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DEVELOPMENT OF ANDROID-BASED METAVERSE MEDIA TO IMPROVE NUMERATION LITERACY OF CLASS V STUDENTS IN PRIMARY SCHOOLS

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ABSTRACT

The research is motivated by the problem of mathematics learning in class V of elementary schools. It is known that students have difficulty collecting data in story form, so students' numeracy literacy is considered low. Research to determine mathematics learning problems related to numeracy literacy in grade V elementary schools. The research uses the *Research and Development (RnD) method* and the *Lee and Owens model.* The data collection techniques used were interviews, observation, media validation, materials, language, practitioners, student and teacher responses, numeracy literacy questionnaires, and test questions. The effectiveness test (N-*Gain)* obtained *a mean of* 65.4 %. So, the media is considered effective in use, so it is concluded that Android-based metaverse media can increase the numeracy literacy of fifth grade elementary school students.

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1. INTRODUCTION

The 2013 curriculum is one of many curricula used and implemented in Indonesia. Implementation curriculum 2013 No regardless from use ICT (technology information and communication). In line with the regulations in Minister of Education and Culture Regulation No.22 of 2016 about Standard Competence Graduate of as well as Standard Contents in utilization information and communication technology to increase efficiency and effectiveness learning. With so in chapter the known that the use of ICT in learning can be put to good use capable increase efficiency and effectiveness learning in school. BesidesTherefore, the use of ICT has a big role in learning media use provide variety meaningful learning as well as fun. Utilization of ICT in the 21st century known as the technological age It's nothing new for teachers, everyone is required to be technologically literate and *updated* to information. Understand and study information only possible to do with ability literacy. Literacy is ability language, speak, read and write, as well as ability think (Padmadewi & Artini, 2018). Literacy related with the ability to read and write. To achieve literacy skills, The initial foundation is the ability to read, understand, study, analyze, conceptualize return so that capable think in a way critical (Irianto & Febrianti, 2017). According to GLS (2018), literacy Not only knowledge And proficiency read write, But Also includes numeracy, science, digital, finance, as well as culture and citizenship ends on behavior in everyday life.

Literacy numeracy is Wrong One type of literacy Which No lost importance from literacy read. Literacy numeracy is knowledge And the ability to use a variety of numbers and symbols associated with basic mathematics to solve practical problems in everyday life days ago analyzing information displayed in various forms as well interpret results analysis For predict And take decision (Mahmud & Pratiwi, 2019). Literacy numeracy in Indonesia Still is at in level low, in accordancewith the results of PISA research data. The results of the PISA research show that level literacy Indonesia Still low, Study year 2019 show that Indonesia's reading ability score is ranked 72nd out of 77 countries, then mark ability mathematics There is in ranking 72 from 78 country, and mark science ability is ranked 70th out of 78 countries. From the results of these data, one solution is that students are required to have skills literacy base for form student capable face challenge inThen day, remember that literacy in Indonesia Still low, so it is hoped that teachers can increase student literacy rates both through the media learning concrete or media digital. Literacy and numeracy skills are useful for improving quality a nation on era of technological development moment This. In line with the opinion of (Shofiya Launin et al., 2022). That technology/science and technology is influenced by humans and adapts to developments over time.

Results of observations and interviews with class V teachers at SDN 1 Wonorejo and SDN 2 Sukorejo, the results showed that one of the basic competencies (KD) The 2013 curriculum that students in class V must master is data collection. It is known that students have difficulty collecting this material data especially in the form of stories, so that numeracy literacy in this class on eye lesson mathematics assessed low. The low literacy numeracy due to several reasons, including teachers not utilizing the media maximum learning on data collection material, learning activities on material the only use book as support for support learning so that activities are felt to be less efficient and effective learning Still nature centered on Teacher or *teachers centered.* The main problem that causes students to still not be able to solve itlearning Which based literacy numeracy is Teacher Which Not yet get used to student with questions based on numeracy literacy.

