INTERACTIVE LEARNING MULTIMEDIA BASED MICROSOFT EXCEL ON THE TEMPERATURE AND HEAT

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Abstract

This study aims to do develop interactive learning multimedia based microsoft excel on the temperature and heat. The concept of sciences especially of physics that deals with the formula and application are still difficult to understood by junior high school students. Students only memorization after that, do not apply the equation physics into the concept of about so as to make students quickly forget against an equation physics. Learning use media are still a few in every learning physics, because the teacher had not optimize the utilization of media. To solve the problems so created learning innovation in interactive form of media that can be pulled students in like learn physics by media microsoft excel. Research methods that were used is the method research and development with the process of 4D (Define, Design, Development, and Dissemination). Research development model 4D performed only reached the stage of development (Development), because the purpose of this research limited only develops and produces a medium learning who deserves to implemented based on the assessment validator. An instrument data collection is sheets of validation to the matter and media experts. Based on the results of validation media experts and the matter obtained the average a score of 3.30 and 3.37 to a category worthy of, so that media learning based microsoft excel being used as a sciences learning media.

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INTRODUCTION

The development of information and communication technologies (ICT) has been changing ever process in human life, include in education. ICT in education not only as subject in school but all subjects in school implementation ict in teaching and learning process in a class. In curriculum 2013, teachers must have ability in ICT operation, in order, teaching and learning able to attract student learning.

The rapid development of technology has made the needs of a concept and mechanism of IT-based teaching and learning (in education) unavoidable (Taufiq et al., 2017). In science learning, most require visual media or supporting tools to facilitate the understanding of the material especially for materials related to natural phenomena. On the one hand, experiments are one of the most commonly used methods to facilitate understanding, but in reality there are some constraints such as limited time available, inadequate equipment and less responsiveness of students to what is being dealt with. Therefore, it is necessary to use ICT as a medium of learning in the form of virtual media or interactive multimedia (Sumarni, 2013).

In accordance with the observation to some schools in East Jakarta, generally in teaching science to students, teachers still use the old learning paradigm in the sense of communication in learning tend to take one direction generally from teacher to student, the teacher dominates the lesson then the lesson tends to monotonous so students feel saturated and bored. Therefore, in teaching science to students, teachers should prefer a variety of approaches, strategies, and models in accordance with the situation so that the planned learning objectives will be achieved. One of the learning strategies that can be used is a technology based learning media that is with the help of computers.

Multimedia-mediated content is incorporated into the learning environment, the information-rich presentations make the learning instructions more effectively than presenting through a single medium in rote learning, so the students can obtain the information more meaningfully and repeatedly through different media and choice (Leow & Neo, 2014). Computer-based learning media is usually presented in a computer program that will guide students individually to complete a learning program consisting of a material description, and a learning evaluation. Characteristics of computer-based learning is individual learning mastery learning. It is said to be individual because in the implementation each student will be faced with a computer that already contains the learning program and the student must complete the program (Yuliana, 2015). This resulted in each student need different time in completing the learning program in accordance with their respective ability level.

Microsoft Excel is usually used to calculate or analyze values in school activities. Microsoft Excel is an application program in Microsoft Office that is used in processing numbers (Winahyu, 2012). This program is often used by accountants to write or record expenses and income in the company or an institution or small agencies. MS Excel program is very useful in chemistry teaching due to its extensive ability in processing and presenting data (Bharathy, 2015). Many accountants who understand and can operate this program but not just an accountant who can junior high school children can also operate this program, because in junior high school level has learned about Microsoft Excel. In its development, Microsoft Excel is not just for graphics, counting or listing. But it can also be used as a learning medium for example for a presentation like in Microsoft Power Point. Excel spreadsheets media uses were very helpful in learning physics of an abstracting nature (Paramita & Pujayanto, 2015).

In this study Microsoft Excel functioned as an interactive multimedia learning that can be used by students independently and can be studied whenever and wherever. The Microsoft Excel learning media consists of indicators, materials, sample questions, material simulations, instructional videos, and interactive evaluations. In learning with Microsoft Excel is a thorough learning (mastery learning), so students must understand the material delivered through media Microsoft Excel and must be able to solve the questions given, because each student answer will be in response by the computer. If the student's answer is wrong then he must repeat the previous material until he can solve the problems correctly.

Temperature and heat had a lot of calculating process, so that students will be memorization many formula.With the help of media, students do not only memorization, but

it will also facilitate students in doing deep understanding the concept of tempereture and heat. The development learning media based microsoft excel in concept about temperature and heat are suitable because the need various simulation of the experiment was capable of being shown in the form of media, so that students will no longer need to experiment in laboratory.

