Development of Mobile Learning Based on Socio Technology Approaches in Reduction and Oxidation

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ABSTRACT

This study aims to develop mobile learning with socio technology approach on Reduction and Oxidation (Redox) topic and to know the feasibility of media produced. *Mobile learning* was tested at SMAN 11 BEKASI from Januari to Mei 2020. Reserach and development method by Borg and Gall used by modifying five stages, namely: needs analysis, product development, validation, and product test. The resulting mobile learning media is called "MobChemRedoks.apk" compatible on Android devices wich provide a summary, video animated, educational games and relationship between Redox and everyday life that cares about the environment. Feasibility test of the media produced 84% with realibility 0,615. Feasibility test for topic and languange 85% with reability 0,925. 86% for trials tests by chemistry teachers. While trials test by small scale students generated 81% and large scale trials test 85%, from the data feasibility and trials test has very good criteria. Based on reserach data it can be concluded that mobile learning based on a socio technology approach in Redox topic is appropriate to use and according of teacher and students needed.

Keywords: *Development Research, Mobile Learning, Redox, Socio Technology Approach*

1. INTRODUCTION

Based on the development of science and technology 21st century, has brought changes in all aspects. One of them is the development of communication devices, namely mobile phones called smartphones. At present, the presence of a smartphone is not a rare item, almost all communities already have these communication tools, so that smartphones can be utilized properly, smartphones can be used as learning media. Smartphones and tablets can be used as learning media. This smartphone-based learning media is called Mobile Learning (M-Learning). M-learning is M-learning is a learning model that uses smartphones, tablets, netbooks or notebooks as a learning tool and is a part of learning through electronics (e-learning). Thus, M-learning is more flexible than e-learning because students can learn wherever and whenever [1], [2]. In addition, M-Learning can provide experience and opportunities to change technology in education [3]. internet quota is needed to download the M-learning application, but not much. When the user has downloaded the application can be used repeatedly, anytime and anywhere without requiring internet quota again. M-Learning currently has a good learning strategy because it can access to knowledge anytime, anywhere and can play an important role in the development of curriculum and pedagogical approaches in the future [4] - [6]. In addition, one study stated that smartphones can be an option as a learning tool replacing textbooks in the future [7]. Thus, students will no longer carry large backpacks full of textbooks and laptops to class, they can use e-books and carry their smartphones as a more efficient learning tool [8].

Thus, mobile-based learning is expected to open up insights for new learning and support performance in the field, providing information and communication access processes anytime and anywhere [9]. Other research has shown that the application of information search through M-Learning is an effective way because it can attract, encourage and motivate to improve the quality of knowledge and skills theoretically [10]. M-learning must cover 5 categories namely 1) pedagogy and learning environment design; 2) platform / system design; 3) technology acceptance; 4) evaluation and 5) psychological construction then, can help in evaluating, designing, and developing the environment so that the information contained in mobile learning becomes meaningful. [11]. M-learning is designed as technology-based learning and is closely related to the social environment in which students are located [12]. The approach that fits the above is the social technological approach. This approach, has the advantage because this approach has a clear role between the social and technological aspects, the social role is to link events in the surrounding environment if there are problems and the role of technology is as a tool to be operated widely [13]. This approach aims to make learning more meaningful one of them by way of students deepening their knowledge of the environment so that students are more careful in everyday life based on the chemical material being studied. Concern for the environment can arouse student participation in overcoming problems in the surrounding environment [14]. So that, later students can solve some real-world problems that are relevant to everyday life by using M-Learning [8].

Previous research states that, Educators need to develop M-Learning for students' information literacy skills so that technology can be best utilized [15]. To improve information literacy, M-Learning must have several aspects including: (1) Use of application features; (2) Ease of installation autorun; (3) Appropriate content and compatibility with the needs of independent learning and mastery learning; (4) High interactivity; (5) Multi-platform; (6) Activating student independent learning and self-evaluation [16]. Topics in M-Learning were chosen which contain factual learning that studies symbols, conceptual studies of theory and memorization, and procedural skills involving knowledge in calculations and relating to problem solving strategies in daily life. Linking material topics with problem solving in daily life can make the learning process meaningful [17]. Thus, the topic of suitable material is the class X reduction and oxidation (redox) reaction material in the revised edition of the 2013 Indonesian education curriculum.

This is supported by the results of the student needs analysis questionnaire data that revealed 87% of students from a total of 74 students and the analysis of teacher needs from 3 teachers, 1 teacher who claimed to need mobile learning media for the redox learning process and more than 50% of students and teachers needed summary of redox material that is closely related to daily life in mobile learning to facilitate the learning process. Based on these problems, the research that will be conducted is about "Development of Mobile Learning Based on Socio-Technology Approaches to Reduction and Oxidation Reaction Materials".

2. METHOD

This study aims to design, develop and test the feasibility of mobile learning media based on a socio-technological approach, so that it can help teachers in the learning process in class X students, especially on redox material. The time to conduct this research starts from January to May 2020. The research was conducted at SMAN 11 Bekasi with students who have received redox material beforehand, to find out how appropriate this media is used in learning.

