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Development of *Pegalinu* Media in Digital Literature Capabilities and Numeration Basic Third-Grade in Elementary School Gugus Wibisono, Jati District, Kudus Regency

Budiningtyas, Ade Kalpika[1], Fajrie, Nur[2] & Utaminingshih, Sri[3]

[1*]Elementary School No. 2 Ngembal Kulon, Kudus, 59341 Central Java, Indonesia

[2,3]Muria Kudus University, Kudus, 59327 Central Java, Indonesia

*Corresponding author: adekalpika@gmail.com

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Abstract: This study aims to analyze needs and develop products through the game in third-grade elementary school. The learning media developed are media through Android applications that can be operated using computers, androids, and gadgets offline or online. In addition, the Development of game literacy and numeracy games in digital literacy and basic numeracy skills for third-grade elementary schools in the Wibisono cluster, Jati District, Kudus Regency. This research is a research development or Research and Development (R&D) using the Borg and Gall development method, which aims to develop android-based learning media in thematic learning by paying attention to three quality aspects: valid, practical, and effective. Data analysis consists of qualitative data and quantitative data. Qualitative data was used to analyze how the responses of teachers and students in carrying out thematic learning using the android-based *Pegalinu* media. Meanwhile, quantitative data analysis was used to analyze the data collected from the questionnaire. Based on the results of interviews, questionnaires, and observations, the level of learning media needs for literacy and numeracy games in the form of games android-based. The results of this media development have been tested for effectiveness with the results of accumulated scores by three material validators, namely 53,52,52 from a maximum score of 60. An average of 87% of material expert validators was obtained. The accumulation of 3 validators of media experts, namely 63.70 and 71, from a maximum score of 80, obtained an average percentage of 85%. The accumulation of expert users is 15,16,17 from a maximum score of 20, obtaining an average percentage of 80%. So that all three are included in the "Very Eligible" criteria. Feasibility is also supported by student and teacher questionnaire responses, which show an average percentage of 80.97% and 86.28%, with the criteria of "Good" and "Very Good." Based on the results of the T-test, it was found that t count > t table, i.e., 4,822 > 1,674, it can be concluded that there is a significant difference between the experimental group and the control group. So, *Pegalinu* media is effective in digital literacy and basic numeracy skills for third-grade in elementary schools in the Wibisono sub-district. Jati Kudus Regency.

Keywords: Development, learning media, literacy, numeracy

1. Introduction

Learning digital literacy and basic numeracy must be distinct from the demands of 21st-century skills. 21st-century learning focuses on activities to train students' skills in the learning process. Skills that must be mastered in the 21st century include critical thinking, problem-solving, creativity, innovation, collaboration, communication, metacognition, and digital and information literacy (Anthonysamy et al., 2020). The Indonesian government has tried to improve students' literacy skills. One of them is through literacy activities at school. Reading literacy for elementary school students is only carried out in primary school textbooks. It makes students less interested in reading because reading books could be more attractive. Besides that, the reading contents are written without pictures and colours, making students uninterested. The books read or used are just that, so students get bored quickly. Therefore, the teacher is critical in determining the quantity and quality of learning, ultimately affecting students' literacy skills.

In the era of technological progress, breakthroughs are needed to build innovative teaching and learning strategies. Learning media is a way to distribute knowledge to students and provides opportunities to explore learning activities and

**Corresponding author: adekalpika@gmail.com*

student learning resources (Puspitarini & Hanif, 2019). One form of learning innovation is to create exciting learning media in the form of technology-based educational games. According to Widodo (2018), media conveys messages or information in the teaching and learning process to stimulate students' attention and interest in learning. The influence of media and technological developments in education has made significant progress.

The interviews with third-grade teachers in the Wibisono cluster, Jati District, and Kudus Regency revealed limited media use. The learning media used are still in the form of books and pictures. According to the demands of the times, teachers must have breakthroughs in using and developing technology-based learning media, which should not be a foreign thing that technology influences the current learning process. A teacher needs the formula to create a competitive generation with a global perspective through technological advances. Teachers should be able to develop their creativity by creating learning media, especially literacy-related ones. Eristi & Erdem (2017) revealed that one of the things that can be done to develop literacy or literacy skills is to use educational game media. Educational games are software tools for developing student abilities' patterns through soft skills, focus, and insight using digital media.

