



## Development of My Biology App Learning Media Based on *Android* Materials of Food Digestion Systems as Student Learning Source at Senior High School

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### Article Info

Article History :  
Received March 2020  
Accepted April 2020  
Published April 2021

Keywords:  
Android, Leraning  
Media, Digestion System

### Abstract

The implementation of the curriculum of 2013 entrusts of innovative and creative learning with the integration of technology in the learning process. Teachers should be creative in finding and gathering learning resources, as well as making teaching materials needed in learning that can help students in learning to achieve goals in the curriculum. So it is necessary to develop learning media based on My Android Biology App in schools in learning biology. Especially in the food digestive system material can be motivate the student and the result of learning. The aim of this study is (1) to analyze the validity of the My Biology App according to media experts and material experts, (2) to analyze the feasibility of the my biology app according to teacher and student responses, (3) to analyze student learning motivation and (4) to analyze the result of learning at student. The method of research is Research and Development (R & D). Pre-Posttest Control Group is the research design. The results of the validation from media experts and material experts indicate that the learning media My Biology App is very valid. It appears in teacher responses with an average of 97.62 and student responses with an average of 108 with a percentage of 90% suitable for use in learning activities. The effectiveness is determined from the motivation data and student learning outcomes. 63% of students are highly motivated and 37% are motivated. The results of the posttest in the experimental class with an average of 86.96 greater than the posttest in the control class with an average of 83.25. In addition, the n-gain in the experimental class 0.74 is greater than the control class with an n-gain of 0.70. It can be concluded based on the results of research that the learning media My Biology App can increase motivation and student learning outcomes in the food digestive system material.

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## INTRODUCTION

The implementation of the curriculum of 2013 requires of innovative and creative learning with the integration of technology in learning process. Teachers should be creative in finding and gathering learning resources, as well as making teaching materials needed in learning that can help students in learning to achieve goals in the curriculum. Teachers is demanded by the 2013 curriculum, teachers as facilitator are required to be able to integrate technology as media and is the information in the learning process.

Knowledge as information presented in various forms of media. Knowledge is used by students in learning activities that are in the form of teaching materials in the form of textbooks (Prastowo, 2012).

Based on the results of interviews with biology teacher for class XI at MAN 2 Semarang, it was found that knowledge, especially biology, has been use tools such as power points and images. The teachers rarely use Android as information in everyday life. Meanwhile, the school facilities of multimedia are complete and also there are superior human resources. Nevertheless, the availability of facilities and human resources are not been used optimally in learning biology especially.

Lazarowitz & Penso (1992) suggested that students generally have difficulty understanding biological material due to abstract physiological concepts and require a lot of memorization.

Learning biology should not only present information and facts for students, but also provide practical value related to daily life (Suhari et al., 2013). One of the biology learning materials for high school students is the food digestive system. The concept of the digestive system of food is closely related to real life.

In the basic competency food digestion (KD) material must be achieved by KD 3.7, the students are able to analyze the relationship between the structure of organ building blocks in the digestive system and relate it to nutrition and bioprocess so that it can explain the digestive process and impaired functions those may occur in the human digestive system through literature study, observation, experiment and simulation.

KD 4.7 students are able to present the results of an analysis of abnormalities in the structure and

function of tissues in the digestive organs that cause disorders of the human digestive system through various media presentations.

Based on the important physiological principles in the food digestive system material has four important principles namely the causative mechanism, the relationship between structure and function, information technic and homeostasis. It is expected that students will be able to achieve these basic competencies (KD). Because of the process cannot be seen directly, so students are felt to need tools in the form of learning media that can motivate student in learning biology and can help improve student understanding so that students do not misconceptions in the digestive system.

