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Strengthening Students' Motivation in Statistics Online Learning Through Interactive Animation Media on Android Smartphone

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ABSTRACT

Students' motivation plays an important role in increasing students' ability and learning outcomes, especially in online learning. Strengthening students' motivation can be conducted by using proper and creative learning media. With an interesting media will make students enthusiastic in taking lessons. The learning process will also be effective, interesting, and easier for educators in delivering messages by using interesting learning media. To transform a learning media, technology can be a powerful tool to be used. The purpose of this study is to improve the students' motivation in Statistics Online Learning by implementing an interactive animation learning media that can be accessed by Android smartphones. The type of this research was design experiment research which applies a treatment into an experiment class then compares it to the control class. The data of students' motivation in an experiment class (52 students) and control class (52 students) were taken using a questionnaire consisting of ten indicators of motivation. Students' motivation data were classified as high or low motivation. The data were analyzed using Chi-Square analysis. Results showed that there is a significant difference in motivation in experiment class and control class. The odd ratio between the experiment and control class was 5.41. It can be concluded that the Interactive Animation Media on Android smartphones can increase the potential of students' motivation by 5.41.

Keywords: *Motivation, Interactive, Statistics, Online Learning Media.*

1. INTRODUCTION

Students' motivation plays an important role in increasing students' ability and learning outcomes. According to [1], the success of the students' learning was related to their motivation. Paris and Turner [2] described motivation as the engine of learning and this could affect in what, how, and when of the learning [3]. Ryan and Deci [4] in their research stated that motivated learners are active in finding a strategy to facilitate their learning and enjoying their learning. This can make them be able to do challenging learning activities.

Motivation is part of one's goal structures, one's beliefs about what is important, and determines whether or not one will engage in a given activity [5]. Brophy [6] stated that motivation is a construct to explain the initiation, direction, intensity, persistence, and quality of behavior. In addition, [7] stated that learning motivation is the intensity of effort to do something in order to achieve the learning outcome maximally.

There are two factors that affect the motivation of learning which are intrinsic and extrinsic factors. According to the research of [8] learners were affected by their intrinsic motivation such as personalities and extrinsic motivation such as the environment. Gustian [9] added that extrinsic factors such as studying conditions, social conditions, environmental conditions, and proper supporting learning facilities are significant factors in influencing the students' motivation. Sufficient supporting learning facilities such as proper learning media have led to a self-determined form of the learners' motivation. References [10], [11], and [12] in their study also stated that the lack of motivational learners was significantly affected by external factors such as learning environment, learning time, and instrumental supports.

The things that can be done by the teachers to strengthen the learner's motivation from the extrinsic side is to build a satisfying learning environment for the learners such as creating an interesting learning media. According to [13] learning media is anything that can be used to deliver messages or information in the learning process that can stimulate learners' attention and interest. Alfi [14] added that interesting learning media will make students be passionate about taking lessons. The learning process will also be effective, interesting, and easier for teachers in delivering lessons.

Technology can be a powerful tool to be used to transform learning media. According to Alfi [14] technology information and communication have a high potential to improve the quality of the learning process. Karwowski et al [15] also stated that the current technology development requires the education to apply proper learning media that are able to increase students' creativity and motivation.

There are various efforts that can make the learning media interesting, one of them is the presence of interactive multimedia elements. Vaugan [16] defined multimedia as any combination of text, art, sound, animation, and video that is delivered to learners by computer or other electronic tools. While Daryanto [17] added that interactive multimedia is media that is equipped with a controller operated by learners to choose the action that they want. Through multimedia tools (visual graphics, animations, audio, and video) and feedback (interactive) provided, learning will become more interesting because the learners feel the multisensory experience thus can increase the students' motivation [18]

Some previous studies about interactive learning multimedia showed that it has the potential to engage students in meaningful collaborative learning, thus it significantly affects the correct answer of the students [19], [20], [21], and [22]. Advance interactive display technology has been a growing interest in exploring its use within the educational context [20]. Research done by [23] showed that interactive multimedia materials make the students easier to understand and visualize the concept of geography. Alfi [14] in his research result stated that the majority of students in the experimental group feel that it is easier to understand the lesson when the teacher uses the interactive multimedia materials in the classroom because it made the lesson interesting and the student's motivation increased.

