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## DEVELOPMENT OF DIGESTIVE MEDIA FOR ANDROID IMPROVED THE PERFORMANCE OF FIFTH GRADERS

**Abstract.** The use of android-based human digestive system media can improve fifth-grade elementary school learning outcomes in Indonesia. The method approach in this research is a mixture of quantitative and qualitative approaches. The validity of the data using expert validation test, instrument test, prerequisite test, feasibility test, and effectiveness test were used. The results of the study the average percentage of the N-Gain score test in the first experimental class was 63.20% and in the second experimental class was 63.24%. Meanwhile, in the control class, the average N-Gain score was 38.91%. The effectiveness test used the t-test with a significance value (2-tailed) of  $0.000 < 0.05$ . The results of t count in experimental classes one and two also show a value greater than the t table, namely for experimental class one t count obtained  $29.067 > 2.017$  and experimental class two with t count  $29.654 > 2.026$ . The results of these calculations are significant differences between student learning outcomes in the pre-test and post-test. So the use of android-based human digestive system media has a significant impact on student learning outcomes in fifth-grade science lessons in elementary school.

**Keywords:** Android media, science learning, learning, outcomes, teachin.

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## РАЗРАБОТКА ПИЩЕВАРИТЕЛЬНОГО МЕДИА ДЛЯ ANDROID УЛУЧШИЛА УСПЕВАЕМОСТЬ ПЯТИКЛАССНИКОВ

**Аннотация.** Использование носителей пищеварительной системы человека на базе Android может улучшить результаты обучения в пятом классе начальной школы в Индонезии. Методический подход в данном исследовании представляет собой смесь количественного и качественного подходов. Были использованы достоверность данных с использованием экспертного валидационного теста, инструментального теста, теста предварительных условий, теста осуществимости и теста эффективности. По результатам исследования средний процент теста N-Gain score в первом экспериментальном классе составил 63,20%, а во втором экспериментальном классе - 63,24%. Между тем, в контрольном классе средний показатель N-Gain составил 38,91%. В тесте эффективности использовался t-критерий со значением значимости  $0,000 < 0,05$ . Результаты подсчета t в экспериментальных классах один и два также показывают значение больше, чем в таблице t,

а именно, для первого экспериментального класса получено значение  $t_{29,067} > 2,017$ , а для второго экспериментального класса -  $t_{29,654} > 2,026$ . Результаты этих расчетов представляют собой существенные различия между результатами обучения учащихся в до-тестовом и после-тестовом периодах. Таким образом, использование носителей пищеварительной системы человека на базе Android оказывает значительное влияние на результаты обучения учащихся на уроках естествознания в пятом классе начальной школы.

**Ключевые слова:** Android-медиа, научное обучение, результаты, обучение и преподавание.

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### **ANDROID АС ҚОРЫТУ МЕДИАСЫНЫҢ ДАМУЫ БЕСІНШІ СЫНЫП ОҚУШЫЛАРЫНЫҢ ОҚУ ҮЛГЕРІМІН ЖАҚСАРТТЫ**

**Аңдатпа.** Android негізіндегі адамның ас қорыту жүйесінің медиасын пайдалану Индонезиядағы бесінші сыныптағы бастауыш мектептің оқу нәтижелерін жақсартта алады. Бұл зерттеудегі әдіс тәсілі сандық және сапалық тәсілдердің қоспасы болып табылады. Сараптамалық валидация сынағы, құрал сынағы, алғышарттар сынағы, техникалық-экономикалық сынағы және тиімділік сынағы қолданылған деректердің дұрыстығы пайдаланылды. Зерттеу нәтижелері бойынша N-Gain балл тестінің орташа пайызы бірінші эксперименттік сыныпта 63,20% және екінші эксперименттік сыныпта 63,24% құрады. Сонымен қатар, бақылау сыныбында N-Gain орташа баллы 38,91% құрады. Тиімділік сынағы  $0,000 < 0,05$  мәнділік мәні бар t-сынағын пайдаланды. Бірінші және екінші эксперименттік сыныптардағы t санының нәтижелері де t кестесінен үлкен мәнді көрсетеді, атап айтқанда бірінші эксперименттік сынып үшін алынған t саны  $t_{29,067} > 2,017$  және t саны  $t_{29,654} > 2,026$  екінші эксперименттік сынып үшін алынды. Бұл есептеулердің нәтижелері студенттердің тестілеу алдындағы және кейінгі сынақтағы оқу нәтижелері арасындағы елеулі айырмашылықтар болып табылады. Сонымен, андроид негізіндегі адамның ас қорыту жүйесінің медиасын пайдалану бастауыш мектептегі бесінші сыныптағы жаратылыстану сабақтарында оқушылардың оқу нәтижелеріне айтарлықтай әсер етеді.