Wrong One method increases literacy numeracy that is with media learning metaverse based android. Media metaverse is a set room virtual, place user makes and explore world with other internet users. Users don't need to be in the room the same physical as other people (Themistocleus et al., 2023). Metaverse comes from the words *meta* which means virtual and *verse* which means universe or world. Technology metaverse means use metaverse on android Which supported by technology Where there are avatars, avatars are naming condition from activity Which shown by appearance picture 3 dimensions in a way virtual. Users will interact as if they were real with everything, they find in the world virtual. Metaverse is digital-based media. Metaverse advantagesas media learning digital according to (Husnussaadah, 2021) is shorten time process Study teach so that more efficient, makes interaction between teachers and students easier, students can access the material learning every moment, Teacher can displays variation media Which will used, student always obtain information latest For supportlearning, activity Study can accessible without limit place And time, creation communicate easily and routine. A form of learning optimization can be seen if learning activities tend to be student-centered which is supported by factual experiences experienced by students (DY Putri et al., 2022). Technological literacy encourages more active, innovative and interactive learning (Alim et al., 2021).

There are several problems, including: Not yet exists media learning metaverse based android Which able to improve numeracy literacy in class V and Lower literacy skills numeracy student in the classroom V. So, the research problem can be formulated: How? validity, practicality, attractiveness and effectiveness of Android-based *metaverse learning media* For increase literacy student numeracy class V Elementary school. Research purposes, to obtain validity data, data practicality, data attractiveness and data on the effectiveness of Android-based metaverse learning media for increase literacy student numeracy in class V Elementary school.

Previous research that is relevant to this research is research Which done by (Rusdiansyah & Leonard, 2021) with title "Development Media Learning *Motion Graphics* Mathematics Based Android in Class V Elementary School Students Semester 1". The results of this research are media developed is suitable and meets the requirements for use as media Android-based *Motion Graphic mathematics* learning for class V students 1st semester of elementary school. Second, (Female FS, 2022) with title "Development Media Learning Application Multimedia In order to improve students' *online* learning literacy and numeracy." Results research This that is increasing literacy and numeracy student, make learning felt pleasant than learning usually. Third, (Setiawan, 2022) with title "Analysis of *Metaverse Potential* in the World of Education in Indonesia". The results of this research are: *Metaverse* believed capable overcome limitations Which There is in world education, such as: restrictions on class capacity due to the pandemic, distance restrictionsand time to attend class, etc. The concept of cyberspace makes learning *online* is more interactive without compromising the student's learning experience at any time, in were just. The difference between this

research and previous research is study This researcher will plan, develop and apply media learning metaverse based android form question literacy numeracyaccompanied picture *virtual* on material collection data. Implementation media This conducted on fifth grade elementary school students in 2022/2023. Whereas previous research was conducted from 2021 to 2022. Eq This research and previous research were both carried out on student class V, increase literacy numeration uses multimedia. Based on problem the researcher interested in do research with the title "Development of *Metaverse-* Based Learning Media Android for Increase Literacy Numeracy Student Class V in School Base".

2. RESEARCH METHODS

The type of research used is research and development (Research *and Development)*. This research uses the *Lee & Owens development model* which has 5 main stages. Steps *Lee & Owens* development, namely, (1) assessment/analysis (assessment*/analysis*) which includes a needs assessment *and* initial and final analysis (*front-end analysis*), (2) design, (3) development, (4) implementation (*implementation*), and (5) evaluation (*evaluation)*. Study This implemented in SDN 1 Wonorejo and SDN 2 Sukorejo District Gandusari Regency Trenggalek for 1 month, from May 15, 2023, to June 15, 2023. So, sample Which used that is There are 12 class V students at SDN 1 Wonorejo student, whereas in SDN 2 Sukorejo amount 16 student. With total overall student sample class V school year 2022/2023 is 28 students.