METHODS

This research is Research and Development (RnD). Research and development is a research method used to produce a particular product, and test the effectiveness of the product. The learning device development model that was developed in this study refers to the type of development of 4-D model (four D model), which consists of 4 stages. The four stages are definitions, design, development, and dissemination.
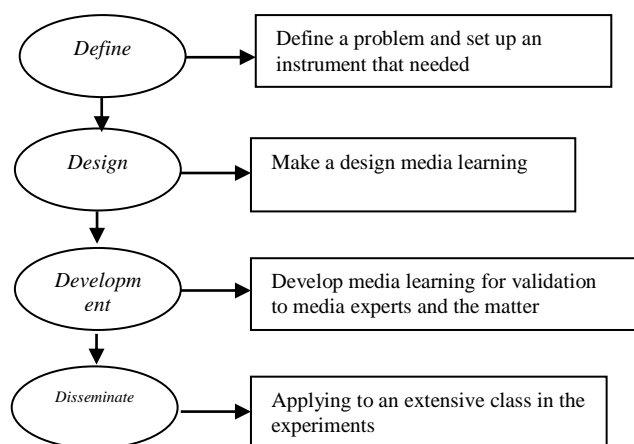

Figure 1. Learning Design

The research instrument used is a validation questionnaire of material experts and media experts. Product feasibility assessments are tested and assessed by validators, media experts and physicists. To find out the average validation score with the following equation

$$Mean = \frac{The\ total\ number\ of\ score}{The\ number\ of\ validators \times The\ number\ of\ choices}$$

In determining the feasibility of learning media need to be considered criteria so that the learning media is said feasible and can be used in the learning as in table 1.

Table 1. Eligibility criteria media learning

No	Score Interval	Criteria
1	$X > 3.5$	very good
2	$2.5 \leq X \leq 3.5$	good
3	$1.75 \leq X < 2.5$	intermediate
4	$X < 1.75$	poor

RESULTS AND DISCUSSION

The results obtained in this study is a form of Microsoft Excel-based physics learning media with the subject of temperature and heat in the form of interactive CD. The stages of the development research are described below:

a) Define, define the stage of product development that consists of analysis of existing problems and prepare the necessary instruments. From the analysis, the material that needs the help of media as a tool of the teacher in conveying the material and the students to learn independently selected is temperature and heat material, because the subject needs concrete things to make it easier for students to understand the material. Experimental simulations and equations of formulas on temperature and heat are also required by students. apart from the analysis of material issues, also prepared research instruments such as material depicted in the storyboard, material expert's validation sheet and media expert

b) Design, in the design stage undertaken, among others, namely 1) designing Microsoft Excel-based learning media applications, 2) Materials, images, video, animated swf, and evaluation questions appropriate and precise with the material temperature and heat.

c) Development, the result of the development stage is 1) Application of Microsoft Excel-based learning media, this application consists of student competence, concept maps, teaching materials, pictures, video, sample questions, simulations and interactive evaluation questions 2) Media validation learning scores based on Microsoft Excel.

Table 2. The result of validation media experts

| No	Aspect	Average
1	Linguistic	3.20
2	Grafika	3.41
3	Operate	3.21
4	Using	3.38
	Average	**3.30**

Media developed according to the aspects of the measurement of the validity Nieveen (1999), namely the validity of learning media to the validity of the content and the validity of construct. Based on the results of the analysis validation media experts in table 2 on learning media based on microsoft excel developed produce values the average a score of 3.30, to a category proper. It assessed covering display, color selection, function buttons, output from a menu, and accessbility processing the program and application usage. Advice of validator is this program would be good, but of it is attention should be given to again.

**Table 3.** The result of validation the matter

No	Aspect	Average
1	Lingusitic	3.28
2	The consistency of the material	3.46
3	Ilustration	3.36
	Average	**3.37**

Aspects assessed by the experts of the material is the lingusitic, the suitability of the indicator with the material, the suitability of the animation with the material to be conveyed, the aspect of illustration, and the question of evaluation. Expert material validation conducted by three validator obtained the average score of 3.37 with the category proper.

On the opening page as shown in Figure 2 is shown a welcome greeting, author profile, and there is a login button to enter into the home. In the home there is a data sheet to be filled by the students. On the subject there are buttons that contain concept maps, student competencies, materials and exercise questions.
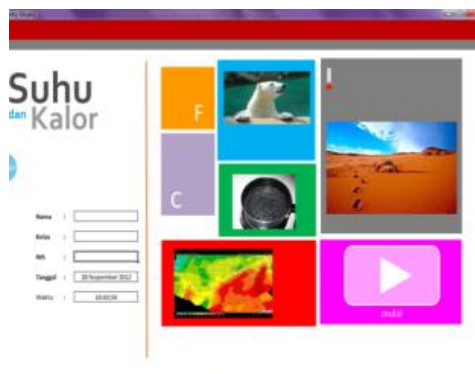
Figure 2. Home Menu

