Android-Based Digital Teaching Materials as Online Learning in New Normal Era to Improve Physics HOTS for High School Students

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ABSTRACT

The current research was carried out to develop android-assisted digital teaching materials in new normal era in order to improve students' HOTS in physics learning activities. Similarly, the study seeks to realize innovative, creative and up-to-date Physics learning activities. The present development research employs the ADDIE systematic learning model, (1) analysis; (2) design; (3) development; (4) implementation; and (5) evaluation. The data analysis is a type of qualitative-quantitative method by assessing the quality of the product developed by competent experts, such as lecturers and teachers in accordance with the field of physics study presented in the form of numbers. The outputs generated from this research are Android-assisted digital teaching materials as an online learning solution for the new normal era to improve the HOTS of students with the values of digital teaching materials (e-modules) on temperature and heat materials as a whole classified as "Very Eligible" considered 91.6%.

Keywords: *digital teaching materials, android, covid-19, physics, HOTS*

INTRODUCTION

Teaching materials are all forms of materials used to assist teachers or instructors in carrying out teaching and learning activities in the classroom (Depdiknas.2017:3). Dick & Carey (2009:242) stated that teaching materials are a set of learning materials or substances (teaching materials) that are systematically arranged, displaying a complete figure of competencies that will be mastered by students in learning activities using HOTS (Alperi, 2015). From the point of view of the development of educational science and technology, teaching materials are all forms of materials used to assist teachers or instructors in carrying out teaching and learning activities in the classroom (Depdiknas, 2017:3).

The Covid-19 pandemic has delivered an impact on various sectors of life, including in learning activities. The government as the decision maker makes policies to carry out online or online learning activities to slow the spread of Covid-19. So we need a solution for learning activities that are appropriate and support the government's policy. through learning to become digital-virtual-online based activities in the form of developing hands-on Android-assisted digital teaching materials which are the right and best solutions for the effectiveness of learning activities in the new normal era (J.P. Islam, 2020). Similarly, technology integration in Physics learning

activities through the development of learning applications that contain Physics learning materials such as innovative, creative and more attractive to students.

Higher Order Thinking Skill (HOTS) is the ability to be able to analyze, evaluate and create something that is considered new, best or different (B. Tanujaya, 2016). HOTS is considered a valuable ability that is more difficult than the ability to remember or explain, so that better, innovative, creative, effective and appropriate ways or information media are needed to be able to convey and display Physics learning activities at the HOTS level, namely through the integration of Android-assisted technology (Mardiana, 2017).

METHODOLOGY

The present development research uses the ADDIE systematic learning model, namely (1) analysis (analyze); (2) design (design); (3) development (develop); (4) implementation (implement); and (5) evaluation (evaluate). It can be seen in the following figure 1:
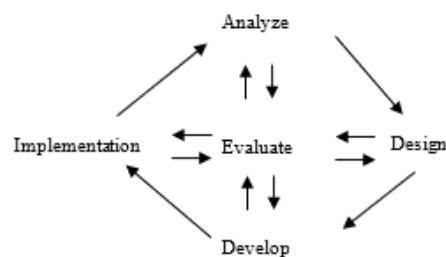

Figure 1. ADDIE model

The analysis stage is carried out by analyzing the media needs of digital teaching materials for development based on the data obtained. The results of the analysis are used as the basis for designing digital teaching materials that contain content, forms, goals, media, instructions, materials, assignments, evaluations, and displays. The results of the initial development are applied to a larger class for refinement. Furthermore, revisions were made in terms of content, appearance, student independence, and other things for improvement. In the final stage, the revised digital teaching materials are evaluated by media and learning experts. The results of the final evaluation are used as material for revision before being produced to be applied. Evaluation of digital teaching materials can be interpreted as an action or process to determine the quality of these teaching materials. After passing the refinement stage, digital teaching materials can be used for learning. The indicator of research achievement is the creation of android-assisted digital teaching materials that can be used as a solution for innovative, creative and interesting Physics learning activities for students in online learning activities in the new normal era.

The technique of data collection is done by: (1) survey through the distribution of questionnaires on the digital teaching materials used; (2) survey and interview with the Islamic University of North Sumatra about online learning in the normal era with the help of android; (3) media Development Validity Instruments for Material and Media Experts ;and (4) literature review related to the development of digital teaching materials.