**Кілт сөздер:** Android медиасы, ғылымды үйрену, оқу, нәтижелер және оқытушы.

**Introduction.** The 2013 curriculum on primary and secondary education aims to develop intellectual intelligence through discipline education. Good educational planning will produce quality human resource output and to develop one's unification requires the right learning process. The implementation of the 2013 Curriculum is expected to be able to answer the challenges of the 21st century, namely the emergence of the phenomenon of digital society which is often called revolution 4.0, namely the change of civilization towards a knowledge society. Teachers and students are required to be able to master the skills of the 21st century, namely being able to understand and utilize information and communication technology (ICT Literacy Skills) [1]. Technological sophistication becomes an optimal medium in the delivery of materials/concepts and completion of final tasks [2]

The role of ICT (Information and Communication Technology) today cannot be separated from the learning process. The development of science and technology has led to rapid progress in the world of education [3]. The world of education has entered the era of the world of media, especially digital media, where the learning process prioritizes media over lecture methods, so the

role of learning media is increasingly important to realize an effective learning process. The function of learning media is able to generate new desires and interests, increase motivation and stimulation of learning activities and even psychologically affect students.

In the learning process, we often encounter several problems, including learning facilities that are lacking, both in quality and quantity. At the time of the learning process students feel bored so the teaching and learning process does not run optimally. Students tend to be interested in using their own gadgets, this requires teachers to provide innovative learning media in accordance with the technological developments they like. Mobile phones are one of the mobile technologies that are widely used and loved by students, so the opportunity to use mobile phones as one of the learning media in the world of education is very large. The development of android-based learning media that is attractive and easy to install on mobile devices is expected to be one of the learning media that can facilitate students who are generation Z in understanding the material delivered by educators because students usually use mobile phones just to play games or just chat with social media users only, it is better to develop media that have educational elements to support the learning process [4].

**Conceptual Framework.** According to Sanjaya [5], learning media are all tools and materials that can be used to achieve learning goals such as radio, television, books, newspapers, magazines, and so on. These tools when used and programmed for education can be said as a medium of learning. Based on the development of learning media technology is grouped into four groups, namely (1) print technology media, (2) audio-visual technology products, (3) technology-based media based on computers, and (4) media produced by combined print and computer technology. Multimedia is divided into two categories, namely: linear multimedia and interactive multimedia [6].

Multimedia is one of the learning media that is often used by teachers in every learning concept [7]. Multimedia combines presentations in the form of images, sounds, animations, and writing. Interactive multimedia is multimedia that in its use there is an interactive relationship between the media used with its users. Interactive multimedia can be used as a learning medium that plays a role in improving student understanding and positively affects the improvement of student learning outcomes [8].

One of the innovation efforts that can attract the attention of students in the process of teaching and learning activities with the use of creative and innovative media [9]. Smartphones are one of the development of information and communication technology that is developing today, where smartphones in addition to having the basic ability to call, send messages, access the Internet, smartphones also have the ability to run certain applications inserted into smartphones. The use of software platforms where there is currently one of them is Android. Android is a Linux-based operating system designed specifically for mobile devices such as smartphones or tablets [10]. Further explained by Takaen, M and Manginsela, A. P. G [10] states that android is a mobile operating system that is widely used today, from children to adults, from high school students to college. Android technology has made learning systems easier and more interesting and can also be accessed anywhere and anytime.

