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The Development of the Material Teaching based Android in Teaching Chemistryat Senior High School Grade X of SMAN 2 BandarLampung

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Abstract: *The aims of this research are to make the products like Andrid used to teach Chemistry for senior high school at Bandar Lampung grade X1. The problems of the research are students cannot master the concept of pH. The research method used was research and development, it created the Android and test it to the experts and students as the subjects. Besides that it also given to the small group to know the effect of the media usage. Based on the result of the test it has better change for the students. Degeng (2001) the results of development of the product effective, efficiency and attractive. When the product was applied it has 135 minutes remains.*
Key words*: Android, Development Research, Learning Result*

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I. Background

Chemistry Study Materials in high schools contain many concepts that are quite difficult for students to understand, because they involve chemical reactions and calculations and concerning concepts that are abstract and are considered by students to be relatively new material. Schools with excellent student input might not be affected by the problems of unfamiliar chemistry lessons, because viewed from the side of the intelligence of students who are classified as good so that teachers will not experience difficulties in delivering chemistry subject matter. However, it is inversely proportional to the input of students who are classified as less superior, then this will be a tough task for chemistry teachers at the school to provide a better understanding for their students.

In addition, teacher creativity in teaching also seems to greatly influence the success of achieving learning goals. For example, in the process of learning chemistry in several schools so far it looks less attractive, so students feel bored and have little interest in chemistry lessons, so the classroom atmosphere tends to be passive, very few students ask the teacher even though the material being taught cannot be understood. In learning like this participants will feel as if forced to learn so that their souls are depressed. Such circumstances lead to irritation, boredom, attitudes of ignorance, so that the attention, interest, and motivation of students in learning becomes low. This will have an impact on the unmet achievement of chemistry learning goals.

Learning difficulties are caused by several factors, including: (1) External (outside), in this case which includes environmental factors both social or natural as well as Instrumental factors which include curriculum, programs, facilities and infrastructure, and teachers. (2) Internal (in), which includes these aspects include physiological conditions such as physiological and five senses. And psychological which includes interests, intelligence, talent, motivation, and cognitive abilities. This is in accordance with Suryabrata (1986) which states that the factors that influence learning can originate from outside the student's self (extrinsic) and from within the student's (intrinsic). These two factors interact both directly and indirectly in influencing student achievement.

The indicator aspects of facilities and infrastructure affect learning difficulties by 58.75% with moderate criteria (Sudijono, 2009). This indicator is the lowest indicator. Facilities and infrastructure can be in the form of textbooks, practical tools, writing instruments, classrooms, laboratories, and so on. Difficulty in obtaining or having learning tools directly or indirectly can affect student learning success. Students will tend to succeed if assisted by adequate learning tools and good facilities. These learning tools will support the students' understanding process. For example, to explain chemical concepts that are abstract and microscopic in nature it is necessary to have props and the availability of appropriate laboratories.

Teacher indicators are the highest indicators that influence learning difficulties because the role of a teacher greatly influences students in learning. Can be seen from the way the teacher teaches students. This is very decisive in learning success. According to Darminto (2006) one of the most dominant factors influencing the success of learning is the quality of the teacher. The teacher's attitude and personality, basic knowledge in education, mastery of teaching techniques, and the ability to explore the minds of each individual student are

very important. Therefore, the teacher as a motivator, the teacher as a facilitator, the teacher as an innovator, and the teacher as a conductor of individual student problems, need to be a reference during the educational process.

The learning process at Bandar Lampung Senior High School is still one-way, learning is still centered on the teacher (teacher center) so that makes students less motivated in learning. The use of technology-based learning media is also rarely done by teachers, even though the supporting facilities and infrastructure in schools are adequate such as wifi, LCD projectors, and laptops / computers.

Learning media must be packaged as attractive as possible so students can easily understand a material. One of the learning media that can be used to overcome the problem of low student interest in bringing books to school is the development of media in the form of pocket books. But pocket books have the disadvantage of being impractical if carried everywhere. Therefore the right teaching material that can support student learning according to the times is android-based mobile learning. The lack of variety in the media distributed is not solely the teacher's fault, but because the teacher lacks optimizing technological development.

The development of mobile technology is currently very rapid, one of the mobile devices that are currently commonly used is cell phones. Nearly 90% of students at SMK Bina Mandiri Depok already have an Android cell phone. The more students who have and use mobile devices, the greater the opportunities for the use of technological devices in the world of education.

Learning media is a hearing aid or vision for students in order to obtain a significant learning experience. Oesman, at.al (2010) one example of learning media is mobile learning and worksheets. Through mobile learning students can be made more attractive in colorful and accompanied by clearer conceptual portrayals. Students will more easily use the media because it can be used. Mobile learning has 3 advantages which can facilitate the mobility of the technology, increase the desire of students to learn increased learner mobility, and the third is to increase mobility in the learning process in the aspect of information mobility and evaluation of the mobility of the learning processes.

