Android Based Math Learning Media with iSpring Suite: The Effect of Its Use on Student Learning Outcomes

Nuril Huda[1], Andini Endah Sri Mulyani[2], Abdussakir Abdussakir[3], and Dimas Femy Sasongko[4]

[1, 2, 3, 4] State Islamic University Maulana Malik Ibrahim Malang, East Java, Indonesia
nurilhuda26@uin-malang.ac.id

Abstract. One of the primary factors to encourage the achievement of learning objectives is the integrated use of media into educational activities. Learning media can increase student involvement, support and facilitate understanding, and increase interest, curiosity, and motivation in learning. With the increasing accessibility of mobile technology, Android-based learning media offers a promising solution to improve student learning outcomes, especially in the field of mathematics education. However, the specific effects of using such media, especially in combination with specialized software such as iSpring Suite, on student learning outcomes are less explored. The purpose of this study is to ascertain how the learning outcomes of seventh-grade students at SMPN 1 Lawang are affected by the provision of Android-based mathematics learning materials created with iSpring suite. This quasi-experimental study used a quantitative approach with a pretest-posttest control group design, involving a sample of 64 students. Data were collected through math learning outcomes tests (pretest and posttest), and data analysis included (1) analysis of the results of validation of question instruments, (2) analysis of test questions, and (3) analysis of student learning outcomes tests. The research findings showed a significant positive effect of using Android-based mathematics learning media on student learning outcomes, with a significance value of 0,000 < 0,05. These results indicate that Android-based learning media has an effect on improving students' cognitive domain learning outcomes, can play an important role in improving students' performance and engagement in the learning process, and supports the wider application of digital devices in the classroom. Therefore, the application of Android-based learning media is highly recommended as an alternative to create more interesting and effective learning activities in today's digital era.

Keywords: Math Learning Media, Android-based, iSpring Suite, Learning Outcomes.

1 Introduction

Learning is a complex activity. The complexity here is caused by the many factors that influence the sustainability of a learning activity, starting from the factors of the education system, the learning environment, to the people who play a role in learning activities ranging from teachers as educators to students. Learning is defined as a process

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of organizing and connecting the learning environment with students to create a learning activity [1]. Effective learning can help students meet the goals of the learning activities they are participating in.

Learning activities can be implemented optimally with the right learning media. Many studies have developed and investigated the influence of the utilization of learning media. This implies that there is a link between the use of learning media and the continuity and achievement of learning activities. One of them is research conducted by Setyaningsih and Atmaja [2] which explains that learning media has an important influence in the world of education, such as an increase in student learning achievement. Harahap and Pradana in [3] their research supports this statement, explaining that learning media has a lot of positive influence on the world of education, starting from facilitating the delivery and acceptance of learning materials, and helping students to concentrate more, so that it can affect student learning outcomes. Thus, it is well recognized that using learning media, especially those based on Android, offers advantages.

Android-based learning media is one of the most popular media in the current era by being operated using a smartphone [4]. Android-based learning media is one of the open-source media that is in great demand to be developed and utilized in the world of education. This is supported by the many benefits of android-based learning media, such as making it easier to access information more quickly, effectively, and efficiently [5].

iSpring suite is one of the media that can be used for offline and online learning. Dasmo [6] explain that the iSpring suite is a compatible tool for use with Microsoft PowerPoint so that it can be converted into Hypertext Markup Language (HTML) so that later it can be integrated into an application/software. iSpring Suite has many interesting features to create, namely features for creating text, various kinds of animations, music, videos,and interactive quizzes, and turning them into game-shaped android applications as learning tools and resources [7]. Samudro et al. [8] added that video recording, slide narration recording, interactive quiz creation, addition of teaching materials, and publication of learning media content on the iSpring Suite can have video, HTML, and Sharable Content Object Reference Model (SCORM) formats. So, it can be concluded that iSpring suite is a tool to create learning media that can be applied both for online and offline learning. In its utilization, android-based learning media with iSpring Suite can be used in various scientific fields, one of which is mathematics.

Mathematics is one of the scientific fields studied at almost all levels of education [9]. Mathematics is usually taught starting from a concrete form for basic education and abstract for higher education. Mathematics is often considered a difficult subject, both to teach and to learn [10]. This is because not everyone has the ability to construct abstract forms in mathematics into a more concrete form, so that learning mathematics requires more effort to think and reason in learning it [11]. Which, the ability to think and reason in mathematics will greatly affect students' math learning outcomes.

