



Interactive Animation Learning Media on Android as a Creative Learning in Regression Analysis Topic

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Abstract

Technology has a significant role in building the quality of education. The implementation of technology in education is to develop the learning media. This study aims to create interactive animation learning media that can be accessed using Android Smartphones as one creative learning alternative in online learning. This media was applied in Statistics Subject, Regression Analysis Topic. The first step was planning and designing. The animation characters, background, color theme, and storyboard were determined in this step. The next step was the production and editing step. After that, the validation steps were done. There were three validators in this research: Statistics Expert, Statistics Lecturer, and Media expert. The validation score of this media was 95.33 was classified as a very good learning media and proper to be implemented. The next step was revising step as the validators' suggestion. The learning media then was implemented in experiment class using a hybrid learning environment. And as the last step, the evaluation step was done by comparing the post-test score of the experiment class and the control class. The data were collected using a test about Regression and were analyzed using two independent sample t-tests. In conclusion, the class that uses the interactive animation learning media has a greater significant score compared to the class that does not use the media. Thus, this learning media can be considered as a creative learning alternative in online learning.

Keywords:

educational technology, interactive animation media, statistics, online learning

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INTRODUCTION

As stated in the Law of the Republic of Indonesia number 20 of 2003 concerning the national education system, the national education system must be able to guarantee equal distribution of educational opportunities, improve the education quality and the relevance and efficiency of education management to face challenges by the demands of changes in local, national, and global life. Education reforms are carried out in a planned, directed, and sustainable manner (Nasional, 2003). Furthermore, quality education is also the 4th goal of the 17 Sustainable Development Goals (SDGs) 2015-2030 proclaimed by the United Nations (Nation, 2015). One of the efforts to improve the quality of education is to increase innovation in the field of education on an ongoing basis (Boeren, 2019). The educational reform must be in line with technological developments.

Over the past two decades, technological innovations have changed education (Castells, 2004). These changes form a new paradigm, namely educational technology (ed-tech). Educational technology is a systematic and



organized process in applying modern technology to improve the quality of education itself (Stosic, 2015). Furthermore, educational technology refers to the use of technology to support teaching and educational management. Several studies on the effect of educational technology on students' learning and cognitive processes had been carried out by Kauffman (2004) and Lee et al. (2008). (Engelbrecht, Llinares, & Borba, 2020) stated “The development of new digital technologies provides new opportunities to educators, and new ways of thinking about how the teaching and the design of teaching-learning environments evolve, generating new practices and establishing goals”

Educational technology has an important role in the development of learning activity. Moreover, since the Covid-19 pandemic, learning activity is done online. The Covid-19 pandemic has given a great impact on the implementation of learning at every level of education. The virtual classes suddenly replaced the common face-to-face ones. The sudden replacement could have some negative impacts on the learning processes and outcomes (Mairing, Sidabutar, Lada, & Aritonang, 2021)

Learning theories are conceptual frameworks that describe how information is absorbed, processed, and retained during learning. Learning theories can also be defined as the combination of conceptual models at the assertion level principles for systematic knowledge of the learning activity through a series of scientific statements functional value informative, explanatory, predictive, summary, normative, in different variations of specific authors or schools using a learning media (Timar & Moraru, 2011). Creativity on the other side is defined as appropriate ideas in any realm of human activity, from science, to the arts, to education, to business, to everyday life, thus the ideas have to be new and appropriate to the opportunity or problem presented (Al-Ababneh, 2020). Lastly, creativity has been identified as an important component in problem solving and other cognitive abilities. Indeed, creativity researchers have long asserted that creativity and learning are tightly coupled phenomena (Sawyer, 2012).

One of the implementations of educational technology in learning and creativity is developing creative learning media. Learning media is anything that can be used to convey messages or information in the teaching and learning process so that it can stimulate students' attention and interest in learning (Arsyad, 2014). According to (Akrim, 2018), the process of teaching and learning will be effective and successful if the teacher is able to create learning media suitable to the material and age level of students. Accuracy in the selection of learning media will affect students' learning outcomes and participation in the class.

