD=5.304) compared to the reading skills of the experimental group (M=85.37, SD=4.730), t (db7) =11.415 p=.001. Regarding Table 14, the increase in reading ability in the experimental group was higher than in the control group. This statement is reinforced by the calculation results of Cohen's value d = 1.399, which is <0.8 or is in a large category. It means that the use of games has a significant impact on producing differences between the experimental and control groups. Therefore, improving reading skills using game products developed in the experimental group is more effective than the control class, which did not use the BERLARI game.

DISCUSSION

According to the results of the concept analysis, students require technology-based learning media that are appealing, inexpensive, and easy to use. The display must be colorful, contain questions and images, have a storyline, monster characters, school-appropriate content, and be fun to play. The findings of this analysis, based on a number of studies, suggest that educational media should be vibrant, feature engaging characters and sounds, and be entertaining (Handikha et al., 2013; Hsiao et al., 2014; Huang, 2019; Hung et al., 2014; Matute -Vallejo & Melero-Polo, 2019; Tao et al., 2017; Ucus, 2015). According to Grimley et al. (2012) and Nami (2020), game applications are entertaining and attract attention. Additionally, Mahalingam et al. (2019) indicated that interactive and exciting games are required to improve students' reading literacy. In addition, Aljaloud et al. (2019), Huang (2019), and Nami (2020) suggested that learning media can influence the achievement of the desired competencies. Therefore, product development was carried out, expected to increase independence and facilitate students in achieving competency in reading lessons.

The results of the concept analysis also showed that learning media needed that is integrated with the local context and present meaningful learning while introducing local culture to students. This study's results aligned with Anggraini and Kusniarti (2017) that learning media that combines technology and local contexts can present fun and meaningful learning. Internalization of local context can also expose students to their culture. According to Qodariah and Armiyati (2013), further advantage of cultural internalization is that it serves as a filter for students against negative foreign cultures. Thus, technology-based learning resources that are engaging, affordable, easy to use, and integrated with local wisdom are required.

Students require informative text for reading learning content. Students are expected to comprehend the information presented by the author in informative texts. Elementary school students are in the pragmatic operational phase, which allows them to apply logic through concrete examples (Hayati et al., 2021). In this case, students are taught about the world's inventors using real figures, making it easy for them to absorb information

from readings. It corresponds to the reading competencies that students must attain in order to fulfill 21st Century skills. Finding information, understanding, interpreting, and integrating information, assessing and reflecting on reading findings, and responding to and creating from reading results are all examples (Aydemir & ztürk, 2013). All these competencies are needed and become a problem that needs to be solved together in contrast to the form of description questions that are not needed and the form of matching questions that are not considered a problem in learning to read. It can be accommodated in questions other than the educational game media that was developed. Van de Ven et al. (2017) suggested that to increase student interest and learning motivation, questions with the most appropriate difficulty level are needed to implement learning games.

The game applications that are created are compatible with smartphones, allowing students to easily access and utilize them (user analysis). It is comparable to Alzubi et al. (2019) and David and Roberts (2021) that the usage of applications on smartphones is simple, hence boosting engagement, self-efficacy, a positive attitude, the desire to gain knowledge, and the need for student performance in terms of reading competency. David and Roberts (2021) underlined that the convenience of playing educational games on smartphones facilitates independent learning at home and in the classroom. Furthermore, it was found that individual learning facilitated by the teacher results in effective learning (Cukurova et al., 2018). Consequently, by incorporating BERLARI game can improve student learning outcomes by increasing motivation and independence in learning. However, this study must examine student independence when using instructional games in a more complete manner. Therefore, future researchers must investigate learning independence as an intermediate variable connecting culture-based media, learning interest, and learning outcomes.

Three experts' results of the application feasibility test showed that the resulting product was categorized as feasible. The results of the feasibility value of the BERLARI Game application are in line with the interpretation table Handikha et al. (2013) that a product is categorized as feasible if it obtains a percentage value of 80-90%. Feasibility test plays an essential role in a study to show the quality of a product (Goldstein, 2015). The higher the results of the due diligence, the higher the product quality that may be utilized. Similarly, the findings of the product development effectiveness test suggested that the generated application might significantly promote students' reading skills. Finding information, understanding reading, interpreting, assessing, and responding to and producing from the provided text has become easier for students. In this study, the increase in students' reading ability varied across all parameters. Students' abilities in evaluating and reflecting, as well as responding and creating, still need to improve. It can be affected by various factors (Bakan & Bakan, 2018), including application content and class management in utilizing the BERLARI Game media. Thus it is hoped that there will be further development or modification in learning that is more oriented towards evaluating and reflecting as well as responding and creating indicators.

Improving students' reading skills as a result of internalizing the cultural context through the usage of a game application as a reading medium. The findings of this study are consistent with previous research Kharisma and Arvianto (2019), which found that using educational games based on local culture can improve students' primary reading skills. Exciting and engaging learning media piques students' interest in studying and makes it simple for them to grasp the learning content (Elsa et al., 2021; Grimley et al., 2012; Nami, 2020; Risnawati et al., 2018). The use of reading games based on local contexts, in addition to being simple to implement, improves students' interest in learning to read in order to increase learning independence. It was also shown that games that direct students' total concentration, are engaging, include demanding practice problems, and meet the criteria for competence and independence are required to increase students' reading skills (van de Ven et al., 2017). As a result, reading game apps that are internalized in the cultural context can help students enhance their reading skills.

CONCLUSION

The results of the concept analysis determine the type of game application developed in the form of engaging, contextual media based on local culture and android-based interactive, which encourages independent learning concerning the achievement indicators of reading learning. Game development involves character introduction features, learning by reading according to the curriculum, and play features. Ethnic characters, skin colors, attire, and music backgrounds from local genres are used to develop games. Through black box testing, products are classified as feasible. On average, the findings of the practicality tests are very practical. The effectiveness test results showed an increase in reading ability using the developed game product. Therefore, the results of this study have theoretical implications for providing knowledge related to the development of instructional designs that can be carried out by internalizing cultural context through online game applications. This study also has practical implications for using BERLARI gaming products in the learning process to attain fundamental competency, encourage teacher professionalism, and improve students' reading skills. The design provides a supporting influence in the form of cultural understanding to students as users by internalizing local wisdom into the application. To future researchers, the resulting product can be developed to achieve similar learning competencies.

This research is limited to changes in students' reading ability. Changes in interest and motivation, as well as other impacts from using the BERLARI game application, need to be studied. Future researchers are expected to be able to examine the impact of using the BERLARI game in addition to improving reading skills.

IMPLICATION

Media development can be accomplished by internalizing the local cultural context in order to overcome low interest and independent learning, which has a negative effect on students' reading ability. the findings of this study showed that the applications can be

adjusted to accomplish additional material learning skills. It is recommended that teachers and students can utilize the resulting game products as reading learning media.

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