In addition to external factors such as learning models and media there are also internal factors that affect student achievement, one of which is the ability of memory. Memory ability is one of the factors that can affect the quality of student achievement. When confronted with material with characteristics that require a lot of memorization such as a colloidal system, of course it requires memory skills as one of the capabilities that are highly needed (Subagia, 2014: 23). The ability of memory can also be interpreted as a psychic ability to enter a store, and cause a recurrence of things of the past. the ability of memory allows students to link their knowledge in the past with the existing problem.

Smartphones have the potential to be used as a learning medium (Sulisworo, 2012). This makes the prospect of using smartphone-based learning media very good. In addition, the use of learning media through smartphones can also divert negative effects from smartphone use, such as playing games because students can learn through smartphones.

Learning media that utilize cellular telephone technology are called mobile learning. Mobile learning is an alternative learning media development. Mobile learning can be seen as a system that is seen in an effort to improve the quality of learning by trying to penetrate the limitations of space and time (Darmawan, 2016). The presence of mobile learning is intended to complement learning and provide opportunities for students to learn material that is not mastered anywhere and anytime (Fatimah & Mufti, 2014).

At present there are still very few learning media that utilize cell phones. Many students still use laptops or some even use manuals to support learning at school. By using a laptop as a learning medium it will be difficult for students to carry the device because it is heavy and seems troublesome. The teacher still uses conventional methods in teaching so that students feel bored when doing learning activities. Seeing this potential, the development of learning media by utilizing cellular phones is by making mobile learning aimed at all Android mobile platforms.

Android is a Linux based operating system intended for mobile devices. Android is the most popular operating system in the community because it has advantages such as the open source nature that gives developers the freedom to create applications (Anggraeni & Kustijono, 2013). Android can be simply interpreted as a software used on mobile devices that includes an operating system, middleware, and key applications released by Google (EMS Team, 2015).Based on the results of research conducted by Astra et al (2015) explains that the simulation lab application can be used as a learning medium for high school students because the average worthiness indicates that the application is feasible. Students can learn concepts well. Besides that students can also evaluate their knowledge by following the evaluation section.

II. Research Methods

This research uses the Research and Development (R&D) method which refers to the Borg & Gall development model (Borg, 1983: 755-765). This development model consists of 10 main stages, namely (1) research and information gathering; (2) product planning; (3) product draft development; (4) initial trials; (5) revision of initial trial results; (6) field trials; (7) improvements to the product of field trial results; (8) field test;

(9) revision of the final product; (10) dissemination and implementation. As for this research the ten steps were adapted by grouping them into three stages, namely a preliminary study, initial product development, and product evaluation.

Before being tested on students the product of the development was validated by a learning material expert, a media expert and five chemistry teachers. Initial trials were conducted on 3 high school students, field trials by 6 high school students and field trials in one class XI of SMA 2 Bandar Lampung.The results of the media assessment both by experts, teachers and students in the form of qualitative data. Data processing is done by converting qualitative data into quantitative data, calculating the average value then categorizing the assessment. Media is considered suitable for use in learning if it is classified as sufficient.

III. Research Results and Discussion

To collect information about the field needs for learning media, limited observations and interviews were conducted at SMA N 2 Bandar Lampung. Based on interviews with chemistry teachers, it is known that one of the important materials in class XI that is still difficult for students to understand is acid-base material. Students have difficulty understanding the concept of the pH of the solution and difficulty in using the right formula in calculating.

From observations and interviews with students it is known that learning chemistry is still in the form of lectures in class and very rarely use laboratories. Students learn chemistry with learning resources in the form of modules from the teacher. The use of other learning media is still very limited. As a school in the city center, most students already have a smartphone. Its use so far is still limited to personal needs and is not used as a support for learning.

Before being tested the media is validated by an expert in learning material. Media assessment by material experts is reviewed from two aspects, namely the learning aspect and the material aspect. Based on the assessment of material experts found that the material aspects obtained an average value of 4.57 and the learning aspects obtained an average value of 4.43. Overall assessment of material experts have an average score of 4.5 which is included in the excellent category. Suggestions given namely on the competency page need to be supplemented with learning objectives and indicators and improvements have been made based on expert material advice. The conclusion from the material experts is that the developed media is appropriate for use in learning.

Validation by media experts aims to determine the quality of learning media developed in terms of audio visual appearance and software engineering aspects. Judging from the aspect of audio-visual display media obtained an average value of 3.82 and software engineering aspects obtained an average value of 3.8. The average total rating by media experts was 3.81 so that the media was categorized well. Suggestions from media experts so that writing in the material menu is tidied up and the proportions of writing questions and answers in level 3 games are adjusted. Both of these suggestions have been made, while the suggestion to add a countdown timer is not carried out on the grounds that the addition of a countdown timer is feared to make students more difficult to complete each level of the game so that students take a long time to reach the last level. Based on the results of the assessment of media experts, it can be concluded that learning media is appropriate to be used as a support in learning.