Android-based human digestive device media developed, made with a Kodular application. Deep [11]. Kodular is a website, which provides tools to create android applications with the concept of drag-drop block programming. Kodular also provides a mini dBase function and store, so we can store and upload data as we see fit. In terms of GUI / display, the code can be customized theme (theme) so that applications are made more current and look professional. The stored code with the existence of the file is (aia) and the existence plugin (aix). This existence plugin consists of several lines of command code in the Java programming language, the next (java) which will convert into an existence plugin file (aix).

Android-based mobile learning media is one of the intermediaries or introductions to learning message sources to facilitate the delivery of information in achieving learning goals. This

is in line with Kuswanto and Radiansah [12] that one of the means that learners are not saturated in taking lessons is with learning media and the biggest results or influence of the expected effect is that learners can be motivated and facilitate in receiving the subject matter. Recommended android-based learning with smart apps creator is used for math learning on other materials to improve critical thinking skills [13].

The use of android-based media is expected to be able to improve student learning outcomes. Teachers play an important role in learning therefore the quality of teachers still plays a key role [9]. The readiness and ability of teachers in managing learning is also very influential on learning outcomes. In hesty's opinion in Puspita [14] the success of learning can be influenced by factors such as teacher quality, student characteristics, availability of facilities and infrastructure and environmental factors. According to Fadillah [15], learning outcomes are changes that occur in students as a result of participating in learning activities, both on aspects of knowledge, attitudes and skills. Learning outcomes are the culmination of the goal of a learning process in which to achieve students are required to perform a performance that can be assessed and become a learning outcome. In essence, learning outcomes are behavioral changes as learning outcomes in a broader sense covering cognitive, affective, and psychomotor fields. Learning outcomes can awaken, improve, and nurture students' passion for learning until successful [16].

Nasution in Purbasari et al. [17] stated that mobile learning strategies are very effective in helping to improve the willingness and learning progress of learners. Students can access the subject matter using their android smartphone anywhere and anytime without limited space and time. According to Sonjaya & Fadlurahman [18] the utilization of Android learning media makes the learning process more interesting and makes students become motivated, excited, and interested in the learning process. The use of animation can increase the attention and motivation of learning learners [19].

**Research Objectives.** This research was conducted to find out the effectiveness of Android application development as a learning medium that uses Android-enabled mobile phones to support learning in elementary school fifth grade IPA on human digestive materials in Indonesia.

### **Methodology**

**Research Design.** The study used Research and Development (R&D) which refers to Borg and Gall steps. Research and Development (R&D) is a research method used to produce a particular product, and test the effectiveness of that product [20]. The method approach used is a mixture of quantitative and qualitative approaches. Data validity tests using expert validation tests, instrument tests, prerequisite tests, feasibility tests and effectiveness tests.

**Respondents of the Study.** The data sources in this study were taken from learners, teachers, as well as from experts. There were three schools that were sampled in this study, Public Primary School Jatimulyo and Public Primary School Karangrejo Number 2 Bonang Demak as an experimental class while Public Primary School Tlogoboyo Number 2 Bonang Demak as a control class.

**Findings and Discussion.** The following will be presented data analysis of student learning results: normality test, homogeneity test, and normalized gain score or N-Gain score statistical test.

**Normality Test.** The normality test in this study used IBM SPSS Statistics version 23 using parametric statistics namely Kolmogorov-Smirnov (K-S), with the testing criteria  $\alpha = 5\% = 0.05$ .