Using learning media in the implementation of learning can improve the quality of learning. Research that supports solving this problem is Dita et al. (2021) research on the Development of E-Bookstore-Based Learning Media to Improve Reading Literacy for Elementary School Students. Based on the results of the Development, the E-Bookstore-based learning media can be very effectively used to improve students' reading literacy. It is proven from the validation results by three expert lecturers, one material expert lecturer, and two media expert lecturers. The results of material validation get a score of 49 with a percentage of 82%, so it is categorized as very high and feasible to use. It is seen in the results of validation media 1, obtaining a score of 47% of 67%. It results from validation media 2, obtaining a score of 43% of 61%, categorized as high and feasible. The research done by Desy et al. shows that the media developed is feasible and effective in improving students' reading literacy skills. In line with the research that will be carried out by researchers, namely developing a media that can improve digital literacy skills in this era of technological advances, a learning media is needed following the developments and demands of the times. This kind of learning is a learning experience using technology (Moore et al., 2011). Technological advances require a teacher as an educator to consistently innovate and vary in creating learning media that can support student understanding (Norman & Furnes, 2016).

IT-based media has been used as projectors but has yet to be used. It makes students less developed. One solution to overcome these problems, researchers, will develop media, namely the *Pegalinu* media. Media *Pegalinu* is the Development of learning media in the form of games where the media is helpful in learning, namely increasing literacy and numeracy skills through Android-based applications. The display is attractive, accompanied by various illustrations that make it easier for students to understand the game's content.

Based on this background, this study's formulation is: 1) How is the Development of *Pegalinu* media in digital literacy and basic numeracy skills for third graders in elementary school all Cluster Wibisono, Jati District, Kudus Regency? 2) How is the effectiveness of *Pegalinu* media in digital literacy skills and elementary numeracy for grade III in elementary school all Cluster Wibisono, Jati District, Kudus Regency? The objectives of this research are 1) to develop the *Pegalinu* media in digital literacy and basic numeracy skills for third graders in elementary school all-Cluster Wibisono, Jati District, Kudus Regency, 2) Testing the effectiveness of the *Pegalinu* media in digital literacy and basic numeracy skills for third-grade in Elementary Schools all Cluster Wibisono, Jati District, Kudus Regency.

2. Literature Review

According to Astuti et al. (2021), the learning process activities are a sequence of acts by teachers and students based on reciprocal connections that take place in educational circumstances to attain specific goals. Teaching is a type of activity in which there is an interaction between educational personnel and students during the learning and teaching process. Training is similar to teaching, but it focuses on the development of specific abilities.

Preliminary observations of the learning process of social science education in third-grade revealed that, thus far, the instructor used learning media in the form of textbooks and worksheets on map material. Students work on the questions in the book and take notes from the teacher in front of the class as part of the learning exercises (Nadrah, 2023). This demonstrates that the teacher has not been able to maximize the learning media, indicating that the teacher requires interactive learning media.

According to Utomo et al. (2021), media is a means of channeling messages or learning material to be delivered by the message source to the target or recipient of the message. Teachers can employ learning media in their teaching and learning activities. This is consistent with Nurpratiwiningsih & Setiyoko (2018) belief that the use of learning media in teaching and learning activities can produce new interests and desires, motivate and stimulate learning activities, and even have a psychological impact on the learner. Thus, learning media that are less than ideal in their implementation of teaching and learning activities can have an impact on their students' learning results.

Despite widespread agreement on the significance of developing young children's early mathematics skills, opportunities for mathematical learning in preschool are limited. Identifying effective policy interventions for adults with inadequate literacy and numeracy abilities is becoming increasingly critical (Windisch, 2015). Despite advances in measuring adult skills and a wealth of literature outlining strategies used in adult literacy and numeracy programs, there has been little research into the effects of various interventions on learners. Tackling major literacy and numeracy deficiencies is difficult since the group of low-skilled individuals is heterogeneous and necessitates several well-targeted

interventions (Verbruggen et al., 2021). However, there is also a growing body of data on teaching and learning approaches that can make a life-changing difference for adults in need. One way to improve students' reading and numeracy skills is to use interactive learning media and the appropriate methodology (Aprilia et al., 2023).

3. Methodology

The research used by the researcher is Research and Development. According to Richey & Klein (2014), development research is a process or steps to develop or improve a new product, which can be accounted for. The steps for implementing the research and development strategy of Richey & Klein (2014) include 1) Research and information collecting (research and data collection through surveys); 2) Planning; 3) Developing a preliminary form of product; 4) Preliminary field testing; 5) Main product revision; 6) Main field testing; 7) Operational product revision; 8) Operational field testing; 9) Final product revision; and 10) Dissemination and implementation.

Data analysis is in the form of preliminary data before the research, product development process data, product feasibility data, and data on the effectiveness of literacy and numeracy game learning media. Sources of data were obtained based on data on problems in the field, data on needs, data on the feasibility of the product being developed, and data on the product's effectiveness. Next, the qualitative data collection technique used in this study was documentation, interviews and observation, while the quantitative data collection technique was through tests and questionnaires.