One of the interesting learning media for online learning is interactive multimedia. Interactive multimedia is multimedia that is equipped with a controller that can be operated by the user so that the user can choose what they want for the next process (Daryanto, 2013). Smaldino et al (2011) stated that through multimedia tools (visual graphics, animation, audio, and video) and feedback (interactive) provided, learning becomes more interesting and produces a multisensory experience. Animation is one form of multimedia that is arranged by combining text, graphics, and sound in movement activities (Munir, 2013). Animation provides a visualization of the concept of the material to be conveyed. With a clear visualization, students' motivation will increase and the process of understanding the concepts will be more optimal (Susanto, 2016).

Previous research has shown that the use of interactive multimedia could develop critical thinking Wiyono (2009) and improve concept mastery (Ferawati, 2011). In addition, research conducted by Prastika (2015) also showed that the application of interactive multimedia was effective in increasing student achievement. (Sahronih, S; Purwanto, A; Sumantri, M.S, 2020) in their research stated that the science learning outcomes of students who learn to use interactive learning media environment-based are higher than the science learning outcomes of students who learn to use non-interactive learning media.

Statistics is one of the basic courses that demand and direct students to be able to think critically about solving a problem. According to Sudjana (2000), statistics is a science that deals with ways of collecting data, processing or analyzing, and making conclusions based on data collection and analysis carried out. Statistics as the science of extracting information from highly complex structured data is often difficult for students since it requires a variety of skills including handling of quantitative data, graphical insights as well as mathematical ability (Mairing, et al 2021). Related to this, the Statistical learning process must be packaged in such a way by utilizing all facilities so that an active, creative, innovative, and fun learning atmosphere can be formed.

Statistics online learning has been carried out with various platforms such as google meet, google classroom, zoom, WhatsApp, and video tutorials. However, this is considered less than optimal because based on the results of observations and interviews with several students, there are various problems such as (1) learning is mostly teacher-centered (not student-centered), (2) the media has not been used optimally, (3) classical and less varied learning, (4) interactions tend to be one-way. Moreover, if learning is done fully online, then these problems must be fixed immediately so that the learning atmosphere is not boring and students can understand the concept of statistics more optimally. The research of Mairing et al (2021) showed that students experienced emotional exhaustion, physical and cognitive fatigue, and lack of motivation during online learning. The lack of understanding and many assignments were given by lecturers caused online learning processes tended to be ineffective (Giatman, Siswati, & Bari, 2020) (Suryaman, et al., 2020) The condition makes the course materials tend to be more difficult to understand meaningfully.

In his research (Puadi, 2020) stated that the learning process of mathematics and statistics needs innovations that can accommodate the enthusiasm and needs of students during the learning process. Mairing (2021) also stated that the integration of digital learning media and computer software was also needed in the online learning of the Advanced Statistics course. The previous research results showed that the integration and development of the learning media and the software in the learning of Statistics subjects could improve students' learning outcomes (Basturk, 2005) (Chaamwe & Shumba, 2016) (Mairing, 2020). However, the integration needed to be planned well to have positive effects on the learning activities and outcomes.

This study aims to develop online learning media based on interactive animation that can be accessed as applications on Android. The urgency of this research is to reduce the students' problems in online learning especially in Statistics Course as stated in previous research. However, can this media affect the

students' statistical analysis skill and be considered as creative learning alternative in Covid-19 pandemic era?

METHODS

This research took place in Politeknik Negeri Bali during Covid-19 Pandemic Online Learning. The method used in this research was quantitative method, especially for the validation (descriptive quantitative) and evaluation step (quantitative inference method). This type of research was Research and Development, namely the development of online learning media based on interactive animation media that can be accessed via Android smartphones. This learning media was applied to the Statistics Course on Regression Analysis topic. There were several steps of Research and Development applied in this research, namely (1) the planning and design; (2) the production and editing; (3) the product validation and revision; (4) the implementation; and (5) the evaluation step. The RnD Process in this research can be seen in Figure 1.