Based on the results of Cimer's research (2012) about the difficulties and ways to improve the effectiveness of biology learning (in students' eyes). Biology contains many concepts that cannot be seen in plain (abstract) and phenomena that require observation, so students must see what they are learning. Therefore, students state that in learning biology, if teachers use visual media, both teaching and learning biology can be more effective. Osborne and Collins (in Cimer, 2012) add that biological material is very much and is not comparable to the allocation of learning time and the way of teaching teachers who are still teacher centered also influence the level of learning difficulties. One solution is to support the visualization of learning material, the imbalance between learning material and time allocation, and to support the student-centered learning approach.

According to Yuniarti (2011) Mobile Learning is able to make mobile phones that were originally only used for WA, telephone or internet. The cellphone can be used as a complete learning tool and resource that contains subject matter consisting of material, questions and try outs and is equipped with various features such as search, jump to and back. One of the considerations in developing Android as a media and learning resource is the base of the operating system used is open source.

Mobile learning-based learning media have been developed for example by Ariani et al., (2016) which produces Chemo-Edutainment-based learning media that has educational value and is entertaining and pleasing to its users. In addition, Kurniawan (2015) also developed interactive

chemistry learning media based on mobile learning of oxidation reduction reaction materials. However, the mobile learning application has a shortage of materials and questions contained in the application cannot be added and updated. Yustiana (2011) also developed Android technology in this research resulting in a mobile phone-based learning media as a learning media, unfortunately the application developed by him was only compatible until the Android operating system was a Froyo version. While the Android operating system that is mostly embedded in smartphones today is the KitKat version.

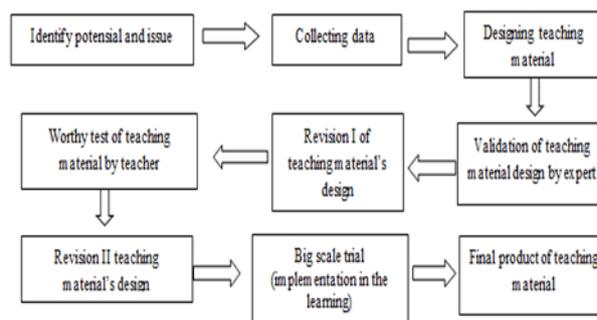
Furthermore, Mobile Learning has three advantages, namely facilitating technological mobility, increasing students' desire to learn, increasing mobility in the learning process in the information and evaluation specs (Osman & Johannes, 2010). Students will more easily access lessons anywhere and anytime, because learning can be done in one place or different places through distance learning which is commonly called distance learning (Yuniati et al., 2012). In line with research conducted by Alfian & Kustijono (2015) that media developed are practical, unlike ordinary devices, because smartphones have a large amount of storage, local memory and have operating units such as computers (Kibona & Rugina, 2015). In terms of students can operate individually.

Norsalis et al. (2016) state that teachers must find ways to make learning interesting and entertaining during the learning process. Thus, the teacher must be able to choose the right media as a source of learning in accordance with the learning objectives, student characteristics and the right to support the delivery of material that is fact, concept, principle or generalization. One of them uses technology in learning. It is by developed android-based learning media as a learning resource to improve the quality of teaching and learning (Heinich et al., 2009). Application of technology in learning is very dependent on the willingness and ability of teachers to use it.

Based on the background that has been described, the need for research development of learning media based on Android My Biology App in schools in learning biology, especially on the food digestive system material to determine student motivation and learning outcomes.

**METHOD**

The research has been done in MAN (equal to Senior High School degree) 2 Semarang city in 2020, the method Research and Development (R & D) or usually called investigation and development. it is adapted from Sugiyono (2010) with the procedure as shown in Figure 1.



**Figure 1.** Step Of Research R & D (Sugiyono, 2010).

Sampling uses a purposive sampling technique, where sampling is assisted by the biology teacher concerned. Samples are selected directly by biology subject teachers on the basis of average smartphone ownership, learning outcomes and student abilities. The design of this study uses a Pre-Posttest Control Group Design pattern. The design of the experiment can be shown as follows (Sugiyono, 2010).