Another implementation of technology in developing learning media is the usage of smartphones in mobile-based learning. According to [24] mobile base learning is learning that uses certain tools that can be accessed anytime and anywhere. The innovative mobile learning can make the learning process to be easier and more interesting so the learning process will be more effective [25]. The advantage of mobile learning according to [26] and [27] was the students can repeat the learning material their spare time, anywhere and anytime they want. The use of mobile-based learning media is able to make a smartphone that was originally only for chatting, telephone, or the internet become a complete learning tool that contains lessons consisting of material, examples, and questions equipped with various features. By using a smartphone, the lesson content can be packaged to be more fun so it can motivate the students to learn and achieve the learning outcome better. This statement was supported by the research of Guzel and Gunhan [28] who stated that mobile learning technology can increase the students' motivation significantly.

Statistics is one of the science courses that demands students to be able to think critically to analyze data and solve a problem through data processing. Sudjana [29] stated that statistics is a science that deals with ways of collecting data, processing/analyzing, and making conclusions based on the analysis. Statistics is a basic skill that students need to master because it involves the decision-making process and determining a strategy in a case. During the online learning in a covid-19 pandemic, Statistics had been delivered in various ways of learning such as conference meetings, group discussion chat, video tutorials. Besides, researchers also had developed interactive learning multimedia (that can be accessed by Android smartphones to apply the mobile learning technology. Thus, this study aims to investigate if the effect of the interactive animation learning media in strengthening the student's motivation in learning Statistics during the online learning

2. METHODS

The population of this study was Accounting Department Students in Politeknik Negeri Bali. The sample size of this research was 104 students. The sampling technique used in this research was cluster random sampling. This type of research was a design experiment research where there were two classes investigated in this study, experiment class and control class. The experiment class consists of 52 students of the Accounting Department of Politeknik Negeri Bali. The experiment class was given the interactive animation learning media in Statistics Course (Regression Analysis Subject) using a hybrid learning technique (combination of synchronous and asynchronous learning). From the previous research, this learning media had been validated and was stated properly to be applied in a class. The first week the class was given free time to use and explore the learning media, and the next week a discussion was held using the conference meeting platform. The control class, on the other side, which also consists of 52 students of the Accounting Department of Politeknik Negeri Bali, was

only given the learning subject synchronously using conference meetings.

After implementing the learning media in experiment class, the data about students' motivation were collected using a questionnaire with a 5 scale of Likert. There were 10 indicators of motivation used in this research (adopted from the research of [30]), which are shown in Table 1.

The questionnaire had passed the validity and reliability test and was stated as valid and reliable (the r-value of each item in the questionnaire was greater than r table for 30 respondents which are 0.361 and the Cronbach's alpha value was greater than 0.7). The result of the validity and reliability test are shown in Table 2.

Table 1. Validity and Reliability Test

Item	r value	Validity	Cronbach's Alpha	Reliability
item1	0.401	Valid	0.880	Reliable
item2	0.644	Valid		
item3	0.688	Valid		
item4	0.708	Valid		
item5	0.700	Valid		
item6	0.809	Valid		
item7	0.434	Valid		
item8	0.473	Valid		
item9	0.621	Valid		
item10	0.577	Valid		

Table 2. Indicators of Motivation

No	Indicator
1	Easier to interact
2	More active
3	More comfortable in studying
4	More responsive
5	More discipline
6	Honesty and Responsibility raised
7	Independent in studying
8	Repeat the learning
9	Look for another study reference
10	Passionate about learning

Both data from the experiment and control class then were classified as high or low motivation (if the average questionnaire value was below 3.5, the respondent was classified as low motivation and if greater than or equal 3.5 was classified as high motivation).

Table 3. Research Design

Treatment \ Motivation	High	Low	Total
Experiment	n_{11}	n_{12}	$N_{1.}$
Control	n_{21}	n_{22}	$N_{2.}$
Total	$N_{.1}$	$N_{.2}$	N

The data then were analyzed using Chi-Square Analysis and the hypothesis was:

H0 : There is no significant effect of the treatment (using the interactive animation learning media) on the students' motivation

H1 : There is a significant effect of the treatment (using the interactive animation learning media) on the students' motivation

Where
n_{11} = observed value of the first row and first column
n_{22} = observed value of the second row and a second column
n_{21} = observed value of second row and first column
n_{12} = observed value of first row and a second column
$N_{1.}$ = the total observed value of the first row
$N_{2.}$ = the total observed value of the second row
$N_{.1}$ = the total observed value of the first column
$N_{.2}$ = the total observed value of a second
N = the total of an observed value

The statistics Chi-Square was obtained using Equation (1) [31].

$$\chi^2 = \sum \frac{(n_{ij} - \mu_{ij})^2}{\mu_{ij}} \quad (1)$$

Where:
χ^2 = the chi-square value
n_{ij} = observed frequency of the i-th row and j-th column
μ_{ij} = expected frequency of the i-th row and j-th column

The criteria to reject H0 is when the $\chi 2$ is greater than $\chi 2$ table (α; (I-1)(J-1)). The $\chi 2$ table can be obtained by using the Chi-Square table.

