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Development of E-Module Based Android for Teaching Material of Plantae Kingdom Topic

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Info Article	Abstract
	Utilization of teaching materials with the latest innovation called mobile learning can be applied in learning using Android-based smartphones. Kingdom Plantae is a complex material so it needs effective teaching materials using Information Technology (IT). The development of IT has not been utilized as teaching materials. This study aims to develop Android-based e-module as a teaching material for the X-class students of Plantae kingdom's worthy, practical and effective materials. Research and Development (R & D) stages include identification of potential and problems, data, e-module design, e-module validation, revision I e-module design, small-scale trial, revision II e-module design, large-scale trials, final revision and product of the Android-based e-module material of Plantae kingdom. Data completion method is done by giving questionnaire of media and material validity, and questionnaire of practicality on small and wide scale test. Data analysis used descriptive percentage. The result of the research shows e-module worthy of teaching materials with material percentage of material 81,75% and media 88,46%. E-modules are practically used as teaching materials with a percentage of 83.05% scale test and 88.06% widescreen scale and e-modules with effectively average N-Gains of 0.61 (medium category). Based on these results, can get Android-based e-module can be used as a teaching material of high school students X class of Plantae kingdom.

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INTRODUCTION

The growth of IT pushes the renewal of the consumption of technology result in learning process, especially 2013 Curriculum. The Minister of Education and Culture regulation (Permendikbud) number 22 year 2016 about graduate competence and content standard states that learning principal used is the use of information and communication for improving learning efficiency and effectiveness. Kristiani et al (2012) states that improvement of education quality can be done by improving the learning activity, in this case is the choosing of learning activity plan. Mulyono et al (2012) states that in the development of leaning equipment, a teacher should use the technology which is stimulate the independent study. Erwani et al (2013) explains that in choosing the high-quality learning equipment can increase the learning activity and creative-critical thinking of the students.

The growth of IT should be treated by educational institute for making learning materials. Prastowo (2012:17) explains that learning materials is materials (information, tools, or text) which are formed systematically for supporting the lesson plan. Learning materials ideally can help teacher in learning process base on the curriculum. Kurniawati et al (2014) concludes that learning materials need to be develop for supporting the learning process, it can be seen from the increasing the learning achievement and motivation also classical completeness. Ulfah et al (2013) concludes the attracting coverage of learning materials can makes students motivated and less bored in the learning process and also helps understanding the materials through the exercise. Mujiyono et al (2013) writes that learning process which use media is increasing the activity, skill, and cognitive value of students rather than control class.

The result of questionnaire of grade X students' need which was conducted on SMA N 6, 7 and 10 Semarang on March 2017 showed that 95% students of grade X has had android smartphone. Students tend to use their smartphone to access social media (Line, BBM, Instagram, WhatsApp, etc.) than access the learning material information. Technological advance makes students interested to any information technology related including the use of IT as learning materials which is module.

Learning materials which is provided by schools are textbooks and student worksheet (LKS) yet not all learning materials can help students in learning process. Students are lazy to read learning materials because the visual is not interested, the language is hard to understand and uncoloured picture, especially on Plantae materials. Students of grade X are hard to understand the kingdom Plantae material due to the wide range of materials and also students find difficult to classify, uncoloured picture and students' less interest of reading.

Kingdom Plantae material is main material of Biology subject on second semester of grade X which has quite wide object learning area. The coverage of the materials is non-vascular plant or *Bryophyte* and vascular plant includes *Pteridophyte* and *Spermatophyte.* Kingdom Plantae studies plant on its morphology, metagenesyis, classification, also the role of plant. The characteristic of the metagenesyis is microscopic. Moreover it needs learning materials that can explain the process of the metagenesis in communicative language and shows colour pictures or video so students are easy to understand the process. For classifying the plant the clear pictures are needed for distinguishing the *Bryophyte, Pteridophyte, and Spermatophyte* on each division.

