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Development of advanced micro devices media to enhance student concept understanding in thematic learning

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Abstract. This research was motivated by the low level of understanding of student concepts on the subject matter on the theme of rich my country. One of the causes is the use of learning media that is still not maximal. The aim of this study was to develop and produce of learning media advanced micro devices to improve the understanding of concepts in thematic learning that meet the valid, practical and effective criteria. This study uses research and development by following the steps proposed by Brog and Gall. In general, the steps of research and development include 1) preliminary study, 2) media development, and 3) product test. Data collection techniques used in this study are tests and questionnaires. Furthermore, the data of the research results are analyzed using the n gain test and the percentage of questionnaire test. The results showed that learning media advanced micro developed fulfilled the valid, practical, and effective criteria.

1. Introduction

In accordance with the 2013 curriculum, the process of learning at the level of basic education is packed in the form of thematic learning. This is intended for student creativity in the learning process can develop. Thematic learning was adapted to the level of cognitive development of students at elementary education level (SD / MI). It is expected that the formation of themes in thematic learning can be a tool to link the concepts between fields of study, so that the learning process is more meaningful [1]. One of the themes that exist in thematic learning in SD / MI is the theme of rich my country. This theme is the 9th theme in class IV that has the competence to invite students to understand various concepts of subject matter, to describe the relationship between natural resources with environment, technology, and society on natural learning, PPKn, Bahasa Indonesia, IPS, and SBdP [2].

Based on preliminary research conducted by researchers to grade IV A student of MI Khodijah Malang showed that the level of understanding of students' concepts on the subject matter on the theme of rich my country sub-theme of utilization of natural wealth in Indonesia is still low. This can

be seen from the score of concept comprehension test on the sub-theme shows that 68% or as many as 25 students from 37 students of class IV A does not full filed the minimum completeness criteria (KKM). Only 32% or as many as 12 students have fulfilled the KKM. One of the causes of the low level of understanding of the concept of students on the sub-theme according to teacher of grade IV A is the use of learning media that is still not maximal. Learning media used are still not able to help students in understanding the concept of thematic learning maximally. This is because the learning media used is still simple and less interesting, so it can not affect the level of student concentration which is very influential on students' understanding of learning materials. According to Fakhruddin (2014) in his research stated that one of the factors causing students' understanding of the subject matter is still low is that the teacher has not used interactive multimedia in the learning activities [3]. Suniati, Sadia & Suhandana (2013) [4], Wulandari, Dewi & Akhlis (2013) [5] in their research also revealed that learning that does not use interactive multimedia impact on the low understanding of student concepts of subject matter.

For that, one of the alternatives that can be used to improve students' conceptual understanding on thematic learning of the theme of rich my country is by developing learning media. Learning media is needed to provide stimulus to the mindset of students in order to improve conceptual understanding through the development of ideas from a learned matter concept [6]. Learning media that can be utilized in the learning process is interactive multimedia. Interactive learning media is a learning media that is two-way or communicative. Interactive multimedia according to Sanaki (2009) [6] is a multimedia equipped with user-operated controller tools so users can choose what they want for the next process. Examples of interactive multimedia are interactive multimedia learning, game applications, and others. According to research conducted by Hayumuti, Susilo & Manahal (2016) [7] revealed that interactive multimedia learning media can provide a concrete picture of the concept of subject matter that must be understood by students. The results of research by Utami & Julianto (2013) [8] also revealed that students' conceptual understanding of the subject matter improved after teachers used interactive multimedia media. The same is also expressed by Maharani (2015) [9] that the existence of multimedia learning is very influential on understanding the concept of students to the subject matter. The absence of interactive multimedia-based learning media to make teachers can't visualize the subject matter so that student difficulty in understanding the concept of subject matter. The concept of understanding indicators in this study is that students are able to re-state a concept, classify objects according to certain traits and be able to apply the concept [10].

2. Methodology

This research uses research and development methods. Sukmadinata (2012) [11] explains that research and development is a process or steps to develop a new product or develop products that already exist that can be accountable. Meanhile, Sudaryono (2013) [12] mentions producing a product needs to be used research that is needs analysis and to test the effectiveness of the product. The product quality developed in this study is determined by 3 criteria, namely validity, practicality, and effectiveness [13], [14]. In general, the steps of research and development include 1) preliminary study, 2) media development, and 3) product test. First, a preliminary study. In this step, the researcher explore information related to field conditions and needs analysis in the field through observation activities and interviews with teacher of class IVA.