To obtain the potential increase of student's motivation if the students were given the treatment (interactive animation learning media), the odds ratio should be calculated. The formula to calculate the odds ratio (OR) is in Equation (2) [31].

$$OR = \frac{n_{11}n_{22}}{n_{21}n_{12}} \quad (2)$$

The value of OR is interpreted as: If OR = 1, it means that there is no relation or effect of treatment (interactive animation learning media) to students' motivation, If OR < 1, it means that the treatment (interactive animation learning media) have the potential to decrease students' motivation, and If OR > 1, it means that the treatment (interactive animation learning media) have the potential to increase students' motivation

3. RESULTS AND DISCUSSION

3.1 Results

This study was aimed to find out if the interactive animation learning media that can be accessed through Android smartphones can increase the potential of students' motivation. To reach the goal of this study, a cross-tabulation of the data about the treatment of the class (using the learning media or not) and their classification of motivation, have been done. Table 4 shows the cross-tabulation of the data, including the observed frequency, expected frequency, and its percentage.

Table 4. Cross Tabulation

Class		Motivation		Total
		High	Low	
experiment	Obs	47	5	52
	Expct	40	12	52
	Total	45.20%	4.80%	50.00%
control	Obs	33	19	52
	Expct	40	12	52
	Total	31.70%	18.30%	50.00%
Total	Obs	80	24	104
	Expct	80	24	104
	Total	76.90%	23.10%	100.00%

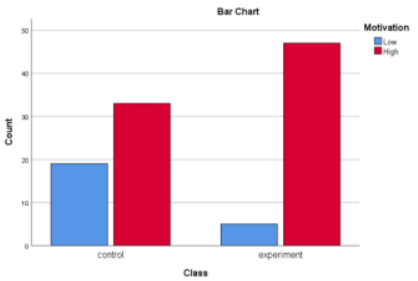

Figure 1 Bar Chart of Motivational.

Table 4 shows that the experiment class had 47 (45.20%) high motivational students while the other 5 (4.80%%) students were classified as low motivational students. On the other side, there were 19 (18.30%) low motivational students in the control class and 33 (31.70%) high motivational students. In total there were 24 (3.10%) low motivational students and 80 (76.90%) high motivational students. Figure 1 also showed the bar chart of low and high motivational students in each class.

The null hypothesis is rejected if the Chi-Square value (Pearson Chi-Square) is greater than Chi-Square Table. The value of Chi-Square is shown in Table 5. The Person chi-square value based on Table 5 is 10.617 with the asymptotic Significance (2-sided) 1s 0.001. According to the statistics table of Chi-Square, $\chi_{(0.05;(2-1)(2-1))} = \chi_{(0.05;1)} = 3.84$. Thus, the Chi-Square value (10.617) is greater than the Chi-Square table (3.84). Hence, the null hypothesis is rejected. It can be concluded that the treatment (using the interactive animation learning media through a smartphone) had a significant effect on students' motivation.

Table 5. Chi-Square Analysis Results

	Value	df	Asymp. Sign (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	10.617[a]	1	0.001	
Continuity Correction[s]	9.154	1	0.002	
Likelihood Ratio	11.17	1	0.001	
Fisher's Exact Test				0.002
Linear-by-Linear Association	10.515	1	0.001	

Table 6. Odds Ratio

Statistics			Value
Estimate			5.412
ln(Estimate)			1.689
Standard Error of ln(Estimate)			0.552
Asymptotic Significance (2-sided)			0.002
Asymptotic 95% Confidence Interval	Common Odds Ratio	Lower Bound	1.836
		Upper Bound	15.953
	ln(Common Odds Ratio)	Lower Bound	0.608
		Upper Bound	2.77

For further analysis, the odds ratio was calculated. These values were calculated to know if the treatment (the interactive animation learning media) could increase the potential of students' motivation. Table 6 shows the value of OR.