The advanced of technology has provided various learning materials with newest innovation called mobile learning. Mobile learning can be applied on the android smartphone based learning process. Crompton et al. (2016) concludes that the use of mobile technology in every sciences and technology will help educator for expanding their ability in field of science and technology. Burden & Matthew (2016) conclude that the use of mobile technology can encourage the educator to think on pedagogy pattern which has had on the participation of science and technology learning.

Ada *et al.* (2016) concludes that there is a positive attitude of students and teacher who use mobile device and social media application for teaching and learning process and it enables the teacher to manage the teaching experience through students' device. Daryanto (2013: 9) mentions that module is a learning material that is packed systematically and designed as independent learning tool.

E-module kingdom Plantae material is completed by clear colour pictures of plants and also videos to help students understanding the plant's metagenesis process. Darknbaar et al. (2017) concludes that e-module is effective to be used in improving students' complex cognitive skill by giving interesting videos and games for students. Kwant et al. (2015) also states that result of the students' skill training can be improved through e-module learning than textbook. E-module is fulfilled by competency test, offline games (installed on phone) as supporting facilities that can be accesses anywhere and anytime.

The purpose of this study is to analyse the appropriateness, practicality, and effectiveness of e-module as learning materials of kingdom Plantae for grade X students of senior high school. The advantages of the study are 1) facilitating the students to learn kingdom Plantae in easy way, 2) motivating and inspiring students to study, 3) Helping the independent learning process, 4) becoming alternative learning media for delivering kingdom Plantae material, and 5) taking advantage of technology advanced for effective learning process.

RESEARCH METHOD

This research was done in the even semester of 2016/2017 academic year. This research used pre-experimental design with One Shot Case Study type. The population in this research is all 74 8th grade students. The sample is determined by taking all 8th grade class from 8A, 8B, and 8C. The sampling method was using purposive sampling.. The procedure which is arranged in this research included (1) The initial by interview with biology teacher for the 8th grade in Mataram Junior High School Semarang; (2) Planning the learning activity of the research including the learning tools; (3) Making the research instrument to obtain the data; (4) Doing the tryout to the research samples; (5) Analyzing the tryout including the validity, reliability, difference, and difficulty levels; (6) Executing the learning activity with NHT cooperative assisted with picture puzzle in learning material of plant tissue function and structure; (7) Analyzing the data including students' activity, learning outcome, and students and teacher opinion; (8) Arranging the outcome and evaluation.

The indicator of effectiveness in this research includes: (1) students' classical activity is ≥75% in active and very active criteria; (2) ≥75% students passes the passing grade, ≥70.

RESULTS AND DISCUSSION

The results of the study included appropriateness, practicality, and effectiveness of e-module. Appropriateness data was a validation from media and material validator, practicality was gained from teacher and students' response on questionnaire while effectiveness data e-module was gained from students' learning result through pre-test and post-test.

E-Module Appropriateness
The appropriateness of e-module was gained from the scoring of media and material validity. In the judgment of material validator (table 1) there were three aspects got maximum score (4) and nine aspects got medium score which is 3. Scoring aspects with maximum score are contextual example, material aspects, and reference aspect. The judgment result shows that materials on e-module are appropriate for using.

Table 1 Appropriateness data of e-module by material validator

No	Scoring Aspects	Score
1	Materials completeness	4
2	Materials clearness	3
3	Materials deepness	3
4	Factual materials on e-module	3
5	Served concepts are conform the definition in the Biology concept	3
6	Materials are clear and in order	3
7	Contextual examples	4
8	Precise on choosing video and animation	3
9	Understandable language	3
10	Exercises along with answer key and explanation	3
11	References	4
12	The completeness of serving material	3
∑ Score		39
Maximum score		48
Percentage (%)		81,75
Criteria		Appropriate

Based on the study result, the material validator (Table 1) was got maximum score (4) for three aspects which are material completeness aspects, contextual aspects and references aspects. Aspects of material completeness for kingdom Plantae materials got maximum score which means the material has been served completely with photo, pictures and video. Contextual aspects got maximum score due to the plants on the e-module was taken around campus or the researcher's living place area. References or sources aspects on e-module got maximum score because the materials were served well including the content, photo, or video which put the source along.