**Table 1.** Design research Pre-Posttest Control Group Design

Class	Pretest	Treatment	Posttest
Eksperiment	O <sub>1</sub>	X	O <sub>2</sub>
Control	O <sub>3</sub>		O <sub>4</sub>

Details:

- O<sub>1</sub> = Giving *pretest* at Eksperiment group
- O<sub>2</sub> = Giving *posttest* at Eksperiment group
- X = *Treatment* (Applying application in *My Biology App*)
- O<sub>3</sub> = Giving *pretest* Control group
- O<sub>4</sub> = Giving *posttest* Control group

Data and source of data is used in this study are presented in Table 1. Meanwhile, the research subjects in the trial were use 70 students of MAN 2 Semarang City consisting of 35 students of class XI IPA1 and 35 students of class XI IPA2.

**Table 2.** Data and Source of Research Data

Data	Data Type	Data Source
Characteristics of My Biology App	Qualitative	IT expert, Study of Literature
The validity of My Biology App	Quantitative	Media expert and material expert
Practicality: teacher and student responses	Quantitative and qualitative	Teacher and student
Effectiveness: Cognitive learning outcomes	Quantitative	Student
Student's motivation to study	Quantitative and qualitative	Student

The validity test of the test questions conducted in this study uses three instruments such as tests, interview guidelines, and questionnaires. The test instrument was tested first to analyze the validity, reliability, level of difficulty, and distinguishing features.

The simple of data was measured using indicators of students' cognitive learning outcomes with N-gain scores on moderate to high criteria on the digestive system material and scores on the assessment of attitudes towards students after receiving learning using the My Biology App learning media on high or very high criteria. Cognitive learning outcomes of students use quantitative data processing on the results of the pretest, posttest, N-gain of the sample class. Student pretest and posttest scores were analyzed using the following formula (David, 2002).

$$Score = \frac{\text{the score gotten}}{\text{score max}} \times 100\%$$

Details:

The right answer, score 1

The wrong answer, score 0

The formula gain is in the below.

$$N - Gain = \frac{\text{skor posttest} - \text{skor pretest}}{\text{skor maximum} - \text{skor pretest}}$$

(Wiyanto, 2008)

We can see the criteria on Tabel 3. as follows:

**Table 3.** The Score Range and N-Gain Criteria

Interval	Criteria
$0,70 \leq g \leq 1,00$	High
$0,30 \leq g < 0,70$	Medium
$0,02 \leq g < 0,30$	Low

Meanwhile, the assessment of attitude planting towards students using questionnaires on student motivation was analyzed descriptively quantitative percentages. In the student motivation study questionnaire there were 36 statements, each statement received the highest score of 5 and the

smallest score of 1, with 5 categories, then determine the criteria. Students can be said to be quite motivated when reaching a score of > 98. The formula for determining student motivation intervals is as follows.

$$\text{Interval} = \frac{\text{skor max} - \text{skor min}}{5}$$

**Table 4.** Student Learning Motivation Category

Interval	Category
122 - 144	Very Motivate
99 - 121	Motivate
76 - 98	Standart
53 - 73	Low
30 - 52	Very low

(Syahputra, 2013)

## RESULTS AND DISCUSSION

### Results

#### 1. Validation of My Biology App by expert media and material

My Biology App learning media has been validated by competent experts in learning media, with the final score that can be seen in Table 5.

**Table 5.** Results of Analysis validation on My Biology App by expert media

Assessment	Score Validasion Results
Validator 1	96.87
Validator 2	98.43
Validator 3	96.87
Total	292
Average	97.4

Validation results in Table 5. Indicates that the My Biology app's learning media is in the category of very valid for use with an average score of 97.4, however the validator provides comments and suggestions for making a few revisions to some sections before use.

The My Biology App learning media has been validated by experts in the food digestive

system, with the final score which can be seen in Table 6.