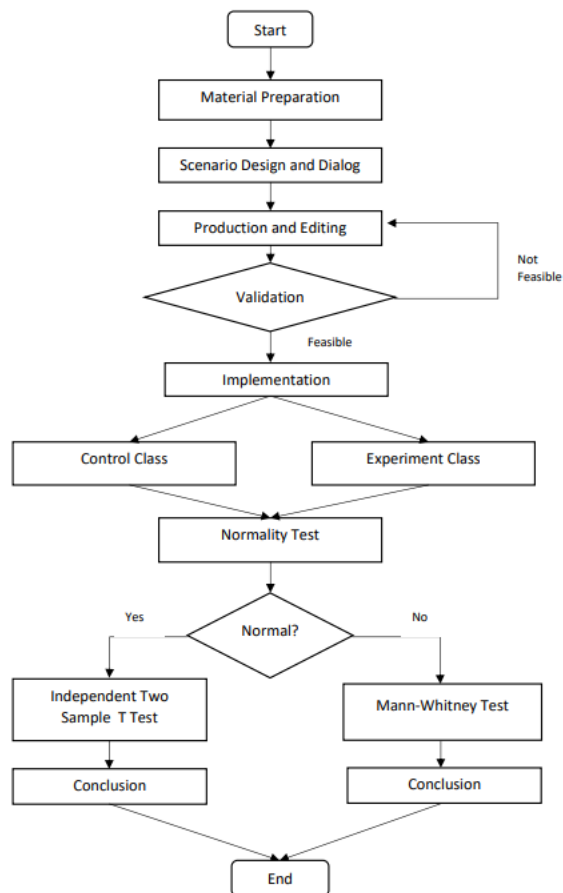


Figure 1. The Flowchart of RnD Process

This interactive animation media product was created using Ms. Powerpoint, developed with the iSpring Solution software, and then converted into an Android-based application using the Website 2 APK Builder Software. The data

used in the product validation stage was quantitative data obtained using a validation sheet. The three validators in this study were a Statistics expert, a Statistics lecturer (who assessed the product from general aspects, material aspects, and evaluation aspects), and media experts (who assessed the product based on software aspects and visual communication aspects). After being validated, the next step was to revise the product according to the validator's suggestion.

The population in this research was the students in Accounting Department, Politeknik Negeri Bali. The sample was divided into two classes, the experiment class, and the control class. The sampling technique used in this research was cluster random sampling. The product was implemented into the experiment class (52 students) using a hybrid learning environment (combination of the synchronous and asynchronous environment). In the first week, the learning was done by using asynchronous learning where all of the students were given time to use and explore the learning media anytime and anywhere, they want. Then at the next week, learning was done by using synchronous learning where all of the students and teacher gathered in one conference room, doing the discussion about the topic. Then at the end of the class, the Statistical analysis test was held. As the evaluation step, the Statistical analysis test score in the experiment class was compared with the control class (52 students). The comparison was done using two independent sample t-tests. The hypothesis in this test was:

$H_0 : \mu_1 \leq \mu_2$ (the test score of the experiment class is less than equal to the score of the control class)

$H_1 : \mu_1 > \mu_2$ (the test score of the experiment class is greater than the score of the control class)

The statistics test was t-test, where the t value was calculated by the following formula:

$$t_{value} = \frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{X}_1 - \bar{X}_2}}$$

If it was assumed that both of the classes have the equal variance, then $S_{\bar{X}_1 - \bar{X}_2}$ can be calculated using the following formula:

$$S_{\bar{X}_1 - \bar{X}_2} = s_{mix} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \text{ where } s_{mix}^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}$$

Where:

- \bar{x}_1 : mean score of the experiment class
- \bar{x}_2 : mean score of the control class
- s_1^2 : variance of the experiment class
- s_2^2 : variance of the control class
- n_1 : the sample size of the experiment class
- n_2 : the sample size of the control class

The criteria of H_0 rejection was if the t value $>$ t table (α ; n_1+n_2-2) (Ross and Wilson, 2017).