4. Results

The materials and tools used to manufacture the game are computers/laptops using PowerPoint software, Camtasia, Cool Edit Pro, HTML 5 Ispring, and Web 2 APK Builder. The steps of media development are: 1) Create animated images in PowerPoint, 2) Publish media with Camtasia, 3) Include narration with Cool Edit Pro and publish media, 4) Create android learning media templates with materials, games, practice questions, Quiz, and profiles, 5) Publish to HTML 5 with Ispring suit, 6) Publish Apk (android) with web 2 APK. In the results of the Development of learning media, there are five menus, namely a) Material, b) Game and Practice Questions, c) Evaluation, and d) Developer Profile.

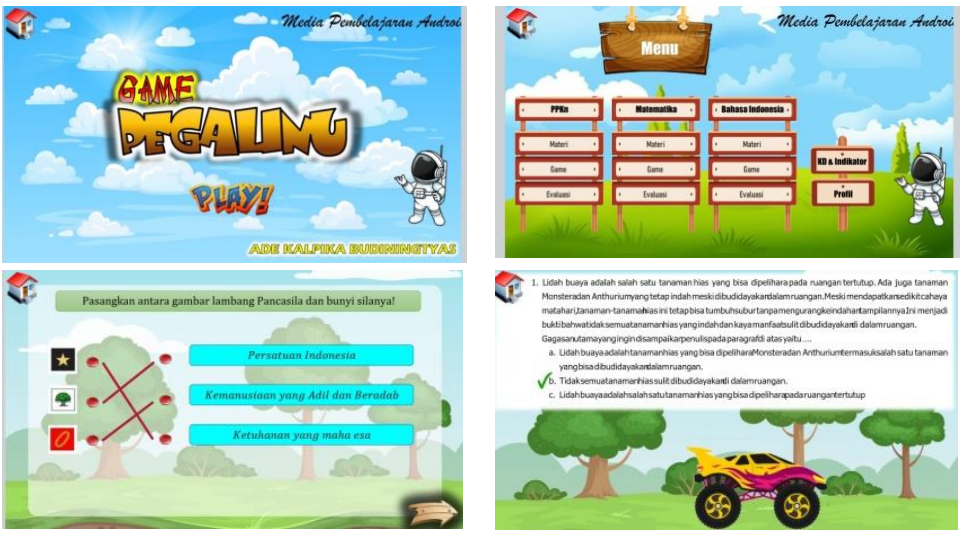

Figure 1. *Pegalinu* game display

In its presentation context, an educational game provides education, whether inserted through story information or the gameplay itself (Ramadhan et al., 2019). The initial view presents the main numeracy literacy game learning media description. The display is made attractive by the students' character. In addition, there is also a material menu as the first step that students must go through before moving on to the game menu. The material contains KI and KD that have been previously adjusted. There is also a menu of practice questions and evaluations where students can measure the extent of their digital literacy understanding of the material presented.

After the product development in the form of learning media is completed, the next step is to test the feasibility of the development product or test validation by experts. Tests are carried out to assess whether the product of learning media development matches media quality and scientific standards. Therefore, it is necessary to involve experts in their fields at this stage. Suggestions and inputs from experts are given to achieve good quality standards of learning media so they are very useful for the perfection of the products developed. The results of the expert assessment were used as consideration for researchers in conducting the revision stage of the developed learning media. The results of the assessment by the experts will be presented in Table 1.

Table 1. Recapitulation of expert validator assessment results

No.	Type of validators	Percentage	Criteria
1	User expert	80%	Very eligible
2	Material expert	87%	Very eligible
3	Media expert	85%	Very eligible

The results of media development have been tested for feasibility and validity with the results of accumulated scores by three material validators, namely 53,52,52 out of a maximum score of 60. An average of 87% of material expert validators was obtained. The accumulation of 3 validators of media experts, namely 63.70 and 71 from a maximum score of 80, obtained an average percentage of 85%. The accumulation of expert users is 15,16,17 from a maximum score of 20, obtaining an average percentage of 80%. So that all three are included in the "Very Eligible" criteria. In line with this statement, Shofiana & Umam (2022) said that the Development of learning media could be valid if the weight score obtained is greater than 70%. Media effectiveness test data is obtained from questions given to students in several elementary schools. The questions were given to the experimental group and the control group. In this case, the Post-test Only Control Group Design is selected. -test Only Control Group Design scheme Post is shown in Table 2.