**Table 6.** Result of Analysis Validaitaion *My Biology App* by expert material

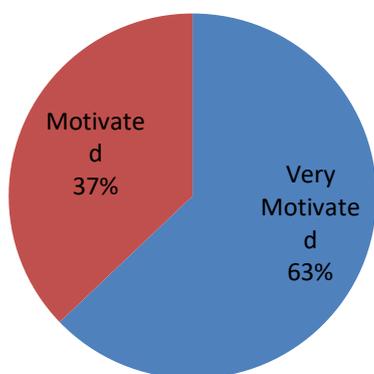
Assessment	Score Validasion Results
Validator 1	100
Validator 2	97.5
Validator 3	87.5
Total	285
Average	95

Validation results in Table 6. Shows that the *My Biology app's* learning media is in the category of very valid for use with an average score of 95, however the validator provides comments and suggestions for making a few revisions of some sections before use.

**2. Motivation and the result of study student on application *My Biology***

**a) Motivation of study**

Learning motivation data obtained from student learning motivation questionnaire. Recapitulation of student learning motivation can be seen in Figure 2.



**Figure 2.** The result of motivation student on *My Biology App*.

Based on Figure 4.1. it can be seen that all students enter the highly motivated and include motivated category, as many as 22 students enter the highly motivated category with a percentage of 63% and 13 students enter the motivated category with a percentage of 37% can be seen in appendix 26. Then the *My Biology App* learning media is effectively used and can motivate students in the process of learning biology in the food digestive system material.

**b) Results**

Measurement of learning results is focused on aspects of knowledge (cognitive). The attitude and skill aspects are still observed, but only as supporting data. Student pretest and posttest learning outcomes can be seen in Table 7.

**Table 7.** Result of *Pre-Posttest* and *N-Gain* at student

Class	Avarage		N-Gain	Criteria	Com-plete
	Pretest	Posttest			
Eksperiment	52,71	86,96	0,74	High	33
control	45,86	83,25	0,70	High	31

Table 7. it shows an average increase in student learning outcomes in the experimental class by 0.74 with high criteria, while in the control class by 0.70 with high criteria.

**Discussion**

The product is developing a learning media in *My Biology App* as a source of student learning. The first development of learning media *My Biology App* is considered reasonable with the validity test by the validator of media experts and material experts. Testing the validity of the learning media on *My Biology App* by competent media experts and material experts in accordance with the suitability criteria consists of the content, linguistic and presentation aspects. In the validity test using the adjusted BNSP standard, both validators stated that it was very valid.

The results of the validity analysis according to media experts found an average of 97.4 with the category of very valid and reasonable to use. In other side there are still some inputs from the validator. One input from media experts is to add the material logo above the blank menu section and give a little experimenting (virtual lab) simply. It is much to develop learning media using various simulation tools (virtual labs). The advantages of simulation are proven to be time-consuming, inexpensive, less space needed (Chan & Fok, 2009). In addition, simulations offer effective tools to improve learning efficiency (Al-Zahrani, 2010), help students to improve practical work performance (Rajendran, 2010; Diviyana & Sanjaya, 2017), strengthen traditional learning success (Liliarti, N., & Kuswanto, H. 2018.), improve understanding of practical work material (Rahman, 2014), and provide better learning achievement (Muchlas, 2015). By incorporating virtual reality as a

simulation tool into the classroom for visualization, and virtual training in the learning process will be more interesting, motivating and can increase knowledge retention (Barata et al., 2015).

Improvements to the logo design need to be done because a good quality logo will give an interesting impression on the contents of the learning media developed. This is in line with research Abildinova & Gulmira (2016) that students will be interested in learning with Android if the symbols and features presented are simple, good but have deep meaning. Based on the analysis of the validity of the material experts according to an average of 95 and categorized as very valid. Furthermore, it needs to be revision according to the material experts on some sub-materials. It needs to be sorted according to the material digestion of the food system so that the sub-material with each other is mutually sustainable.