Learning outcomes themselves are defined as a form of change in students' abilities or knowledge that can be observed and measured after carrying out a series of learning activities [12]. Learning outcomes are also defined as the achievement of criteria or

values from a series of learning processes carried out by students [13]. Learning outcomes can be influenced by many factors including: physical, spiritual, psychological, family, school (friends, teachers, facilities/facilities and infrastructure), and community factors [14]. In learning, the results that students will get are numerous and vary regardless of the internal and external factors that influence learning activities and results.

Based on these theories, it is well recognized that more research is necessary to determine whether and to what extent Android-based mathematics learning media with iSpring Suite can help the achievement of learning outcomes and objectives iSpring. So, in this study, researchers are interested in knowing the effect of using Android-based learning media with iSpring Suite on student learning outcomes.

2 Method

This research methodology combines a quasi-experimental research model with a quantitative approach. This research design is an intact group comparison, which divides and compares the control class and the experimental class [15]. The research design is effectively presented in Table 1.

Table 1. Research design.

Class	Pretest	Treatment	Posttest
Experiment	K_1	L	K_3
Control	K_2	–	K_4

Description:

L	Given treatment
–	No treatment
K_1	Pretest results in the experimental class
K_2	Posttest results in the control class
K_3	Pretest results in the experimental class
K_4	Posttest results in the control class

Source: Adopt by Mulyono and Agustin [16]

The flow of this research can be observed in Fig. 1.

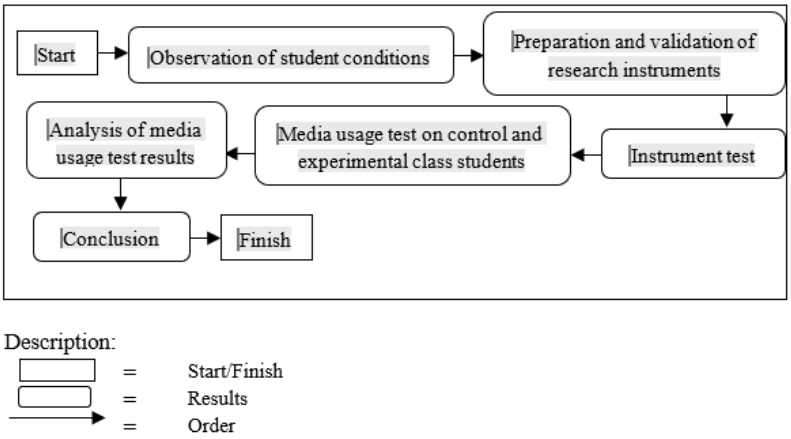
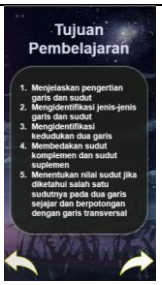


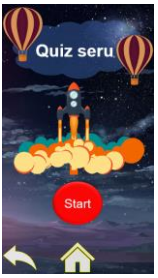
Fig. 1. The research flow.

The subject retrieval technique used is to take a group of students/classes that are already available in a group called an intact group, so in determining the subject, the researcher draws a class that will act as a control class and experimental class [15]. The study population was all classes of SMPN 1 Lawang then, referring to the test results on subject retrieval, the instrument trial class was obtained from grade 7A students, with a total of 32 students. The control class is grade 7B students and the experimental class students are grade 7C students, with a total research sample of 64 students.

Research activities were carried out from February to April. The learning media implemented for students contains features including instructions for use, learning outcomes, learning objectives, and a home which contains material features and a fun quiz. Some features of the learning media can be observed in Table 2.

Table 2. Features on the media.

No	Feature	No	Feature	No	Feature
1	 Directions for use	2	 Learning outcomes	3	 Learning objectives

4	5	6
		
Home	Materials	quiz

Analysis of student learning outcomes tests is done by (1) analysis of the results of validation of question instruments, (2) analysis of question items, and (3) analysis of student learning outcomes tests. The analysis of the results of the validation of the question instrument will be explained with two data points which include quantitative data from the test question validation sheet and qualitative data obtained from criticisms and suggestions from 2 validators. Validity and reliability analysis was carried out by adapting the Asri and Dwiningsih percentage formula [17].

$$P = \frac{f}{N} \times 100\% \quad (1)$$

Description:

f = Frequency of validation results

N = Frequency count of validation results

P = Percentage of validation results

Based on the results of validity and reliability qualification research adapting Asri and Dwiningsih [17] Table 3.

Table 3. Validity and reliability qualifications.