RESULTS & DISCUSSION

Results

a. Planning and designing product

In this step, the research team held coordination about the plan and the product designs. The team discussed the framework, flow, and design of interactive animation media. There were some results in this step, regarding (1) the title of the application, namely “Belajar Analisis Regresi”; (2) The menu page consisted of the Competency, Material, Learning Videos, Case Examples, Evaluation, and Bibliography menus; (3) The animated characters in this product were students, a businessman, and a secretary; (4) The selected background was the business man’s office; (5) The evaluation menu consisted of 20 questions regarding regression analysis along with feedback on student answers; (6) the evaluation result report was automatically sent to the researcher's email.

b. Production and Editing

At this step, the interactive animation media were created, edited, and finalized. The software used for making the product was Ms. Powerpoint, iSpring 8.0, and APK2 software. Ms. Powerpoint was used to create video designs, backgrounds, and templates. iSpring 8.0 software was used to create interactive parts of the product, such as quizzes and feedback. While the APK2 software was software that was used to convert files into applications that can be installed on Android-based smartphones.

c. Product Validation and Revision

At this step, the product that had been converted into an Android-based application file was validated by three experts, namely Statistics Expert, Statistics teacher, and Media Expert. The results of the validation of the three validators in this study were presented in the following table:

Table 1. Result of Validation

No	Validator	Aspect	Score	Classification
1	Statistics Experts	General Aspect	97.78	Very Good
		Material Aspect	98.00	Very Good
	Evaluation Aspect	95.65	Very Good	
	Overall Assessment of Statistics Expert	97.14	Very Good	
2	Statistics Lecturer	General Aspect	95.56	Very Good
		Material Aspect	90.00	Very Good
	Evaluation Aspect	93.33	Very Good	
	Overall Assessment of Statistics Lectures	92.85	Very Good	
3	Media Expert	Software Aspect	95.00	Very Good
		Visual Communication Aspect	96.67	Very Good
		Overall Assessment of Media Expert	96.00	Very Good
Overall Assessment			95.33	Very Good

After validation, the revision step was done according to the suggestions of the validators. The following table shows the detail in revision step

Table 2. Revision Suggestion

No	Validator	Revision Suggestions
1	Statistics Expert	The consistency in using a statistics term, some text are not easily read because of the color, the degree of freedom in ANOVA table should be written clearly, the formula in simple regression analysis should be edited
2	Statistics Lecturer	the formula in simple regression analysis should be written in bold
3	Media Expert	Some color does not match, some text does not fit the dialog box

d. Implementation

In this step, the product that had been validated and revised was implemented into the experiment class. The experiment class was chosen randomly by using cluster random sampling. And as a comparison, the control class was also chosen randomly. The implementation in experiment class was done using a hybrid learning environment (combination of asynchronous and synchronous learning environment) where at the first week, students in experiment class were given time to use and explore the interactive animation learning media (including to answer the evaluation in that product) at their free time, anytime and anywhere they want. Then in the second week, synchronous learning was done using a conference system as a google meet to discuss the topic. While the control class was only given synchronous learning to discuss the topic.

e. Evaluation

After implementing the product, the Statistical Analysis test was done. The test was divided into two types of tests, which are (1) oral test and (2) practical test. The oral test was done to test the ability of the students about the concept of Statistical Analysis. The practical test was done to know the skill of the students in analyzing a case and solve it using Statistical Analysis. The test score of the experiment class was compared to the test score of the control class. The Statistics test that is used to compare the test score is the independent sample t-test. But before using that test, the normality test was done to check the assumption. The hypothesis of the normality test was:

H_0 : The data was normally distributed

H_1 : The data was not normally distributed

The H_0 rejection area is when the sign value is greater than the alpha. The test was done using Kolmogorov-Smirnov Test, which the results were shown in the following table.