On the media judgment of kingdom Plantae e-module (Table 2), there was seven aspects that were got maximal score which is 4 and three aspects got medium score which is 3. The scoring shows that the media is very appropriate as learning materials because there are no minimum scores which are 1 and 2. The recapitulation of media validator score can be seen on Table two as follows.

Table 2 Appropriateness data of e-module by media validator

No	Scoring Aspects	Score
1	Consistency of serving	4
2	Logicality of serving	3
3	Orderliness of serving	3
4	Coherence	3
5	The precise on material and illustration	4
6	Example of exercises	4
7	Concept chart and summary	3
8	Answer key and explanation	4
9	The precise on table and pictures identification	3
10	References on texts, pictures and video	3
11	Introduction	4
12	Table of contents	4
13	Glossary	4
∑ Score		46
Maximum score		52
Percentage (%)		88,46
Criteria		Very appropriate

Assessments provided by media validators (Table 2) get scores with very decent categories. The result of the media validator assessment gives score 3 on six aspects and gives the maximum score of 4 on seven aspects with the total assessed aspects are 13 points. Aspects that get a score of 3 are logical presentation aspect, coordination, coherence, concept maps at the beginning of the chapter and summaries at the end of Chapter, the precision of numbering/naming tables and

images, and reference sources. The maximum score is derived from seven aspects: consistency of presentation, the precision of illustration with the material, examples of exercises each chapter, key answers and discussion, introduction to e-module, table of contents, and glossary.

E-module is made to make students easier to learn. Sanjaya (2012: 259) states that the creation of a chart on the media aims to present the message of learning by combining the elements of writing, drawing, and photographs into meaningful unity with the intent to simplify complex learning materials to be easily understood.

E-Module Practicality

The practicality of e-module is measured through a questionnaire of small and large-scale test questionnaires. Practical responses of students on small-scale tests conducted on 36 students class XI. The e-module practical responses (Table 3) reflect students' interest in Android-based instructional materials that are attractively packaged.

Table 3 Practical e-module response data

No	Aspects	Rating Score	∑ Score of each aspects
1	Clear directions	4	
2	Interesting appearance	3	
3	Photos and video can be operated	3	18
4	Understandable language	4	
5	Can be used as learning materials	4	
6	Appropriate with basic competence	4	
7	Indicator-based purpose	3	
8	Interesting and systematic Bryophyte's materials	3	
9	Interesting and systematic Pterydophyta's materials	3	
10	Interesting and systematic Spermatophyta's materials	3	
11	Use original and relevant photos	4	37
12	Clear video	4	
13	Appropriateness of question to the material	3	
14	Logical explanation	3	
15	Clear summary	4	
16	Helpful Glossary on e-module	3	
17	E-module can be used as learning materials	4	
18	E-module helps teacher in the learning process	4	11
19	E-module can be used anywherea	3	
∑ Obtained score			66
Maximum Score			76
Average (%)			88
Criteria			Very practical

In the display, learning interest, practicality to be used anywhere and anytime, and use as a resource material for students kingdom Plantae aspects. Scoring rating of the practicality of e-module with the categories Disagree is given by the students on the aspect of photo/video in e-module, writing aspect used in e-module, aspect of presented Spermatophyta material, and aspects of e-module practice. Aspects of photo clarity there is a score Disagree because there is video of moss' metagenesis with unclear sound and video display, so students have to listen several times to understand the video show. Aspect of writing on e-module get response Disagree because the writing is too small and cannot be enlarged so that students who have difficulty in reading feel

disturbed due to difficulty in reading. Material aspect Spermatophyta gets a response Disagree because, Spermatophyta material is more complex material than Bryophyte and Pteridophyta material, if the presentation of Spermatophyta material too much will not help student's difficulties in learning. The next aspect which gets Disagree response is questions exercises because there is typo so need to be revised. Critics and suggestions which were given by students are to fix typo in the questions exercise part, e-module application should let user to zoom in and out the small writing and presentation of the material should be summarized.