The data analysis technique at this research stage uses techniques quantitative data analysis and qualitative data analysis techniques. At this quantitative stage it is used to test the effectiveness or suitability of the media learning that has been developed and testing the suitability of learning with data collection material for mathematics subjects. There is a questionnaire expert validation using a *Likert scale* consisting of 4 scores. According to Sugiyono (2017) scale *likert* used in develop instrument to measure the attitudes, perceptions, opinions of a person or group person regarding a potential or problem object, product design, process manufacture product or product Which made. The qualitative data analysis stage used is descriptive data analysis Qualitative aims to process information data from questionnaire results in the form of criticism and suggestions by experts, teachers, and students. This technique is used to find out information and grouping information from data qualitative Which form feedback, criticism, suggestions for improvement, and revision of *metaverse* learning media based *android.*

Population is a combination of all elements that form events, things, or person Which own characteristics similar Which become center attention researcher. In this research, researchers can interpret that, the population is amount from overall student Which made as object research by researchers. In Sugiyono's opinion (2017), explains that population is region generalization Which consists of object/subject Which have certain qualities and characteristics determined by researchers for studied so that conclusions can be drawn. This study used a population of 380 students in class V Semester 2 of the 2022/2023 academic year in Gandusari District. student. Sample is part of population size which has been set which has certain characteristics and qualities to be researched. According to the opinion of Sugiyono (2017), explain that sample is part from amount and characteristics yng owned by population the. Researcher in do Sampling must be careful to obtain working sample results for his research. Technique *sampling* Which used by researcher in determine *sampling* that is is technique *purposive sampling.* According to Sugiyono's opinion (2018), explains that *purposive sampling* is sampling using certain appropriate considerations with the criteria desired by the researcher to obtain a sufficient sample size researched. So, sample Which used that is part student class V in SDN1 Wonorejo and SDN 2 Sukorejo from the two elementary schools were used as samples in research. It is known that the sample size of class V students at SDN 1 Wonorejo is 12 student, whereas in SDN 2 Sukorejo amount 16 student. With total overall student sample class V school year 2022/2023 is 28 students.

Researchers used interview instruments and observations to directly observe the process of learning activities related to school and student conditions before using Android-based metaverse learning media. Researchers also chose to use questionnaires as *a pretest* and *posttest* in data collection instruments with closed and direct questionnaire types and used a *Likert scale* (graded scale) to measure the increase in students' numeracy literacy given before and after a treatment was given. Researchers also use documentation to prove the truth of the learning process that has been carried out. Before being used, the researcher had tested the validity and reliability of this research instrument in data processing using the SPSS version 25.0 program with the aim of finding out whether each question item was valid to use and whether the test used through the questionnaire was reliable. Next, a data normality test and a data homogeneity test were carried out with the help of SPSS version 25 to be able to answer the formulation and hypothesis of this research. Hypothesis testing uses the *Independent Sample t-test,* the aim is to find out the difference with the provisions if the sig level. (2- *tailed) pretest* and *posttest* of 0.00. So, it can be concluded that H_0 is rejected, which means it exists differences in numeracy literacy abilities before and after media use learning Android-based metaverse. Effectiveness test to determine the effectiveness of the application of the media developed

to be effectively used to improve literacy skills student numeracy. The *N-gain* test was carried out using SPSS 25.0 *software*.

3. RESULTS AND DISCUSSION

Data analysis was carried out after all data was collected. Before the instrument was given to the research sample, a validity test was carried out with a correlation formula using SPSS 25.0. Then the reliability test with the *Alpha Cronbach formula* is used to determine the level of confidence in the instrument. The following table summarizes instrument tests which include validity tests and reliability tests:

Table 1. Test Validity *Pretest*

No. Question	r tabler count		information
1	0.37	0.518	VALID
2	0.37	0.431	VALID
3	0.37	0.766	VALID
4	0.37	0.789	VALID
5	0.37	0.682	VALID

Table 2 Test Validity *Posttest*

No. Question	r count	r table	information
1	0.37	0.838	VALID
2	0.37	0.838	VALID
3	0.37	0.838	VALID
4	0.37	0.838	VALID
5	0.37	0.926	VALID

Based on table 1 above, it is known that from *the pretest* carried out For all student respondents, it is known that the dominant $_{\text{table r}}$ is greater than the $_{\text{calculated r}}$, which shows that the results of this study are valid. Based on table 2 above, it is known that from *the posttest* carried out of all student respondents it is known that rtable is greater than rcount, which shows the results This research is all valid. From the two tables above can concluded that after exists use media learning metaverse based android proven increase ability literacy student numeracy. Criteria testing if $r_{\text{count}} < r_{\text{table}}$ so tool measuring the stated valid, And on the contrary if $r_{\text{count}} > r_{\text{table}}$, then tool the measure is not valid.