On the opening page as shown in Figure 2 is shown a welcome greeting, author profile, and there is a login button to enter into the home. In the home there is a data sheet to be filled by the students. On the subject there are buttons that contain concept maps, student competencies, materials and exercise questions.
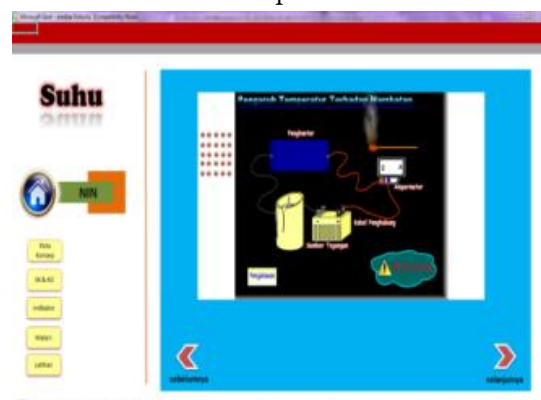
Figure 3. Content Menu

The learning material page in Figure 3 will appear if the content menu on the opening page is pressed. On the page of this learning content will display learning materials about temperature and heat. When the next menu on press next, so button will connect to the next content. In this learning content contains material, images, animation, power point and video learning. In the temperature view there is a matter of temperature conversion, so if the student later fills the number on the thermometer scale column it will automatically see the value on another thermometer scale, this can be used as an example and the student exercise on the concept of temperature conversion.

Figure 4. Evaluation

On the evaluation page as shown in Figure 4, students are tested for their ability to work on pertinent questions about temperature and heat. Students will fill in the answer box provided and when it is finished answer will follow next kesoal, but can not go back to the previous problem. In the exercise of this question there are 10 questions and at the end there will be an evaluation result done by the students so that the students know their ability. Then dibembar the exercise results about there is a print menu, and if pressed the print button will be connected keprinter which then the evaluation results can be printed.

Figure 5. Result

Utilization of Micosoft Excel as a learning media is made by combining or collaborating both programs that Micosoft Excelyang therein Microsoft Power Point to complete the learning materials. Microsoft Excel here serves as a program that can be used to create files or worksheets related to physics material. Also in Microsoft Excel this can also be linked with video of type swf file, avi, or wmv by using certain link. The process of making this learning media begins by creating worksheets by using Microsoft Excel. On the evaluation page, here

without utilizing Macro Visual Basic for Application then automatically calculating the value can be done that is by using the program processing numbers from Microsoft Excel. So after finished doing the evaluation questions the students can directly mengetahoi value by clicking the score button. Utilization of Macros is used to arrange the results of student exercises to be printed directly so that students get results immediately after completion of the exercise.

The results of this study is a learning program in the form of Microsoft Excel learning CD. Learning media that have been made is tested media expert. Based on the questionnaire analysis from the media expert test, the average validation score of 3.30 with the appropriate category can be used as a lesson. But there are still things that need to be held revise color degradation that looks less clear and the location of the buttons used need for guidance first. Based on the advice of media experts then done revise like by adding a clue to clarify the function of the button that will be used. The second expert test is made to the material expert. Based on the questionnaire analysis from the expert material the average score of 3.37 is obtained with the appropriate category so that it can be used for the lesson. About the content of this learning program is in accordance with the current curriculum for junior high school student.

To the matter of content that is learned students temperature and heat engine in a media learning microsoft excel can be seen in table 4.

Table 4. The content that can learn by students

No	The content that can learn
1	Temperature
2	Long expansion
3	Area expansion
4	Volume expansion
5	Azaz Black
6	Heat
7	Heat transfer

The development of media use microsoft excel make teachers helped in for the explain of material, attracted the interest of subject content student use microsoft excel (Agustinawati & Gesang, 2014). Similar things also expressed by Firdaus & Muchlas (2015) that learning at class

which uses microsoft excel as a learning media make learning be comfortable and exciting. Learning multimedia interactive based microsoft multimedia excel developed announced eligible based on user experts, and easy in its use than other programs.

According Taufiq et al, (2017), the development of multimedia technology has promised a big potential in changing one's way to learn, get information, adjust information, etc. Multimedia also provides a chance for education to develop a learning technique.

CONCLUSION

Based on the results of research that has been conducted on the learning of physics-based Microsoft Excel, it can be concluded that, media learning multimedia interajtid based on Microsoft Excel has been successfully created. Based on the results of validation of media experts and material experts obtained an average score of 3.30 and 3.37 with decent categories, so that Microsoft Excel-based learning media proper of use as a medium of learning media.

It is expected that the research on the product or the results given not only the learning CD but also need additional handbook use of learning media based on Microsoft Excel in order to facilitate siswadalam learning. It is necessary to conduct a large class trial to find out the students responses to the learning media.

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