Large-scale trials were conducted at the last meeting by providing a student response questionnaire. Overall the students respond very well to the existence of e-module as teaching materials. Responses given on large-scale trials are good and show e-module is very practical use by class X students as teaching materials. Suggestions are given by student is to added more games in the e-module for students. They enjoyed the presented games. The teacher's responsiveness to the practicality of the e-module is obtained through a questionnaire.

E-module is designed to make students feel happy, because its practicality and concise. The materials are presented using audio visual and there are games that make students more excited. The addition of visual audio in the form of photos and videos on e-module is very helpful for students in learning, especially on material metagenesis/plant's life cycle. Mathew & Ali (2013) summarizes the use of audio visual as a teaching-learning method, stimulating a student's personal understanding and improving the learning environment in the learning process as a joyful learning experience. Amalia & Bintari (2016) concluded the use of pictorial media to stimulate the senses of students to understand. Students tend to prefer when the questions or exercises are packed in the form of games, unlike the case when students do the exercises, it is proven by enthusiastic students who provide input to be given more e-plant games.

Fariroh & Anggraito (2015) concluded the development of learning activities need to be interspersed with games so that students do not feel bored. Enthusiasm of students to these applications certainly makes teachers feel happy because it could combine teaching materials with current technology added with the games as an encouragement for students. The Kici & Kahraman's (2015) study concluded the e-education environment games can be used as an entertainment and interact with friends or competitors so that students are motivated to learn and get more information. Widiyanti et al. (2015) also concluded the development of learning activities in addition to presenting the current affairs; it can be interspersed with more exciting activities like gaming or competition so students are not bored.

E-Module Affectivity

The effectiveness of e-module obtained from students' cognitive value through pretest and posttest and tested with N-gain (Table 4).Results of students' cognitive value can be seen in Table 4.

Table 4 The cognitive value of the students

No	Test Result	Exp 1 (X MIPA 5)	Exp 2 (X MIPA 6)	Exp 3 (X MIPA 7)	Average
1	Pre test score average	48,24	50,40	49,86	49,50
2	Post test score average	80,27	82,29	82,36	81,64
3	Maximum Score	100,00	100,00	100,00	100,00
4	N-gain score average	0.57	0,64	0,63	0,61
5	N-gain criteria	Medium	Medium	Medium	Medium

The development of technology can be utilized to broaden the students to utilize the facilities provided by the school in the form of wifi. The learning activities can take advantage of technology owned by the students both the offline and online. The use of Android is used by students in the form of e-module is certainly one of the utilization of technology in education. Based on research

Soffany et al (2014) concluded that the management of the Android platform in the form of a tablet or phone, the application form of technology that can be utilized as an instructor for students in education. Terit et al (2013) concluded that technologies such as mobile phones, PDA, tablet, and other electronics can successfully be used both inside and outside the classroom to achieve a wide range of learning outcomes, and enable users to take advantage of the flexibility and individualized learning experience..

In the learning process, cannot be separated from the constraints that have been done during the research. Constraints occur before the teaching and learning process. Before the learning begins, students are given e-module through the Share It application first, it takes a lot of time about 15 minutes to transfer files from one student to another. At the time of learning, not all students listen to the teacher's instruction in applying the e-module or when the teacher asks students to open the exercise questions. Students even open the games application contained in e-module. The teachers impressed with the teaching materials provided to students. The teaching materials which are Android-based e-module are independent so that students can learn at their own learning speed. Based on the research of Mckendry & Vic (2012) concluded that the existence of learning applied to students in the high school and university indicate that they have a responsibility in obtaining skill and ability that can reach the expectations in the learning environment. Individual learning indirectly trains the student in taking responsibility for himself to acquire the knowledge required by each student in his or her own way. Independent learning cannot be separated from the teacher's responsibility to guide students through the learning process.

CONCLUSION

E-module which is used on the Kingdom Plantae learming is valid with validity value of material was 81.75% and media was 88.46. The practicality of e-module was gained from percentage value of teachers' response with 88%, try-out response with small scale was 83.05% and 88.06% from try-out with big scale. The effectivity of e-module was gained from pre-test and post-test value with N-gain value was 0.61.

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