Validation by the chemistry teacher was carried out before the initial trial with the aim of getting an assessment from five high school chemistry teachers. The assessment consists of four aspects, namely aspects of learning, material, audio-visual display, and software engineering. Of the four aspects of the assessment obtained an overall average score of 4.44, which means the media are categorized as very good and worthy of use as a support in learning. The chemistry teacher said that the learning media that had been developed were very good and interesting to be used in learning. Suggestions are given that the media should be able to be used via a computer or laptop so that it can be used by students who do not have an android.

After going through the validation process both by material experts, media experts and by media chemistry teachers then were tested on 3 high school students to get an initial response. The three students chosen represent high, medium and low ability students. Based on the calculation results, it is found that the assessment of learning aspects is 4.4 and the aspects of media display is 4.37. The average total for the initial trial was 4.38, which means the media was categorized as very good so it was suitable to be used as a support in learning. In the initial trial the students stated that the media was interesting and made students enthusiastic to complete all levels.

Field trials were conducted to obtain responses to the media in the medium group consisting of 9 high school students. The evaluation in the field trials stated that the learning aspects and media display had a total average of 4.28 with details of the learning aspects of 4.17 and the media display aspect of 4.4. This means that the learning media developed are categorized as very good and fit to be used as a support in learning.In the field trials the students stated that the learning media were interesting and good. Some students commented on the

music used and suggested adding animation to make the material menu more interesting. Based on the results of the field trials, improvements were made to further carry out field trials.

The field test was conducted by testing the media to a group of class XI students of SMA N 2 Bandar Lampung, totaling 21 people. Field test results show that the learning aspect obtained an average score of 3.94 while the media display aspect has an average score of 3.88. The average total score for the field test was 3.91, which means the media was categorized as good and suitable to be used as a support in learning. Based on media assessments that have been done both by material experts, media experts, chemistry teachers and also students can be done by calculating the average value to assess the media as a whole. This final assessment aims to determine the feasibility of the media as a support in learning chemistry.The average value of the media as a whole can be seen in Table 1.

Table 1 The Evaluation of Media

Number	**Evaluator**	**Average**	**Average Maximum**
1	Media Expert	3,81	5
2	Material Expert	4,50	5
3	Chemistry teacher	4,44	5
4	Student	4,19	5
	Total	4,24	5
	Category	**Very good**	**Very good**

Table 1 informs that the average total media rating is 4.24, which means the media quality criteria are classified as very good. From this it follows that the Android-based chemistry learning media is feasible to be used as a support in learning.The results of the learning achievement of the realm of skills in the experimental class I (media) the average achievement of skills in students with high memory abilities was 77.12 while students with low memory abilities were 72.45. While the experimental class II (android-based mobile learning media) had an average learning achievement in the realm of knowledge in students with high memory abilities of 83.61, in students with low memory abilities of 77.40.According Herpratiwi (2009) identified that constructivist learning theory that learning events are basically no longer like the previous concept of a lecturer or educator transferring knowledge to participants but students find a problem and the purpose of each learning material. This means that knowledge is also not something that already exists but a process that is developing continuously. In this process the activeness of a person is crucial in developing his knowledge.

In addition to effectiveness tests, researchers also test efficiency. This test is used to find out what is used in learning to use interactive multimedia whether it is less (efficient) or more than a predetermined amount of time. The recapitulation of time spent in learning using interactive multimedia is presented in the following table:

Table 2 the result of efficiency

Learning Activity	Time Required		Time used	
	Lesson hours	Minute	Lesson hours	Minute
Learning Activity 1	2	2 x 45: 90	1	45
Learning Activity2	1	1 x 45: 45	1	45
Learning Activity 3	3	3 x 45 135	1	45
Amount	**6**	**270**	**3**	**135**

The time needed to learn speaking skills on the pH understanding material by using Android-based teaching materials developed by researchers, the time needed is only about 3 x 45 minutes. While the use of modules requires more time. In learning to understand pH, the teacher takes about 6 x 45 minutes. The efficiency of learning is measured by key indicators referring to time. This result is based on the opinion of Degeng (2001: 172). Degeng provides indicator signs in the form of questions that must be answered to find out the efficiency of learning. How much time does it take for students to reach the stated learning goals? How many personnel are involved in implementing learning? How is the use of learning resources designed for learning? The answers to these questions will give an idea of the level of learning efficiency. In this study the calculated efficiency is the efficiency from the aspect of time.

The equation used to calculate the efficiency of learning success is formulated by Carol (Miarso, 2009: 255) as follows:If the time spent by students to learn interactive multimedia is less or equal to the planned time allocation. The results of product efficiency calculations with regard to learning time have an efficiency value of 135 minutes. The analysis is: 1) if the time spent by students is the same as the time needed by students. 2) If the time spent is greater than the time required by students. 3) If the time spent is less than the time required by students.

IV. Conclusion

Android-based chemistry learning media has been developed with stages according to the development steps of Borg & Gall. Android-based chemistry learning media on acid-base material that has been developed get a total rating of 4.24 (out of a maximum score of 5) which is categorized as very good so it is fit to be used as a support for learning. Learning media that have been developed are expected to be used optimally in supporting chemistry learning. Based on the test of android at small group, it has change for students in understanding the concept of pH. Besides that it is more efficiency when it was applied to the field.

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