Research development carried out refers to the Borg & Gall research and development model. The research phase consists of (1) collecting information (2) planning (3) developing preliminary products (4) preliminary field testing (5) main product revision (6) main field testing (7) operational product revision (8) final product revision (9) operational field testing (10) dissemination. This stage is then simplified using Waldopo's (2002) theory that research and development are closely related to (1) research (2) evaluation (3) development [18].

Data collection techniques in this study is to use a questionnaire or instrument. The first step is to distribute the student and teacher needs analysis questionnaire totaly 74 students and 3 teachers of chemistry. After the media was developed, the study was continued with the feasibility test by experts namely materoi, language and media experts by using the eligibility test questionnaire by experts. After the revision based on recommendations from experts, the resulting mobile learning media were tested on teachers and students on a small and large scale.

3. RESULTS AND DISCUSSION

3.1. Needs Analysis Results

The results of the needs analysis were then produced as a percentage. Analysis of students' needs to find out the media needed to support a good learning process on redox material. While the analysis of teacher needs to find out the media needed by teachers as a supporting tool in learning.

The results of the needs analysis which stated the redox material was difficult to understand because the material was abstract, too many counts and memorization, this was agreed by 64% of students and 100% of teachers. To overcome the difficulties of redox learning, 73% of students choose a tutorial and practicum, while 80% of teachers choose an alternative by multiplying practicum and using mobile phones as learning resources. Data shows 77% of students and 58% of teachers that learning resources used so far use textbooks, student worksheets and lectures by teachers.

Thus, the needs of students and teachers in redox learning require a summary of redox material, this is reinforced by 100% of student respondents and 67% of teacher respondents. Respondents were 97% of students and 100% of teachers agreed that animated videos were needed to increase understanding of redox material. Furthermore, 93% of students and 100% of teachers agree that there are quizzes / games that can be used to test students' understanding of redox material. In addition to material, animated videos and quizzes, 97% of students and 100% of teachers agree that redox material is connected with everyday life that has integrated environmental aspects.

The results above indicate that students need learning media that includes material content summaries, video animations, games, materials related to daily life and integrated environment and can be used flexibly. The use of smartphones as learning media is a new innovation approved by 87% of students and 100% of teachers, for learning chemistry on redox material. More than 50% of teachers and students use Android-based smartphones. So, from the analysis of the data needs of teachers and students in the chemistry learning process redox material requires the development of smartphone-based learning media called Android-based mobile learning media with a socio-technological approach and integrated environment, which means relevant redox material in everyday life as well as making mobile learning users aware of their respective living environments.

3. 2. Stage of Development of mobile Learning

Product development stage, there are 3 steps between making learning media planning, making storyboards and the final step making learning media. In the first step, planning is an illustration of the mobile learning content to be made covering basic competencies and achievement indicators, selecting material from various sources that have been adapted to the latest curriculum, making material summaries, preparing content to make animated videos and chemical flashes linking the material with daily life, making questions to be included in games, making student worksheets that are integrated with the environment.

The next step is to create a storyboard, storyboarding functions to know the flow of the media developed so that it is directed and systematic. The third step is to create learning media with a variety of software between Adobe Flash CS6 for application programming which is the main application for creating learning media, canva for designing media and powtoon for making animated videos. Making learning media refers to the storyboard that was created in the second step. The initial stage is to have a mobile system that will be used, based on the results of the analysis of the needs of teachers and students who use more Android-based smartphones than IOS, the system used in the development of mobile learning is AIR for Android. Mobile learning media is developed with a 1080x1920 pixel portrait layout layout in the form of an application in the .apk file format (Android Pageage) called "Redox" and the operation of this mobile learning media by "touch screen".

3.3. Stage of Media Testing

This stage is the product quality test phase that will be tested on several media experts, material experts and field trials by teachers and students. This stage aims to determine the quality and feasibility of mobile learning media for learning. This feasibility test by material and language experts is carried out to ensure that the material and concepts presented in mobile learning are in accordance with curriculum content standards that use a soio-technological map, and to ensure that the language used in mobile learning is easy to understand and does not cause double interpretation of participants students, this feasibility test was conducted by three lecturers of chemistry and chemistry education at UNJ. Material and language expert assessment consists of 4 indicators and 11 statements. Following are the results of the material and language expert feasibility test:

Table 1. Feasibility Test Results Material And Language Experts

No	Aspect	Item		Criteria
1	The relevance of the substance of the content to the competencies that must be achieved by students	1 - 3	86%	Very good
2	Question	4 - 8	83%	Very good
3	The relevance of the substance of the contents of the material to the environment	9	92%	Very good
4	Language	10 -.11	79%	Good
Average Overall Rating			85%	Very good