The effectiveness is the achievement of learning objectives in the teaching and learning process. It can be ideality. In this study the effectiveness of the My Biology App learning media can be seen from the motivation and student learning results. Figure 4.3, shows an average of 22 students are highly motivated with a percentage of 63% and 13 students are motivated with a percentage of 37% when participating in learning using the My Biology App learning media. Interest and motivation are very influential on learning outcomes because learning motivation is an important condition in learning success (Buccheri et al., 2011) according to the opinion (Nagpal et al., 2013) learning facilities are factors that play a role in supporting student learning success independently. Learning media can eliminate the boredom of students because the media is used more than one. In one media there are many other supporting menus, so learning media is very good for students to learn independently (Riyana & Susilana, 2009).

Students are interested in mobile devices at school (Gikas & Grant, 2013; Pashovkin, 2014). Using mobile applications in education will give students constant access to learning material (Yadiannur & Supahar, 2017). Students' interest in learning media My Biology App starts from the beginning of seeing the application after downloading it on the Playstore, so that there is a curiosity about how and what is contained in the

My Biology App learning media. Besides that, students think compared to textbooks is more practical using the Android-based My Biology App as a source of student learning.

The use of technology can also be used in learning to be more interactive and interesting students in learning. Such as android or smartphone technology that is used as a learning medium can provide learning material applications that have an efficient and effective impact that can be downloaded by students according to the material needed, so that it can be repeated whenever learned by themselves (Abdelraheem & Ahmed, 2018).

The My Biology App learning media also features room chats to make it easier for students to learn and can use it anywhere and anytime without being tied to school time to support media technology and the motivation of students in learning (Liu et al., 2017).

The measured in this study focused on cognitive assessment as seen from the increase in students' pretest and posttest results. While the affective and psychomotor assessment of students is only as supporting data. In Table 4.4, the average pretest score of students was 52.71 in the experimental class, while the average value of the pretest in the control class was 45.86.

Then the pretest value in the experimental class is greater than the pretest value in the control class. Then the average value of the posttest in the experimental class was 86.96 while the average value of the posttest in the control class was 83.25. This shows that the learning media My Biology App can improve student learning outcomes on the material digestion system of food. In line with Gonzalez & Martin (2015) the use of smartphones for learning activities gives students comfort in learning. It can be seen in table 4.4. the average value of N-gain in the experimental class that is 0.74, while the average value of N-gain in the control class is 0.70. it occurs a high average criterion in the experimental class and control class. The android-based learning can improve teaching and learning process by emphasizing student knowledge acquisition (Shanmugapriya, 2012), as well as creating opportunities to improve thinking skills and abilities and problem solving (Dekhan et al., 2013; McCann, 2015). Creative learning environments can influence academic achievement,

motivation, involvement, and thinking skills (Davies et al., 2013).

The Android-based learning app My Biology App encourages communication, collaboration, and active learning which is astounding and combines applications for group projects (Hsu et al., 2012). Group projects are combined learning experiences that can occur synchronously and asynchronously when using a mobile device. The encourage other activities and interactions or collaboration between students and reduce the time spent by teachers during school evaluating each assignment. Project-based collaboration arouses student learning motivation. The inclusion of cellular technology with designs that lead to learning activities can be done anywhere, actively, and collaboratively (Erdogan & Dede, 2015).

A literature review shows that mobile technology empowers students to build and guide their own knowledge anytime and anywhere (eg, Herman, 2005; Khan & Chiang, 2014; Mehdipur & Zerehkafi, 2013; Asabere, 2013; Malik & Agarwal, 2012). Mobile technology can help learning opportunities and give students additional tools to create meaningful learning experiences (Ziden, 2013).

This learning media development research supports that student motivation can be improved by e-learning and m-learning, which leads to improved academic results and changes in student attitudes (Shabrina & Kuswanto, 2018).

## CONCLUSION

It can be concluding the result of research on my biology app based on android that was very useful and it has been proven by expert with average 97.4. Besides, the student can increase the motivation of study in student.

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