Second, media development. In this step, the researcher prepare the initial draft of instructional media that will be developed. Then, the draft of learning media that has been made is reviewed by expert validators to get media-related inputs developed. Furthermore, the researchers conducted a small group limited trials to get the final product. From the results of a small group of limited trials, the researchers obtained inputs from students and teachers who were sampled from the small group's limited trials of product deficiencies developed. The researcher then revised the products developed based on input from teachers and students who were samples of the small group's limited trials. Third, test the product. This product test is done on the fourth-grade students of MI Khodijah Malang. This

test is conducted to determine the effectiveness and practicality of the developed product, ie AMD learning media.

Meanwhile, the data collection techniques used in this study are tests and questionnaires. The test in this study uses a technique test that refers to the guidance of the preparation of the 2013 curriculum test. This test is used to obtain data about the level of understanding of student concepts after following the learning using developed products. While the questionnaire in this study in the form of a structured questionnaire, where respondents' answers have been provided by researchers. This questionnaire is used to measure students' responses to developed products. Furthermore, the data of the research results are analyzed using the n gain test and the percentage of questionnaire test.

3. Result and Discussion

3.1 Results of Learning Media Validation

Based on validation results by 3 validators consisting of 2 expert validators and 1 validator practitioners in thematic learning obtained data as table 1 below:

Table 1. Recapitulation Result of Learning Media Validation.

Validator	Score	Description
Expert learning media	84.21	Valid and need a little revision
Expert learning material	98.33	Valid and need a little revision
Lesson Practice	95	Valid and need a little revision
Average	92.51	Valid and need a little revision

From table 1 it appears that the average assessment result of 3 validators has amounted to 92.51. This means that the learning media developed meets the valid criteria and needs to be slightly revised. Validator gives a suggestion for improvement of learning media, that is theme of discussion should be put on learning media and font size needs to be enlarged to be more clear and use font more interesting.

The description of the revision of learning media developed as the following table 2:

Table 2. Description of Results Media Revision

Revised Points	Before Revision	After Revision
Adding discussion themes in learning media		
Enlarging the size of the font and change the font more elegantly		

3.2 Results of Practical Test Learning Media

One of the benchmarks of successful implementation of learning media in the classroom is the implementation of RPP that has been prepared that refers to the developed learning media. Practicality is assessed based on the implementation of RPP on the learning process and student responses to the

learning process using the developed media. The data of the assessment results of the implementation of RPP and student responses are as follows:

1) Small group test

Small group trial was conducted with 10 students of grade IV of SDN Merjosari 1 Malang City taken at random. At this stage, learning was done in accordance with the RPP that has been prepared based on learning media developed. The results of the observer's assessment of the implementation of RPP in small groups is as the table 3 below:

Table 3. Recapitulation results of implementation RPP

Observer	Score	Information
Observer 1	78.82	Good
Observer 2	79.17	Good
Average	78.99	Good

Based on table 3 shows that the average observer's assessment of the learning process at the small group trial stage was 78.99. The score is included in the good category, ie the learning process is in accordance with the RPP prepared based on the developed learning media. The observer commented that the teaching method is still monotonous and just silent in front of the class, not taking the courage to check the students behind, so the students feel unnoticed. Observers provide suggestions for improvements in subsequent learning so that teachers are more open and give attention to all students. Students also respond very well to the use of learning media *advanced micro devices* in the process of learning in the classroom, so that *advanced micro devices are* feasible to continue in the next trial.

2) Wider group trial

The group test was carried out to 23 students of grade IV of SDN Merjosari 1 Malang City taken at random. At this stage learning was done in accordance with the RPP that has been prepared based on learning media developed. The results of the observer's assessment of the implementation of RPP in the wider group is as the table 4 below:

Table 4. Recapitulation results of implementation RPP

Observer	Score	Information
Observer 1	79.17	Good
Observer 2	91.67	Very good
Average	85.42	Very good

Table 4 shows that the average observer's assessment of the learning process at the group stage of the broader trial is 85.42. The score is included in the excellent category, the learning process is in accordance with the RPP prepared based on developed learning media. The Observer commented that in the learning process of teachers is still less than the maximum so that teachers do not get sympathy and response from students. The advice given by the observer to the teacher is that the teacher should always look cheerful and pay more attention to the students. Students also respond very well to the use of learning media *advanced micro devices* in the learning process in the classroom, so that media is *advanced micro device* feasible to be continued in the field test phase.