Test data analysis prerequisites to test hypotheses through normality and homogeneity tests. The normality test is carried out using *Kolmogorof Smirnov* using the SPSS 25.0 program with level significance 0.05. If mark significance results mark measurement ability literacy numeracy student > 0.05 so results mark ability measurement literacy numeracy student distributed normal.

Table 3 Results Test Normality

Tests of Normality

		Kolmogorov-Smirnov [a]			Shapiro-Wilk		
	class	Statistics	df	Sig.	Statistics	df	Sig.
results	pretest	,124	28	,200 *	,963	28	,402
	posttest	,119	28	,200 *	,946	28	,153

Based on the results of the normality test using *Kolmogorof Smirnov* show that data distribute normal which is indicated by the significance value on *the pretest* 0.402 and significance value *posttest* 0.153 result of measuring numeracy literacy skills students > 0.05 then the results of measuring students' numeracy literacy abilities distributed normal.

The homogeneity test is used to determine the existence of data from two or more groups are homogeneous (same) or heterogeneous (not the same). Test homogeneity This done with use *One-way* ANOVA calculated using help program SPSS with level significance 0.05. From the results that will be obtained if the significance value shows > 0.05 so variant data homogeneous.

Table 4. Results Test Homogeneity

Test of Homogeneity of Variance

		Levene Statistics	df1	df2	Sig.
results	Based on Mean	3,863	1	54	,055
	Based on Median	2,851	1	54	,097
	Based on Median and with adjusted df	2,851	1	51,709	,097

	Based on trimmed mean	3,737	1	54	,058

Based on the results of data measuring literacy abilities The numeration of the *pretest results* has a significance value of 0.055 > 0.05 means data ability literacy numeracy student distribute normal. Mark The posttest significance was 0.097 (> 0.05), which means the variance of ability literacy Student numeracy is homogeneously distributed.

Table 5 Results Test Hypothesis
Independent Samples Test

		Levene's Test for Equality ofVariances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
results	Equal variances assumed	3,863	,055	-10,877	54	,000	-15,250	1,402
	Equal variances note assumed			-10,877	50,245	,000	-15,250	1,402

Hypothesis testing in this research uses *a paired sample t-test* to find out whether there is difference average two sample Which not paired. Test *paired samples t-test* use help SPSS 25.0. Based on mark sig. (2-tailed) *pretest* and *posttest* of 0.00. So, it can be concluded that H_0 is rejected, which means it exists differences in numeracy literacy abilities before and after media use learning Android-based metaverse.

Table 6 Test Effectiveness *N-gain*
Cases Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
NGain_percent	28	100.0%	0	0.0%	28	100.0%

Descriptives

			Statistics	Std. Error
NGain_percent	Mean		65.4464	3.19365
	95% Confidence Intervals forMean	Lower Bound	58.8936	
		Upper Bound	71.9992	
	5% Trimmed Mean		65.4015	
	Median		67.8710	
	Variance		285,583	
	Std. Deviation		16.89921	
	Minimum		33.33	
	Maximum		100.00	
	Range		66.67	
	Interquartile Range		27.32	
	Skewness		-,125	,441
	Kurtosis		-,650	,858

The effectiveness test is used to determine the effectiveness of the application of the media that has been developed to be effectively used to improve literacy skills student numeracy. The *N-gain* test was carried out using SPSS 25.0 software. Based on the results of the *N-Gain* test in media use to improve students' numeracy literacy skills, show the mean value or average as big as 65.4% Which including in category effective can It was concluded that the use of Android-based metaverse learning media effective to improve abilities student numeracy literacy.