Table 2. Scheme post-test only control group design

Group	Treatment	Experimental
O	X	O
Control	-	O

(Sugiyono, 2011)

In this design, neither the experimental nor control group was selected randomly. In this design, the experimental and control groups were compared. The experimental Class received treatment, while the control class did not. The experimental group is Elementary School No. 1 Ngembal Kulon and Elementary School No. 2 Ngembal Kulon. The control group is Elementary School No. 3 Ngembal Kulon and Elementary School No. 4 Ngembal Kulon. The experimental group received treatment using the game Numeracy Literacy, while the control group was without any treatment, as shown in Table 3.

Table 3. Data value of the experimental group and control group

No.	Value	Experiment	Control
1	Highest score	92	80
2	Lowest score	60	48
3	Average score	77.88	65.40

Based on the developed media's evaluation results, the experimental group's average value is 77.88; the highest score is 92, and the lowest score is 60. The average score in the control group is 65.40, the highest score gets 80, and the lowest score gets 48. The average value shows that the game of numeracy literacy is used in learning. It aligns with the research conducted by Krishnan (2023), where research using the Post-test Only Control Group Design revealed that the output results obtained a t-count value of -9.706 < 1.992. There is a significant difference between the experimental and control classes, which means that instructional media greatly influences the evaluation results—using 2D animation-based learning media with student learning outcomes that do not use 2D animation-based learning media. So, it can be concluded that there are differences in student learning outcomes.

The effectiveness of the game, prerequisite tests, and limited field trials were carried out as follows. A normality test described whether the experimental and control groups were normally distributed. The results of the normality test using SPSS are shown in Table 4.

Table 4. Normality test

Learning outcomes	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
	Experiment	.130	35	.145	.963	35	.281
	Control	.128	20	.200	.949	20	.353

a. Lilliefors significance correction

The results of the Normality test output above show that Experiment Class = Sig. 0.145 > 0.05, then the research data is normally distributed. Control Class = Sig. 0.200 > 0.05, then the research data is normally distributed. A homogeneity test was conducted to show whether the experimental and control groups had the same variance. In this study, the normality test was carried out using the Levene test with the help of the SPSS 17.0 program. The results of the

homogeneity test are shown in Table 5. The level of significance used is 0.05. If sig > 0.05, it is homogeneous; if sig < 0.05, it is not homogeneous.

Table 5. Test of homogeneity of experimental and control groups

Levene Statistics	df1	df2	Sig.
.822	1	53	.369

Based on the homogeneity test, obtained significance, then H0 is accepted, and the data is homogeneous (same). Due to the significance of 0.420 > 0.05, it can be concluded that the existing data is homogeneous.

Hypothesis testing was carried out after the normality test and homogeneity test stages. The results of the two tests found that all data were normally distributed and homogeneous, so parametric statistical tests could be performed with the T-test. With the condition that the error rate was 0.05 or 5%. If t count < t table, accept H1; if t count > t table, accept H0. The normality and homogeneity tests previously concluded that the data from the control and experimental Classes were usually distributed and came from samples with the same variance (homogeneous). The next stage is conducting a t-test to determine the average value of the two groups and whether there is a significant difference. The t-test results of the control and experimental class values were carried out using the test SPSS 17.0 T sample paired. There was a significant difference between the experimental group and the control group. In addition, a questionnaire was distributed in a field trial to determine the effectiveness of the developed product. The results of filling in the teacher and student response questionnaires in the main field trial can be seen in Table 6.

Table 6. Student response questionnaire results in the main field trial

No.	Aspects Assessed	Percentage
1	Display	81.25%
2	Presentation	80.33%
3	Usefulness	81.33%
Overall Average Percentage Score		80.97%

Based on the questionnaire results on student responses to the *Pegalinu* learning media, satisfactory results were obtained with an average percentage of 80.97%. Several aspects were assessed, namely the *Pegalinu* game media display aspect, which obtained a percentage of 81.25%. It indicates that the *Pegalinu* game media display is good and liked by students. Furthermore, in the presentation aspect, in presenting the *Pegalinu* game, several materials have been adapted to core competencies and basic competencies. Appropriate language and the display of the navigation buttons are considered relatively easy and liked by students with a percentage of 80.33%. The last aspect is usefulness, where the *Pegalinu* media is very beneficial and helps students understand the information in the game, as evidenced by the satisfactory scores obtained. It shows that students' responses to the *Pegalinu* media are generally high. Students are also enthusiastic about receiving learning with the help of *Pegalinu* media. This statement is reinforced by Novitasari (2016), which reveals that the combination of exciting pictures, animations, and sounds will eliminate the boredom experienced by students because learning is not monotonous and makes students interested in studying the material presented.