The table showed that the asymp. Sig. (2-tailed) of score test of control class and experiment class are 0.057 and 0.200 respectively. These values were greater than the alpha 5% (0.05) therefore, the H_0 was rejected and it can be concluded that the data was normally distributed.

Table 3. Result of Normality Test

Statistics		Score Test of Control Class	Score Test of Experiment Class
N		52	52
Normal Parameters ^{a,b}	Mean	70.0577	77.0865
	Std. Deviation	12.66486	14.53755
Test Statistic		0.121	0.093
Asymp. Sig. (2-tailed)		0.057	0.200 ^d

Because the normality assumption was fulfilled, then the independent sample t-test can be applied in this case. The hypothesis in this test was

$H_0 : \mu_1 \leq \mu_2$ (the test score of the experiment class is less than equal to the score of the control class)

$H_1 : \mu_1 > \mu_2$ (the test score of the experiment class is greater than the score of the control class)

The H_0 rejection criteria is when t value is greater than the t table. The results of this analysis were shown in Table 4.

Table 4. Result of Independent Sample T-Test

Statistics	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	2.182	0.143	2.629	102	0.010
Equal variances not assumed			2.629	100.120	0.010

The Levene's Test for Equality Variances in Table 4, showed the F value as 2.182 and the sign. value is 0.143. This sign. value was greater than the alpha 5% (0.05) then it was concluded that the variance of both classes was not significantly different. Hence, equal variances are assumed in this case. The t value was 2.629, while t table = t (0,05; 102) = 1.983. It can be seen that t value > t table, so the H_0 was rejected. The conclusion of this analysis is the test score of the experiment class is greater than the test score of the control class. This means the interactive learning media that was developed, can affect students' ability in Statistical Analysis.

Discussion

This research was development research that aimed to produce an interactive animation-based learning media that can be accessed by students using Android Smartphones. Learning, especially online learning, certainly requires innovation and creation in its delivery so that students feel happy and enjoy the learning process. In this way, the learning objectives can be achieved properly. This

study developed learning media with animated characters so that it looks more attractive. The animation presented could provide a visualization of the concept that will be conveyed in the media. When students are able to visualize the material they are facing, students understand the material well (Puadi, 2020). The animated characters chosen in this study were a student who invited users to learn, a businessman who were experiencing business problems, and a secretary character who helped the businessman to answer his problems using the concept of regression analysis. Several research developments related to the use of animation media including animation media developed by Zaniah (2016) in lessons on electricity. Also, the development by Fitriani et al (2013) on science subjects showed that animation-based learning media could help the learning process and was suitable for use in learning. In geometry Learning using interactive media that utilizes macromedia flash, which uses visualization, animation, and illustrations in geometry gave better results on students' understanding and abilities theoretically, practically, and visually (Altiparmak, 2014).

In addition, there was an interactive element so that students can direct the application according to their desire. The interactive elements in this research were forward, back, home buttons, and learning video buttons. Interactive elements were also inserted in the evaluation menu. Each time a student submitted an answer to each question, feedback would appear to inform them of the correctness of their answer.

After going through the validation step by three validators, the results obtained that the general aspect, material aspect, and evaluation aspect were given a value of 97.78, 98.00, and 95.56 respectively by the statistics expert. Meanwhile, the statistics lecturer gave a score of 95.56, 90.00, and 93.33 respectively on the general aspect, material aspect, and evaluation aspect. Overall, statisticians and statistics instructors rate this product at 97.14 and 92.85, respectively. This value was classified in a very good classification and was feasible to be applied. The third validator, (media expert) gave a value of 95.00 and 96.67 for the software aspect and visual communication aspect. This value was classified as very good and this indicated that this product was feasible to be applied in terms of software and visual communication. Overall, the product validation process gave a result of 95.33. This indicated that based on the assessment of these three validators, interactive animation media products that can be accessed via Android Smartphones was classified as very good and feasible to be applied in learning.