Table 1. Tests of Normality

	Class	Shapiro-Wilk <sup>a</sup>
		Sig.
Student Learning Outcomes	Pre-Test Experiment 1	.357
	Post-Test Experiment 1	.095
	Pre-Test Experiment 2	.248
	Post-Test Experiment 2	.368

	Pre-Test Control	.315
	Post-Test Control	.455
*. This is a lower bound of the true significance.		
a. Lilliefors Significance Correction		

Source: SPSS 23 data processing results

The results of the normality test calculation found that the value of the significance of the student's pre-test was obtained sig value as follows, Public Primary School Karangrejo Number 2 Bonang Demak (Pre-Test Class Experiment 1) of 0.357, Public Primary School Jatimulyo Bonang Demak (Pre-Test Class Experiment 2) of 0.248. Both classes received a value of  $> \alpha = 0.05$ . So, it can be concluded that the population of the group is normally distributed.

**Homogeneity Test.** Homogeneity testing in this study was conducted with the assisted software IBM SPSS Statistics version 23 using the test of Homogeneity of Variances, which is with the criteria of  $\alpha = 5\% = 0.05$ , if obtained the signification value  $> \alpha = 5\%$  (0.05) or F calculate  $< F$  table then the data has the same variance.

Table 2. Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Student Learning Outcomes	Based on Mean	.837	2	99	.436
	Based on Median	.657	2	99	.521
	Based on Median and with adjusted df	.657	2	97.573	.521
	Based on trimmed mean	.835	2	99	.437

Source: SPSS 23 data processing results

The results of the homogeneity test using the test of Homogeneity of Variances, which is based on the homogeneity test of the pre-test value and post-test obtained signification 0.437. From these results it can be concluded that the signification value of  $0.437 > \alpha = 5\%$  (0.05). This significance value indicates that  $H_0$  is accepted, so both pre-test and post test data are homogeneous.

**Hypothesis Test.** The t test is used to describe the media use of android-based human digestive devices based on values in experimental groups and control groups. The result of the t test is.

Table 3. Paired Samples Test

		Paired Differences						T	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		Lower	Upper			
				Lo	Up					
				wer	per					
air 1	1-Pre-Test Experiment Class 1- 1-Post-Test Experiment Class 1-	35.59	8.122	1.224	33.12	38.06	29.06	43	.000	
air 2	2-Pre-Test Experiment Class 2 2-Post-Test Experiment Class 2	35.39	7.358	1.194	32.97	37.81	29.65	37	.000	

Source: SPSS 23 data processing results

The results of calculations on the experiment table one obtained that  $t$  count  $>$   $t$  table, which is  $29,067 > 2.017$  and in the experimental class 2 with  $t$  count  $29,654 > 2,026$ , it can be concluded that  $H_0$  was rejected and  $H_a$  accepted.

**Test N – Gain.** The Gain test is used to test the difference in posttest and pretest values. The gain test is carried out with the help of SPSS. The results of the gain test are.

Table 4. N-Gain Test Results

		Class	Statistic	Std. Error		
N- Gain_Percent	1	Experiment Mean	63.2003	2.33250		
		95% Confidence Interval for Mean	Lower Bound	58.4963		
			Upper Bound	67.9042		
		5% Trimmed Mean	62.9201			
		Median	62.5000			
		Variance	239.384			
		Std. Deviation	15.47205			
		Minimum	37.84			
		Maximum	93.62			
		Range	55.78			
		Interquartile Range	23.40			
		Skewness	.262	.357		
		Kurtosis	-.720	.702		
		Experiment 2	2	Experiment Mean	63.2372	2.47675
				95% Confidence Interval for Mean	Lower Bound	58.2189
Upper Bound	68.2556					
5% Trimmed Mean	62.8859					
Median	62.3821					
Variance	233.102					
Std. Deviation	15.26769					
Minimum	37.84					
Maximum	93.62					
Range	55.78					
Interquartile Range	24.80					
Skewness	.239			.383		
Kurtosis	-.840			.750		
Control				Mean	38.9135	2.43617
				95% Confidence Interval for Mean	Lower Bound	33.8145
		Upper Bound	44.0124			
		5% Trimmed Mean	39.2411			
		Median	40.7842			
		Variance	118.698			
		Std. Deviation	10.89487			
		Minimum	12.28			
		Maximum	59.65			
		Range	47.37			
		Interquartile Range	14.14			
		Skewness	-.524	.512		
		Kurtosis	.995	.992		

Source: SPSS 23 data processing results

Based on the results of the calculation of the N-Gain score test above, showed that the average value of N-gain score of the first class of experiments amounted to 63.2003. N-gain second-class score of 63.2372. While the average N-gain score for the control class was 38.9135.