Table 7. Results of teacher response questionnaires on main field trial

No.	Aspects Assessed	Percentage
1	Display	85.93%
2	Presentation	85.41%
3	Usefulness	87.5%
Overall Average Percentage Score		86.28 %

5. Discussion

The average score of each aspect of filling out the teacher response questionnaire at the main field trial stage shows results with the "Very Good" criteria. Based on the results of filling out the questionnaire, *Pegalinu*. Media developed in terms of appearance obtained a percentage of 85.94%, shows according to the teacher's response, the display is decent and reasonable according to the Development of students. Judging from the presentation aspect, it also obtained a percentage of 85.41% in presenting the material, content, and navigation buttons contained in the *Pegalinu* media were excellent and easy to accept. Furthermore, 87.50% is also obtained from the usefulness aspect, which shows that the *Pegalinu* media is beneficial in delivering learning materials. This understanding can be seen from the scores obtained by students who exceed the minimum completeness criteria and students' enthusiasm for using *Pegalinu* media. In line with this, Widiastika et al. (2021) explained that the presence of android-based media could improve the quality of learning and attract students' attention, increasing student motivation in learning so that they can understand learning materials better and achieve learning goals. Meanwhile, Widiastika et al. (2021) revealed that students would prefer

something interesting such as image visualization, attractive colors, and exciting animations, to improve understanding and learning outcomes. So, the learning media for numeracy literacy games is feasible and effective to use in digital literacy and basic numeracy skills for third-grade elementary school students in the Wibisono cluster, Jati District, Kudus Regency.

The capacity to think critically in mathematics can be improved by routine and non-routine tasks that use worksheets to assess students' numerical and verbal abilities. Each teacher assesses students' levels of knowledge, numerical abilities, and linguistic talents in order to direct pupils to be more critical in solving math problems (Rahmawati et al., 2021). Teachers can be referred to as change agents, and change agents must be professionally competent in order to promote a learning mentality (Iskandar & Zulela, 2021). The indications of analyzing problems, solving problems, and making judgments can be used to assess critical thinking capacity in elementary school mathematics learning.

Students' efforts in the process of increasing literacy and numeracy can improve students' abilities in the process of improving literacy and numeracy by employing consistency learning approaches in practicing reading, discussing, counting, and displaying learning videos. And, of course, with the help, excitement, and willingness of pupils to study, the process can be accelerated.

The advantages of this literacy and numeracy habituation practice are as follows: 1) students become familiar with AKM-based questions; and 2) students' literacy and numeracy skills improve. Because the family and community environment pushes kids to always speak the local language to interact every day, especially low grade pupils, students find it challenging to read Indonesian. Because language for communication has a significant impact on the progress of student literacy, and students must have good thinking and communication abilities in order to have good literacy and numeracy competence (Safari & Khasanah, 2023).

6. Conclusion

Based on the results of this development research, it can be concluded as follows: 1) the results of this media development have been tested for effectiveness with the results of accumulated scores by three material validators, namely 53,52,52 from a maximum score of 60. An average of 87% of material expert validators was obtained. The accumulation of 3 validators of media experts, namely 63.70 and 71, from a maximum score of 80, obtained an average percentage of 85%. The accumulation of expert users is 15,16,17 from a maximum score of 20, obtaining an average percentage of 80%. So that all three are included in the "Very Eligible" criteria. Feasibility is also supported by student and teacher questionnaire responses, which show an average percentage of 80.97% and 86.28%, with the criteria of "Good" and "Very Good; 2) product trials are carried out through limited trials and large-scale trials. The wide-scale trial was obtained from the post-test results of the third-grade students of Elementary School No. 1 Ngembal Kulon and Elementary School No. 2 Ngembal Kulon as the experimental Class, compared with the post-test results of the control class at Elementary School No. 3 Ngembal Kulon and Elementary School No. 4 Ngembal Kulon. After that, the effectiveness test was carried out using. A prerequisite test is performed, with normality test results showing that sample data is normally distributed, and the homogeneity test indicates that sample data is the same or homogeneous—the results post-test significance value of 0.000 <0.05 means that it can be concluded. There is an average difference between the control and experimental classes post-test. It shows that the average post-test of the experimental Class is higher than the average of the post-test of the control class. It was found that t count > t table, i.e., 4.822 > 1.674, it can be concluded that Ho is rejected and Ha is accepted. There is a significant difference between the experimental and control groups. The statistical test results concluded that the Development of numeracy literacy learning media was proven to be effective in digital literacy and basic numeracy skills for third-grade elementary school students.

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