Value Range	Qualification	Description
$85\% - 100\%$	Very valid or reliable	No Revision
$69\% - 84\%$	Valid or reliable	No Revision
$53\% - 68\%$	Valid or reliable	Partial Revisions
$37\% - 52\%$	Less valid or reliable	Revision
$20\% - 36\%$	Very valid or reliable	Revision

The analysis of the question difficulty index adapts the qualifications referring to Table 4 [18].

Table 4. Qualification of question difficulty.

Value Range	Qualification

0,00 – 0,30	Challenging
0,31 – 0,70	Moderate
0,71 – 1,00	Simple

The criteria used in the examination of the questions' differential power index were based on Table 5 [18].

Table 5. Qualification of differential power.

Value Range	Qualification
0,70 – 1,00	Low
0,40 – 0,69	Enough
0,20 – 0,39	Good
0,00 – 0,19	Very good

Item analysis consists of (1) validity analysis, (2) reliability analysis, (3) difficulty level analysis, and (4) differentiation analysis. which is carried out using Statistical Package for the Social Sciences (SPSS) analysis tools. The flowchart of item analysis can be observed in Fig. 2.

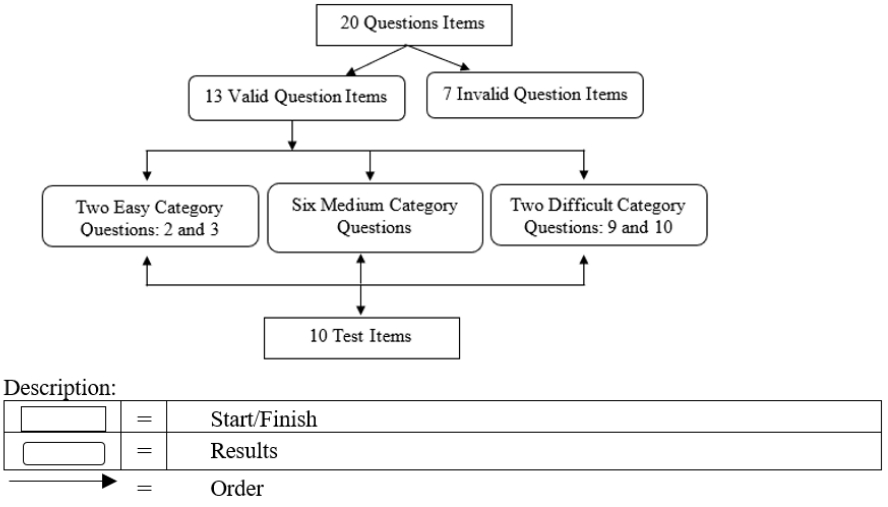


Fig. 2. Flowchart of item test results.

The analysis of the student learning outcomes test consists of (1) normality test, (2) homogeneity test, (3) independent sample t test, and (4) paired sample t test which was also carried out using SPSS.

3 Result and Discussion

The effect of using android-based math learning media with iSpring suite in improving student learning outcomes in this study is presented in the results and discussion which includes (1) analysis of the results of validation of question instruments, (2) analysis of question items, and (3) analysis of student learning outcomes tests as follows.

3.1 Analysis of Question Instrument Validation Results

Analysis of Question Instrument Validation Results by the Validator 1 (V_1) and Validator 2 (V_2) can be observed in the Table 6.

Table 6. Qualification of differential power.

Validator of test questions (V_1)	Mathematics teacher (V_2)
Quantitative Data	**Quantitative Data**
The percentage of validity of the test questions was obtained at 88% (very valid)	The percentage of validity of the test questions obtained was 92% (very valid)
Qualitative Data	**Qualitative Data**
Make the difficulty level of the questions more varied, namely with the difficulty level of easy, medium, and difficult questions.	Suitable for use without revision

According to the findings of the question validation, it is known that the test question instrument is valid with a validity percentage of 88% and 92% respectively with an average instrument validity of 90%. The percentage results show that the test questions fall into very valid qualifications. Thus, the test questions can be used for the next stage, namely the analysis of each item. A measurement instrument must be valid and reliable so that it is truly tested for accuracy and utility so that it can represent the objectives to be achieved from making the instrument [19]. Valid instruments can facilitate the process of measuring the variables or indicators under study, whether they can actually measure (represent) each variable or indicator [19]. Purba et al. [20] added that the validity of an instrument in research is one of the important factors in drawing conclusions.

3.2 Analysis of Test Items

The analysis of the test items is as follows:

Validity Test. Analysis of the results of the validity of the question instrument can be observed in Table 7.