From the results of the calculation of the N-gain score test obtained the average value of N-gain score of the first experimental class of 63.2003 with a percentage of 63.20% including the category 'quite effective' and the second experimental class of 63.2372 with a percentage of 63.23% including the category 'quite effective', while the average N-gain score for the control class of 38.9135 with a percentage of 38.91% belonged to the category 'ineffective'.

The results of the test analysis t obtained the results of the significance value of both experimental schools is 0.000, the value of this significance is less than 0.005. It can be concluded that the results of the t test with paired sample t test show a significance value of  $0.000 < 0.005$ . Guided by the test criteria if the significance value  $< 0.05$  then  $H_a$  is accepted and  $H_0$  is rejected. From the results of the test t count the first experimental class and the second experimental class showed a value greater than t the table, for the experiment class one t count was obtained  $29.067 > 2,017$  and the second experimental class with a t count of  $29,654 > 2,026$ . From the results of these calculations it can be concluded that there is a significant difference between learning that uses android-based digestive device media and those that do not use android-based digestive equipment media.

These results agree with Daryanto [21] that effective learning is as follows: 1) student-centered learning, 2) involving science process skills in constructing concepts, laws or principles, 3) involving potential cognitive processes in the development of intellect, especially high-level thinking skills of students, 4) can expand the character of students. The development of android-based digestive device media can be opened by using a smartphone, tablet based on the operating system, especially android. So that students can open and use this medium is not only limited to classroom spaces and meetings, but can learn anywhere, anytime and with anyone. The use of android as a medium of learning can attract the interest and motivation of learners in learning and also help students in understanding concepts in animal networking materials and can make students learn independently [22].

The use of android-based learning media is very effectively applied, according to the results of research Saputri [23] with the aim of research to produce android-based learning media and to find out the difference in learning achievement of students who use android-based learning media as well as students who do not use android-based learning media. The results of the study can be concluded that there is a significant difference between the learning achievement of students who use android-based learning media and students who do not use android-based learning media.

Utilization of android-based media affects student learning outcomes. Research conducted by Juannita & Prasetya Adhi [24] showed that the test results there was a significant increase in learning outcomes after using learning media and questionnaire results that got a total percentage of 88.56% with very good information. This result agrees with Murod, Utomo & Utaminingsih [25] that the use of android-based interactive e-module Mathematics teaching materials is effective enough to improve the understanding of the class VI circle concept of the concept of circles with a t-count value of 30.926 while t-tables of 1.9765 then  $t\text{-count} > t\text{-table}$  or  $30,926 > 1.9765$ .

Pratama et al. studied the effectiveness of the kit portable PLC on electrical motors courses among vocational school students in Aceh, Indonesia, and concluded that using Information technology is beneficial in the educational process [26-28]. Another study's results of the above research are reinforced by Sholiqah & Agustina [29] that there is an increase in learning outcomes through the problem of using the test gain index of 0.4 with moderate criteria and user acceptance test (UAT) with an average of 87%, showing that the application has been in accordance with the design made and can improve student learning outcomes in accordance with the application of the given learning media.

**Conclusions and Recommendations.** In this study it can be concluded that the medium of android-based human digestive apparatus is very effectively used in learning the theme of three healthy foods fifth grade elementary school. Students are easier to learn and provide new learning experiences for students with the use of android-based learning media. Students easily use it anytime and anywhere either independently or in groups.

The advice given by the authors is that the android-based human digestive apparatus developed will provide more optimal benefits if at the time of application of teacher media should pay attention to the learning conditions of students and the use of android phones in learning in accordance with the learning carried out so that learning goals can be achieved properly. For a better knowledge if the conclusions are valid, we would recommend the study in other Primary Schools in Indonesia or international settings (e.g. in Germany).

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