The data analysis technique of this research is a qualitative-quantitative analysis of the feasibility and effectiveness of the use of android-assisted digital teaching materials. Through the prerequisite test for normality, and homogeneity, as well as the results in the form of a gain test. Limited and field trials through one group pretest-posttest design and non-equivalent control group design (Emzir, 2013).

RESULT AND DISCUSSION

In this study, the product produced is an Android-based digital teaching material to improve students' HOTS on temperature and heat material which will later be used by students in the learning process in the form of electronic modules (e-modules). Data analysis in the study includes material and media aspects of educational e-modules.

Aspects of the Characteristics of the Guided Inquiry Module

The validator assesses the module to see the suitability of the learning stages starting from orientation, problem formulation, formulating hypotheses, collecting data, analyzing data, and drawing conclusions.

Table 1. Results of student needs analysis

Aspect	Score		Item	Total Score	F.h	%	Category
	Expert$_1$	Expert$_2$					
Orientation	7	7	2	14	16	87	Very Eligible
Formulation of the problem	7	6	2	13	16	81	Very Eligible
Formulating Hypotheses	8	8	2	16	16	100	Very Eligible
Collecting data	15	14	4	29	32	90	Very Eligible
Analyzing Data	11	11	3	22	24	92	Very Eligible
Drawing conclusion	4	4	1	8	8	100	Very Eligible
					Total	550	Very Eligible
					Mean	91,6	

Note:

Fh (expected frequency) = item × number of experts × scoring score (4 scales)

Item = Number of statement items

The results of the calculations in Table 10 show that in terms of the characteristics of android-based digital teaching materials (e-modules) to increase the HOTS of students on temperature and heat material as a whole it is classified as "Very Eligible" with the mean "91.6%".

Each aspect is considered feasibility aspect known as Orientation of 87% very eligible category, Problem Formulation of 81% very eligible, Formulating Hypotheses of 100% very eligible, Collecting Data by 90% very eligible, and Analyzing Data by 92% very eligible, Drawing conclusion 100% very eligible.
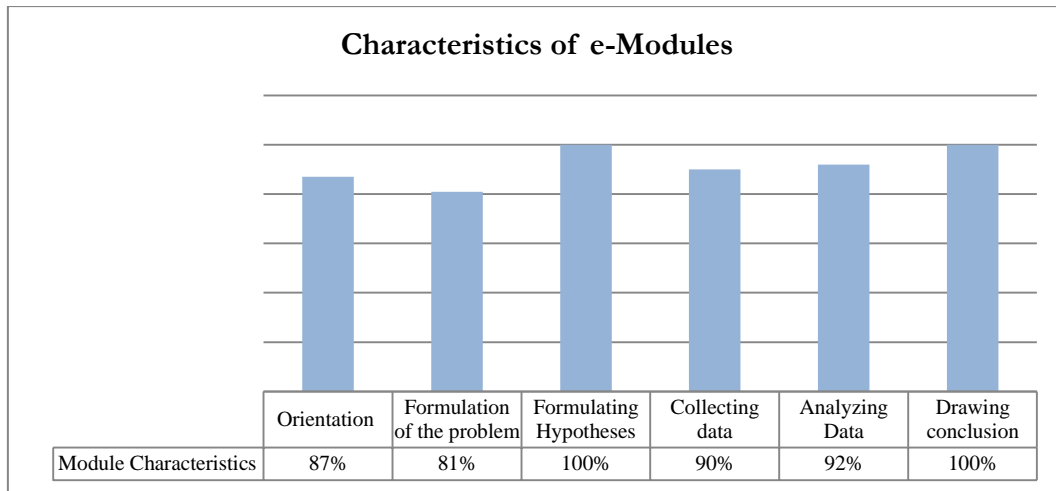
Characteristics of e-Modules

	Orientation	Formulation of the problem	Formulating Hypotheses	Collecting data	Analyzing Data	Drawing conclusion
Module Characteristics	87%	81%	100%	90%	92%	100%