The value of OR (estimate) in Table 6 is 5.412. This OR is greater than 1 so it can be interpreted that the treatment (the interactive animation learning media) had the potential to increase the students' motivation. The students have a potential to be highly motivational in experiment class 5.412 times higher than if the students were in control lass. It means that treatment in experiment class had the potential to strengthen students' motivation 5.412 times.

3.2. Discussions

Extrinsic factors such as studying conditions, social conditions, environmental conditions, and proper learning facilities are significant factors in influencing students' motivation in learning [9]. The research of [10] also showed that the lack of students' motivation was significantly affected by external factors such as learning environment, learning time, and instrumental supports. Hence, in order to strengthen students' motivation in learning, a change situation of studying should be done.

There are many ways that could change the studying situation, one of them is transforming the learning media using the power of technology. In this study, the development of learning media was applied to a group of experiment classes. The new learning media presence the interactive elements in order to make the students feel the multisensory experience as they can increase their motivation in learning [18]. The learning media was also including animation displays so the students will feel interested in studying. Besides that, this learning media was also designed to be accessed through Android smartphones, hence the students can study anytime and anywhere in their spare time. According to Huang et al [25] this learning process will be more effective.

The data of students' motivation in the experiment class were collected. And as for comparison, data from a control class were also collected. The motivational data of the experiment and control class were classified as low and high motivation and were analyzed using Chi-Square Analysis. Based on the results, the null hypothesis in this research was rejected in the 95% level of confidence. It means that the difference of treatment in experiment and control class (learning media) and students' motivation is associated. Or in the other words, this interactive animation learning media significantly affect the students' motivation. The odds ratio (OR) value from cross-tabulation data was 5.412. The OR that greater than 1 showed that the treatment (interactive animation learning media) had the potential to increase students' motivation. In this study, the OR 5.412 means that the students had a potential to be highly motivational in experiment class 5.412 times higher than if the students were in the control class. It can be interpreted that the treatment in experiment class had the potential to strengthen students' motivation 5.412 times.

This result was supported by some previous studies. Wachtler et al [32] stated that the interactive component in learning media could gain the interaction that may enhance students' motivation. This interaction could be considered a major influencing factor in learning because it could transform the passive watchers to become active learners. Koven-Vacks et al [33] also argued that a technological approach in a more interactive form of learning media could empower the learning process and motivation.

Mobile-based learning media was also an interesting thing in improving the learning process and motivation. The high result of OR in this research may also be connected by the application of mobile base learning in the developed learning media. Studies employing interactive technology in the form of tablets (mobile base) reported improved motivation, supported learning in small groups, and independent work [34], [35], and [36]. The use of mobile learning can make a smartphone that used to be just for a chat, phone calls, or just accessing the internet, to be a useful tool to study. By using a smartphone, the students will feel free to study anytime and anywhere they want because it is easy to bring a smartphone anywhere. Mobile learning can also increase the possibility of informal learning that does not depend on a certain location of learning. Hence, this could increase the students' motivation in learning.

4. CONCLUSIONS

The application of interactive animation learning media that can be accessed through android smartphones was proven effective in strengthening students' motivation in Statistics Online Learning in the Accounting Department of Politeknik Negeri Bali. The interactive animation learning media can increase the potential of students' motivation by 5.412 times compared to the control class.

AUTHORS' CONTRIBUTIONS

This study was designed, directed, and coordinated by N.W.D. Ayuni. As the principal researcher, N.W.D Ayuni provided conceptual and technical guidance for the study. A.A. Putrawan designed the research classification and designed the implementation of the learning media. K.C. Dewi built the questionnaire and carried it out into a google form then K.C. Dewi did the validity and reliability test of the questionnaire. Implementation of the learning media was performed by N.W.D. Ayuni. The data were collected by K.C. Dewi and were analyzed by N.W.D. Ayuni and A.A Putrawan.

The main text of the paper was written by N.W.D. Ayuni. The section of methods was first written by A.A. Putrawan and K.C. Dewi then was improved by N.W.D. Ayuni. K.C. Dewi performed the discussion section in this paper. A.A. Putrawan and N.W.D Ayuni also added some explanations in that section. K.C. Dewi adjusted the paper into the manuscript template with the help of A.A. Putrawan.

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