Expert or practitioner assessment/validation results from product development before being applied to the research field moreover formerly do testing media to expert media, linguists, and material experts. When

there are deficiencies, the media is revised and then tested again by experts until there are no further revisions or can be assessed valid for use in the field.

Table 7. Results Evaluation Questionnaire Media Expert

No.	Indicator	Statement	Mark Validator
1	Presentation	a. Numeracy literacy questions on Android-based *metaverse learning media* clear And easy understood	4
		b. Media Android-based metaverse serve Numeracy literacy questions	4
		c. Language Which used easy understood	4
		d. Android-based metaverse media train students to get used to solving numeracy literacy questions	3
2	Attractiveness Media	a. Images and animations used interesting	4
		b. Images and animations used to provide encouragement to students	3
		c. Combination color media interesting	4
		a. Media is easy and safe to use	4
		b. Media can be used as repeated practice	4
		c. Media can be accessed at any time as long as it is connected to the internet	4
		d. Media is easily stored in the form of data on an Android cellphone	4
		e. Instructions for using the media are clear and easy to understand	3
4	Size and layout	The image corresponds to the numeracy literacy question	4
		The font size and animation are appropriate and clear	3
		Tata the location of the images/animations and writing attracts students' attention	4
5	Appearance overall	Appearance on media easy android based metaverse understood	3
		Design interesting media	3
		∑R	62
		N	68
		P	91.2%

Validation expert media aim for validate about fill material, accuracy of the material, and up-to-date material regarding numeracy literacy questions found in the media. Based on results evaluation expert media shows the percentage 91.2%. Based on these criteria media metaverse learning that has been developed is included in the qualification "very valid", so that Android-based metaverse learning media is feasible used.

Table 8.Results Validation Expert Language

No	Indicator	Statement	Mark Validator
1	ıccuracy Language	a. Accuracy election say	4
		b. Accuracy structure sentence	3
		c. Meaning sentence clear	4
		d. Language Which used in accordance with Spelling Which Perfected (EYD)	4
		e. Language Which used in accordance with level understanding student	4
		f. Language Which used not pregnantsentence/word rough	4
2	Communicative	a. Language is easy to understand and clear	4
		b. Sentences usedcontaining information or message that want to delivered	4
		c. Sentences usedsimple And appropriate target	3
		d. Instruction use mediaclear and easy understood	3
		∑R	37
		N	40
		P	92.5%.

Validation expert Language aim for know coverage straightforwardness, communicativeness, accuracy in language, accuracy sentence, sequence and integration of thought flow. So that it can be applied by students And Teacher school environment, and students can easily access metaverse media content on data collection materials. Based on the results of the language expert's assessment in the form of media metaverse on material collection data show presentation 92.5%. Apart from filling out questionnaires, linguists also provide suggestions, comments, and notes on the metaverse media being developed. Suggestions and commentsfrom expert Language shown on Table following.

Table 9. Suggestion And Comment Expert Language

No.	Type Media	Suggestion And Comment
1	Metaverse media based android	Sentence simple, No too long

Based on suggestion and comment expert Language, sentence simple, not too long. Data analysis to find out the percentage that appear according to predetermined criteria, are displayed that criteria validity media metaverse results of linguist tests that have been analyzed show the percentage 92.5%. Based on criteria the media metaverse Which Already developed enter to in qualification "very valid", However media metaverse is necessary revised in accordance with suggestion and comments by experts language for media metaverse worthy used.

Table 10. Results Evaluation Expert Material

No	Indicator	Statement	Mark Validator
1	Contents of the material	Suitability of the media to the material	4
		The content of the material is in accordance with the 2013 curriculum	4
		The material is in accordance with KI, KD, and learning objectives	4
2	Material accuracy	The material is adapted to the real environment	4
		The breadth of material used	3
		Suitability of the examples used	4
		Accuracy of images and illustrations	3
		Material covers the issue numeracy literacy	4
3	Material feasibility	The material used in accordance with the curriculum Which applies	4
		The material is in accordance with science and technology	4
		∑R	38
		N	40
		P	95%

Validation expert material aim for know coverage fill material, contextual, accuracy of material and presentation of material. So, it can be implemented by students and teachers in the school environment, and students easily learn fill material on media learning metaverse based android on material collection data. Based on results evaluation expert material Which form media metaverse learning in data collection material shows the percentage 95%. Besides fill in sheet questionnaire, expert material Also give suggestion, comments, and notes on the metaverse media being developed. Suggestions and notes from expert material shown as following.