Most of the development of learning media using technological breakthroughs had a good to a very good level of validation. This was because current technological breakthroughs can increase students' enthusiasm in learning so that learning does not always run monotonously like traditional learning. This is in line with several previous studies regarding the development of learning media. Syahrinsi et al (2021) in their research on the development of interactive multimedia in hydrosphere learning for high school students stated that the products they developed were classified as acceptable and feasible to be applied. Likewise, with Sulistiryani et al (2021) developed the learning media for Data Communication Course into a game. The research got a good to very good score from the three validators and a very good value for potential users.

The implementation in this research used the hybrid learning environment, which was a combination of synchronous and asynchronous learning environments. Some previous studies about synchronous learning were held by Khan (2006), Clark et al (2007), and Amiti (2020). In these studies, the important key in synchronous learning was the interaction between teacher and students in a specific conference platform in real-time. On the other hand, asynchronous learning is a kind of distance learning that does not require the presence of teachers and students in real-time or simultaneously. In asynchronous learning, learning is not bound by time, place, or a certain online classroom and can be accessed according to the time the student wants (Shahabadi and Uplane, 2015). But of course, the teacher must provide the learning material in a form of audio/video, book, article, or PowerPoint presentation (Perveen, 2016).

Hybrid learning is the combination of both synchronous and asynchronous learning. This learning is called hybrid because it combines simultaneous and non-simultaneous learning as learning instructions in synchronous and asynchronous learning which have completely different patterns (Perveen, 2016). Some latest studies about the effectiveness of hybrid learning were held by El-Gayar and Dennis (2005), Putra (2015), Indarto et al (2018), Hediandah and Surjono (2020). The impact of Hybrid learning implementation were (1) Hybrid learning was proven to be able to overcome frustration and limitations between teachers and students in the learning process through online facilities; (2) Hybrid learning made the learning process to be more innovative because the variety of interaction and discussion (Lord & Lomicka, 2008 and Delacey & Leonard, 2002); (3) Hybrid learning could make the learning atmosphere to be more enjoyable and conducive because the students are happy and active in the learning process (Melton, et al, 2009).

The result in the evaluation step of this product showed that the experiment class which was given the product using hybrid learning, had a significant higher test score than the control class. The mean of experiment class test score was 77.09 while the mean of control class test score was 70.06. It can be a proof that the interactive animation learning media that can be accessed using Android Smartphones has a significant impact in increasing the Statistical analysis skill of the students. Some students in the experiment class were interviewed and their reaction was they are happy seeing animation that helps their imagination to understand the concept and the case better. And the interactive part made it enjoyable to learn through this media. Besides that, it was fun to do the evaluation part of the media because it was completed with animation and music, as they feel like playing a game. In addition, students could access the media through their Android Smartphones made them easy to study anywhere, anytime, and everything was in their grip.

This result was in line with the previous study that was held by Syahrinsi et al (2021). This research concluded that interactive learning media has effectiveness towards improving the competence of learners as seen from the learning results between pre-test and post-test scores. Sahronih et al (2020) also stated that the science learning outcomes of students who learn to use interactive learning media environment-based are higher than the science learning outcomes of students who learn to use non-interactive learning media. A similar study about interactive media was also done by Bustanil et al (2019). The research gave a result that interactive

learning media could increase students' learning outcomes and motivation. Other researchers have also developed interactive learning media, such as Moedjino et al (2018) who developed interactive learning media in Biology using augmented reality; Mc Kann (2014) who developed an Interactive Media Layering (IML); Gan et al (2015) studied about increasing student learning quality using digital interactive media; and Yanti et al (2016) who construct an interactive learning media in Gas Theory.

CONCLUSION

After passing through various steps of research, it can be concluded that this development of interactive learning media is a valid learning media that can affect students' ability in Statistical Analysis significantly. In addition, students also enjoyed the implementation of the learning media. Thus, this learning media can be considered as a creative learning alternative during online learning. For further development, this product can be applied using other materials in one course so that learning applications can become one integrated application.

CONFLICT OF INTEREST

The researcher stated that there is no relation nor conflict of interest between the researcher and the management of Jurnal Teknologi Pendidikan Universitas Negeri Jakarta.

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