Figure 2. Graph Percentage of inquiry module characteristics

Product Overview

Figure 3. E-Module cover
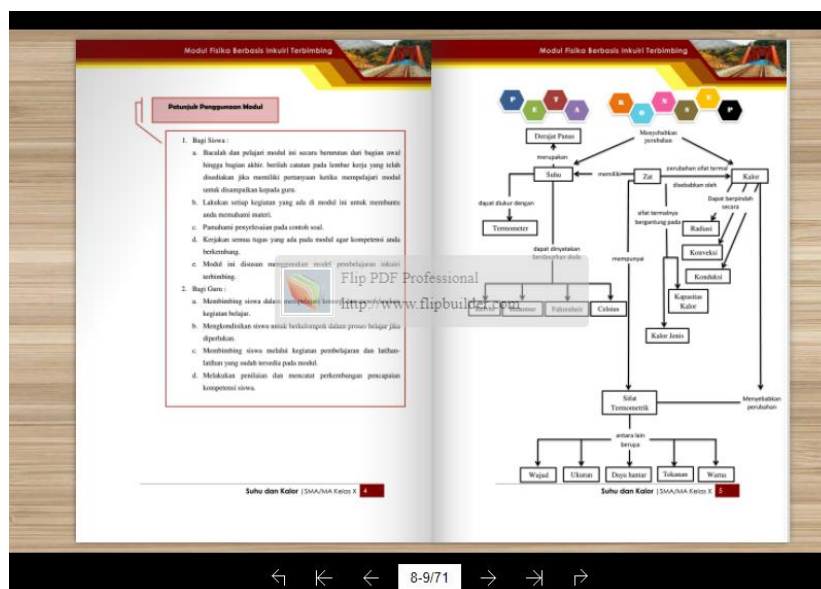
Figure 4. Mind-Mapping of e-Module

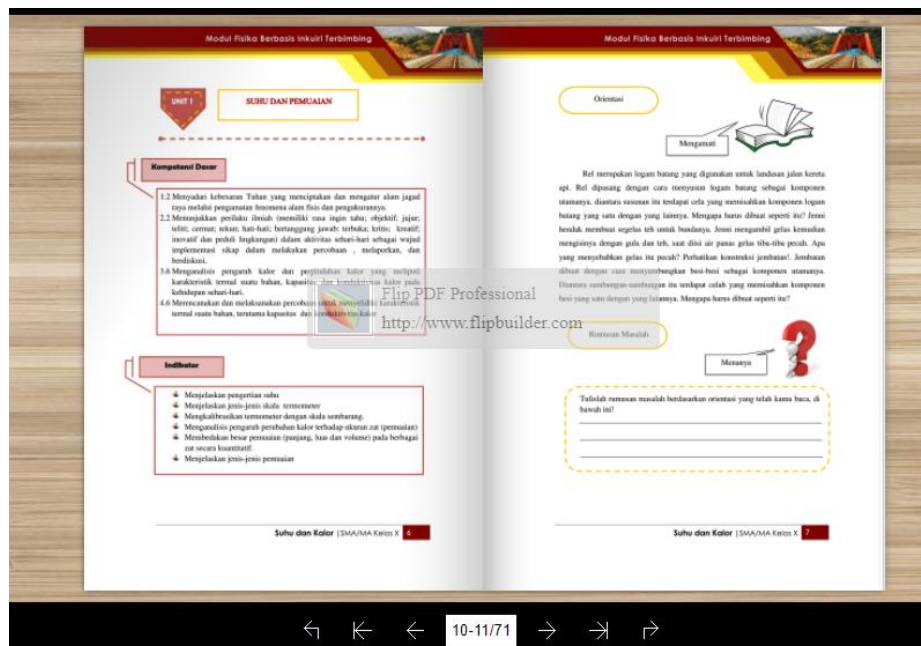*Nana Mardiana, Satria Yudha Prayogi, Sukartika, Siti Haslina, Md Harizan*

Figure 5. HOTS implementation on e-modules

CONCLUSION

Based on the calculation of the data obtained, it can be concluded that the Physics learning module based on the guided inquiry model based on the overall assessment results is classified as very valid with each characteristic aspect of 92.6% considered very eligible. Based on the results of the test conducted by the validators, the characteristics of e-module Physics learning are overall classified as "Very Eligible" with mean "91.6%". Each aspect is considered very eligible, namely Orientation by 87%, Problem Formulation by 81%, Formulating Hypotheses by 100%, Collecting Data by 90%, and Analyzing Data by 92%, Drawing Conclusion by 100%.

And therefore, it can be concluded that the physics learning module based on the guided inquiry model is very valid to be used in the learning process. E-Physics learning module based on guided inquiry model on temperature and heat material seeks to improve HOTS skills and provide new knowledge for students, presented in the form of electronic modules thus they become more interesting.

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