Table 7. Validity test results.

No	Multiple choice

	Category	Percentage
1	Valid	65%
2	Invalid	35%

Considering the question validity test's findings, it is known that the questions are valid and invalid. A measurement instrument must be valid and reliable so that it is truly tested for accuracy and utility so that it can represent the objectives to be achieved from making the instrument [19]. Valid instruments can facilitate the process of measuring the variables or indicators under study, whether they can actually measure (represent) each variable or indicator [19]. Purba et al. [20] added that the validity of an instrument in research is one of the important factors in drawing conclusions.

Reliability Test. Analysis of the reliability results of the question instrument can be observed in Table 8.

Table 8. Reliability test results.

Reliability Statistics	
Cronbach's Alpha	N of Items
0.777	10

Considering the question reliability test's findings, it is known that valid questions are reliable questions. So that ten test items can be used to measure student learning outcomes through the use of Android-based math learning media with the iSpring Suite. Reliable question items show the stability of the question as a consistent measuring instrument, even if repeated under different conditions, so that it can still give the same results [19].

Difficulty Test. The analysis of the findings of this study's examination of the question instrument's difficulty can be observed in Table 9.

Table 9. Hardness test results

No	Multiple choice	
	Category	Percentage
1	Difficult	25%
2	Medium	50%
3	Easy	25%

Considering the difficulty test's findings, it is known that out of twenty questions, 25% of the questions are difficult, 50% of the questions are medium, and 25% of the questions are easy, with a comparison of the difficulty of the questions respectively of 1: 2: 1. Thus, it is understood that the questions used are evenly distributed; there is no

tendency for them to be too difficult or too easy. Thus, it is understood that the items used evenly have no tendency to be too difficult or too easy. This agrees with the explanation of Stronge et al. [21] as cited in Purba et al. [20] that good question items are questions that are not too difficult and not too easy. This is because items that are too easy make students stimulated to have more effort in solving problems; on the other hand, items that are too difficult make students tend to despair easily because they feel the difficulty of the problem is more than their abilities.

Differential Test. The analysis of the findings of the test of the differentiating power of questions in this study can be observed in Table 10.

Table 10. Differential test results.

No	Multiple choice	
	Category	Percentage
1	Very good	25%
2	good	60%
3	Good enough	15%

Considering the differentiating power test findings, it is known that out of twenty questions, the questions have a very good differentiating power, good questions, and good enough questions, with a comparison of the differentiating power of the questions successively amounting to. So it is understood that the differentiating power of the items is in the range of good enough to very good. Items with good differentiating power can help categorize students into high and low groups well [20]. Purba et al. [20] explained that the differentiating power of questions can help to divide or group students into groups of smart and less smart students.

3.3 Student Learning Outcome Test Analysis

Analysis of student learning outcomes using and not using Android-based learning media in control and experimental classes was reviewed by referring to the test results. The test results were analyzed by conducting normality, homogeneity, independent sample t-test, and paired sample t-test tests. The following are the results of the analysis:

Normality Test Results. To ascertain if the test data has a directed pattern distribution, the normality test is the first test performed. The findings from the normality test are displayed in Table 11.

Table 11. Outcomes of the normality test.

	Kolmogorov-Smirnov			Shapiro wilk		
Class	Statistic	df	Sig.	Statistic	df	Sig.

Math learning outcomes	Control class	0.144	32	0.089	0.935	32	0.055
	Experimental class	0.147	32	0.078	0.937	32	0.062

All data with the Kolmogorov-Smirnov test and Shapiro-Wilk test had a significance (sig) value of at least 0.05, as shown in Table 11. Thus, the data were "normally distributed", meaning that the tests had a directional pattern.

Homogeneity Test Results. Finding out if the test result data is homogeneous or has the same variance is the goal of the homogeneity test. The test outcomes are shown in Table 12.

Table 12. Results of the homogeneity test.

		Levene Statistic	df1	df2	Sig.
Math learning outcomes	Based on Mean	0.144	1	62	0.706
	Based on Median	0.121	1	62	0.729
	Based on Median and With Adjusted df	0.121	1	61.890	0.729
	Based on Trimmed Mean	0.147	1	62	0.703

It is explicit from Table 12 that the significance value (sig) on the mean is 0.706, indicating that the significance value is more than 0.05. The test data is therefore "homogeneous," or of the same variety.

Independent Sample t Test Results. An independent sample t-test is performed to determine whether learning media can enhance student learning outcomes. The outcomes of testing with the independent sample t-test are presented in Table 13.