Based on the table above the average overall rating in the feasibility of material and language is 79% - 92% with an overall average of 85%. then the reliability test was carried out using the Hyot reliability formula and got a result of 0.925 which was classified as "very good". The results showed that the instrument used was reliable and the quality of the media was good. Next is the media expert test conducted to determine the feasibility of the product, get information, criticism and suggestions for the media, so that learning media become feasible and quality, the feasibility test of media experts is conducted by three vocational school teachers in Multimedia. The assessment of media experts consists of 2 indicators and 14 statements. Following are the results of data processing that has been carried out:

Table 2. Feasibility Test Result Media Expert

No	Aspect	Item	Percentage of Feasibility	Criteria
1	Audio and visual	1 - 9	84%	Sangat baik
2.	Software and engineering	10 - 14	83%	Sangat baik
Average Overall Rating			84%	Sangat baik

Based on the table above the average overall rating in the feasibility of the media is 83% -84% with an overall average of 84%. These results indicate that the media is "very good". then the reliability test was performed using the Hyot reliability formula and got 0.615 results which were classified as "good". These results indicate that the instruments used are reliable and the quality of the media is good. After the feasibility test stage by material, language and media experts and improvements have been made, then the media will then be field tested to be assessed by chemistry teachers and students on a small and large scale, for the assessment of media trials by teachers consisting of six indicators and 23 statements. Based on data processing, the percentage results are shown in table 3.

After the media is tested by the teacher then subsequently, it is tested by students on a large scale and small scale. Small scale consists of 10 students and large scale consists of 65 students, the students who carry out the assessment are students who have previously received redox material. Before students give an assessment of the mobile learning media, students are asked to download mobile learning with a link provided by the researcher. Furthermore, students provide an assessment consisting of 5 indicators and 26 statements.

Table 3. Teacher Trial Results

No	Aspect	Item		Criteria
1	The relevance of the substance of the content to the competencies that must be achieved by students	1 - 3	92%	Very good
2	Question	4 - 6	83%	Very good
3	Language	7 -. 8	84%	Very good
4	Audio and visual display	9 - 17	85%	Very good
5	Software and engineering	18 -. 22	91%	Very good
6	Usefulness	23	81%	Very good
Average Overall Rating			86%	Very good

Overall, the results of the field trials conducted by students and teachers fall into the "very good" category. So that it can be concluded that the developed mobile learning media is appropriate to be used as a tool in learning chemistry. Plus the educational games feature in students 'mobile learning can measure the ability to understand chemistry concepts without being limited by time and place [19], and mobile learning can provide greater learning benefits to students because accessibility and design features attract students' attention such as font size, color and contrast. Therefore, that interest in learning increases [20]. Mobile learning can open insights for current learning and can be support performance in the field and providing access to information and communication processes anytime and anywhere [1].

Mobile learning becomes more effective because it can encourage, motivate and improve the quality of knowledge theoretically, make the learning process more meaningful [2]. So that, learning becomes meaningful, according to the State of The Art regarding mobile learning, M-learning must cover 5 categories, that is 1) pedagogy and learning environment design; 2) platform / system design; 3) technology acceptance; 4) evaluation and 5) psychological construction, can help in evaluating, designing, and developing an environment so that the information contained in mobile learning becomes meaningful [3].

Table 4. Small & large scale trial results

No	Aspect	Item	Percentage of Small Scale	Percentage of Large Scale	Criteria
1	Question	1 - 4	81%	85%	Very good
2	Language	5 -. 6	79%	84%	Good
3	Audio and visual display	7 - 15	80%	86%	Very good
4	Software and engineering	16 - 20	86%	87%	Very good
5	Usefulness	21 - 26	80%	86%	Very good
Average Overall Rating			81%	85%	Very good

Mobile learning becomes more meaningful because it can connect material with everyday life, this is an advantage of the mobile learning socio-technological approach, because when compared to other mobile learning chemistry learning becomes more meaningful because not only knowledge is highlighted but this approach also puts forward the role social in technology so students care about their environment. This is consistent with previous studies that the material associated with everyday life can make students interested in learning chemistry because they feel that the material is closely related to daily life, so as to encourage the independence of students in the learning process [21] and according to previous research also that the socio-technological approach can be meaningful because students can be more careful in daily life based on the material being studied [13].

4. CONCLUSION

Based on an analysis of the needs of teachers and students, a mobile learning media based on a socio-technological approach called MobChemRedoks.apk was produced with a file size of 122 MB. The resulting media can be used on android mobile devices and tablets with version 4.1 (Jelly Bean) up to the latest version 10.0 (Q). The content contained in mobile learning media includes basic competencies, materials, video animations, student worksheets, chemical highlights and games.

The development of mobile learning media is carried out due diligence and media trials. the results of the feasibility test of material and language experts were 85% with a reliability of 0.925 and a media feasibility test of 84% with a reliability of 0.615. Experiments conducted by teachers by 86%, small-scale students 80% and large-scale 83%. Based on the feasibility test and the media trial the final criteria is "very good" so that, the mobile learning media based on socio-technological approach to integrated environmental redox material is suitable for use and in accordance with the needs of students and teachers.

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