Table 11. Suggestion And Expert Comments Material

No.	Type Media	Suggestion And Comment
1	Media Learning metaverse based android	Time allocation fixed, provide objective learning in syllabus, create 3 indicator And use saystudent customized.

Based on suggestions and comments from material experts, one of them use say student customized in media metaverse. Criteria validity media metaverse material expert test results that have been analyzed show the percentage 95%. Based on these criteria, metaverse media has been developed enter to in qualification "very valid", However media metaverse need revised in accordance with suggestion and comment by expert material so that media metaverse worthy used.

Table 12. Results Evaluation Practitioner

Instrument Number	Statement	Validator Value
1	Conformity of questions with KI and KD	4
2	Question easy to understand	4
3	The questions presented are appropriate to the student's ability level	4
4	That question served in accordance numeracy literacy	4
5	Appearance Interesting *Android* -based *metaverse* learning media	4
6	Accurate selection of letters, sizes and colors	4
7	The images/ animations used are appropriate	4
8	Android-based *metaverse* learning media is able to facilitate students to build their knowledge and understanding	2
9	Effective and efficient in its use	3
10	Media is easy to operate	3
11	Students are more active in learning	4
12	Students easily understand the material	4
13	Existence Android-based *metaverse* learning media can can improve students' numeracy literacy	3
14	Makes it easier for teachers to learn	3
	∑R	50
	N	56
	P	89%

Validation practitioners aim For know convenience media. Based on results evaluation practitioner from development the media shows a percentage of 89%. It was concluded that the teaching media that was developed enter in criteria very practical. Based on assessments from experts, a recapitulation of expert assessments is presented as follows.

Table 13. Results Recapitulation Validator

No.	Validator	Percentage	Information
1	Expert Media	91.2%	Very Valid
2	Expert Material	95%	Very Valid
3	Expert Language	92.5	Very Valid
4	Expert Practitioner	89%	Very Practical
	Average	92%	Very Valid

Expert test recapitulation shows an average percentage of 92%. Based on the average percentage is the Android-based metaverse learning media Already developed into in category “Very Valid”. So, these results show that there is an influence from using Android-based metaverse learning media to increase the numeracy literacy of class V students in elementary schools and the media is considered effective in increasing the numeracy literacy of class V students in elementary schools. This research is relevant to previous research. Researchers discuss the validity, practicality, attractiveness and effectiveness of Android-based metaverse learning media to improve the numeracy literacy of class V students in elementary schools, especially SDN 1 Wonorejo and SDN 2 Sukorejo.

4. CONCLUSION

Based on results study and development media learning *metaverse* based *android* Which has done researcher, can withdrawn Conclusions from the results of media expert validation of Android-based metaverse learning media, the validator provides very valid criteria for Android-based metaverse learning media based on numeracy literacy in data collection material in fifth grade mathematics subjects in elementary schools. Based on the average practicality value obtained from students' responses to the media, the media was rated as practical with a percentage of 89%. The criteria for media to be considered interesting are assessed from the content of the media and the quality of the media that supports learning. Then the results of the teacher's responses agreed that practical media was used. Thus, it can be concluded that the development of learning media using the Android-based metaverse is practically used as learning media by students and teachers. From the results of media validation, teacher responses and student responses to Android-based metaverse learning media, media experts strongly agree that the media is very interesting. Supported by assessments from teacher responses and student responses that the media is considered interesting to use in learning. Media learning effectively used For increase ability literacy numeracy student

with seen from mark test ability literacy increasing student numeracy. Based on the results of different tests carried out, there are differences before and after the use of learning media metaverse Android based. Android-based metaverse learning media as an interesting, practical and effective learning media for users schools as a tool to support learning media digital Good android or computer use makes it easier students in learning.

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