Table 13. Outcomes of the data from the independent sample t test.

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Math learning outcomes	Equal variances assumed	0.	0.706	−6.632	62	0.000	−13.906
	Equal variances not assumed			−6.632	61.938	0.000	−13.906

It is explicit from Table 13 that the significance value (sig) is 0.000, indicating that the significance value is less than 0.05. Therefore, it is well established that utilizing the iSpring suite in conjunction with Android-based math instructional resources can enhance student learning outcomes. The average comparison between the two classes is then shown in Table 14.

Table 14. Comparison of the averages of the two groups through the independent sample.

	Class	N	Mean	Std. Deviation	Std. Error Mean
Math learning outcomes	Control class learning outcomes	32	73.59	8.253	1.459
	Experimental class learning outcomes	32	87.50	8.519	1.506

According to Table 14, The experimental class achieved an average learning outcome of 87.50, in contrast to the control group's average learning results of 73.59.

Paired Sample t Test Results. The paired sample t-test was employed to determine whether the learning media significantly enhanced student learning outcomes. In Table 15, the outcomes of the paired sample t-test are displayed.

Table 15. Data from the paired sample t test results.

	Class	Mean	Std. deviation	Std. error mean	Confidence interval of the difference		t	df	Sig. (2-tailed)
					lower	Upper			
Pair 1	Pretest-posttest	−13.2	5.904	1.044	−15.410	−11.153	−12.726	31	0.000
Pair 2	Pretest-posttest	−23.43	6.891	1.218	−25.922	−20.953	−19.241	31	0.000

It is explicit from Table 15 that the pretest and posttest findings have a significance value (2-tailed) of 0.000, indicating that the paired sample t test results have a significance value of less than 0.05. In order to improve student learning outcomes, the results of evaluating the pretest and posttest questions indicate a substantial difference between students who use and do not utilize Android-based math learning media with the iSpring Suite.

It is well recognized that offering learning media to students improves their learning outcomes in the cognitive domain, based on the findings of multiple testing activities. This is demonstrated by the fact that students in the experimental class had a greater gain in learning outcomes from the pretest to the posttest than students in the control class (significant difference of $0.000 < 0.05$).

The improvement in student learning outcomes can be observed in Figure 3.

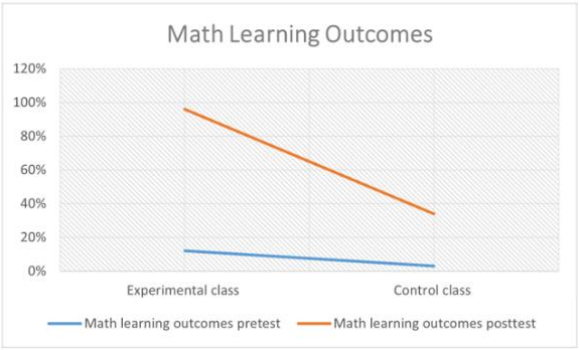


Fig. 3. Students' learning outcomes.

Different effects on the same performance demonstrate how learning media affects student learning results. In this study, the learning media used was Android-based and integrated with the iSpring suite. Additionally, according to Winarno and Ramadhani [22], students who use learning materials with the iSpring suite can have a greater improvement in their learning outcomes than those who do not.

The utilization of the iSpring suite to enhance student learning outcomes is not only for a certain level; starting from elementary school to upper secondary levels also shows positive results. As in the case of research conducted by Nuraini et al. [23] in their research it was found that 91% of elementary school students could reach the standard of mastery. Strengthening this statement, Ramadani et al. [24] in their research also showed that 78% of students were declared to have reached classical completeness. It is illustrated by various of these studies that the iSpring suite is applicable and influences education at all levels. This is corroborated by the iSpring Suite's capacity to visually deliver educational materials by showcasing animations, pictures, and illustrations, as well as audio and videos that influence students' motivation, interest, and learning outcomes [6]. Thus, it can be implied that student learning results are impacted by math learning media that are based on Android and use the iSpring Suite.

4 Conclusion

The conclusions in this study, when reviewed based on data analysis, results, and research, are: (1) the question instrument is valid with a validity percentage of 90%; (2) the question items used have a comparison of the difficulty level of the questions successively 1: 2: 1, the comparison of the differentiation test is 5: 12: 3. In addition, the questions were also declared valid and reliable; (3) learning media affects student learning outcomes with a significance value of $0.000 < 0.005$. Therefore, the cognitive learning outcomes of students are impacted by Android-based math learning media combined with the iSpring.

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