3) Field trials

The field trials were conducted to students of grade IV of MI Khodijah Malang taken at random. At this stage learning was done in accordance with the RPP that has been prepared based on learning media developed. The results of the observer's assessment of the implementation of RPP in field trials are as Table 5 below:

Table 5. Recapitulation results of implementation RPP

Observer	Score	Information
Observer 1	84.38	Very good
Observer 2	96.88	Very good
Average	90.63	Very good

At table 5 shows that the average observer's assessment of the learning process at the field trial stage is 90.63. The score is included in the category very well, namely the learning process is in accordance with the RPP prepared based on learning media developed. In the learning process teachers are able to condition students well. Teachers have also given attention to all students, both students who sit in front and behind. In this field test stage, the students also responded well using learning media *advanced micro-devices* in the learning process in the classroom so that the media could *advanced micro-devices* be used in the learning process.

3.3 Results of Media Effectiveness Test

Effectiveness is a criterion that shows that the media developed successfully achieve the desired goals. The effectiveness of instructional media developed is seen in the improvement of students' understanding of the subject matter presented through the test. If the average learning outcomes of students reach the minimum completeness criteria (KKM), then the media developed to meet the effective criteria. Effectiveness in this study refers to the results of calculation of n gain test.

The results of students in the field test by using instructional media *advanced micro devices* are as table 6 below:

Table 6. The results of learning outcomes in the field test

Description	Students Value	Description
ValueTop	98	Exceed KKM
Lowest Rated	78	Exceed KKM
Median	94	Exceed KKM
Mode	92	Exceed KKM
Average score	90.8	Exceed KKM

Based on table 6 above shows that the average score of student learning outcomes is 90.8, with the highest score of 98 and the lowest score of 78. The value has exceeded the KKM set by the school that is 70 This also means that the completeness of fourth-grade students of MI Khodijah Malang reaches 100%.

To find out whether there is an increase in the ability of students' understanding of the subject matter before and after using learning media *advanced micro devices* can use the n gain test. The result of calculation of n gain test is as table 7 below:

Table 7. The result of calculation of n gain test

n (number of student)	Ideal score	n-gain maximum	average value n gain
37	100	0,83	0,72

Table 7 shows that the result of the *n-gain* test on the comparison of *pre-test* and *post-test* results obtained an average value of 0.72. This value is high. This means that the learning process using learning media *advanced micro devices* can improve students' concept understanding on the theme of rich my country.

From the description of the research above shows that learning media *advanced micro devices* developed has meet the valid criteria, because the average result of the validation of expert amounted to 92.51 (valid) included in either criterion. In addition learning media *advanced micro devices* also meet the practical criteria, because: (a) the results of the observer's assessment of the learning process

in the field trial stage of 90.63. The score is included in the category very good, namely the learning process is in accordance with the RPP prepared using the developed learning media; (b) the result of questionnaire of student response to learning process using learning media *advanced micro devices* also showed very good, that is equal to 81,93 learning media *Advanced micro devices* also meet the effective criteria, because the average value of student learning outcomes of 90.8. This value exceeds KKM established by the school that is equal to 70. This is also reinforced by the results of the n-gain test which shows that there is an increase in the ability of students' understanding of the subject matter by using learning media *advanced micro devices* of 0.72. This means that multimedia learning media *advanced* effectively improves students' understanding of concepts.

This is because the use of multimedia media in the learning process has several advantages, including multimedia provides an interactive process and provide ease of feedback, providing multimedia to the learner in determining the topic of learning and multimedia processes provide ease of systematic control in the learning process [15]. In addition, according to research conducted by Juanda (2011) [16], Tüzün, Yılmaz-Soylu, Karakus, et al. (2009) [17], Wulandari, Dewi, & Akhlis (2013) [5], Utami & Mampouw (2018) [18], Zhang & Zhou (2003)[19], Arifuddin (2017) [20] Wandani & Nasution (2017) [21], Smith & Woody (2000) [22], Zhang, Zhou, Briggs et al. (2006) [23], Zaeri, Moh-yusof & Daud (2015) [24] who revealed that the use of multimedia media in the learning process can improve learning motivation, learning activities and student learning outcomes.

4. Conclusion

Based on the results of research that has been described can be concluded that: 1) learning media advanced micro devices declared valid based on consideration of experts. Expert validation results show that the average of learning media validation result of 92.51 (valid) is included in either criteria; 2) learning media advanced micro devices is considered practical, because: (a) the results of the observer's assessment of the learning process in the field trial stage of 90.63. The score is included in the category very good, namely the learning process is in accordance with the RPP prepared using the developed learning media; (b) result of questionnaire calculation of student response to learning process using learning media advanced micro devices also showed very good, that is equal to 81,93; 3) learning media is advanced micro devices also declared effective, because the average value of student learning outcomes of 90.8. This value exceeds KKM established by the school that is equal to 70. This is also reinforced by the results of the n-gain test which shows that there is an increase in the ability of students' understanding of the subject matter by using learning media advanced micro devices of 0.72. This means that multimedia learning media advanced effectively improves students' understanding of concepts.

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