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Development of Android-Based Modules to Improve Learning Outcomes and Learning Motivation of High School Students

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Abstract

Physics is very well known as a difficult science to understand because it contains many complex mathematical formulas and calculations that can affect student learning outcomes and motivation. To overcome this situation, it is necessary to innovate teaching materials, namely with android-based modules. Almost all students now have a smartphone. An android-based physics module was developed to improve student learning outcomes and motivation. This research is a Research and Development (R&D) research using a Nieveen research design which includes 1) preliminary research, 2) the design stage (prototype stage), and 3) the assessment stage. The android-based module was validated by two expert validators who are lecturers of Physics Education at the University of Jember, obtaining the same score of 75 in the valid category. As for the validation results, the user validator, a physics teacher at MA Raudaltul Ulum obtained a score of 92.8 with a very valid category. To find out the increase in student learning outcomes, pre-test and post-test questions were given. The pre-test and post-test results were analyzed using the N-gain test and obtained a score of 0.72 in the high category. Learning motivation is done by distributing questionnaires. The distribution of the questionnaire was carried out after learning using an android-based module.

Keywords: android; module; physics
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INTRODUCTION

In the learning process, it is necessary to have effective and efficient learning to train students to find their knowledge independently (Kurniawan et al., 2015). Physics teachers at schools often discuss theories from the handbooks used, give the formulas, and give examples of questions (Bashar in Viajayani et al., 2013). Physics is very well known as a difficult science to understand because it contains many complex mathematical formulas and calculations. This makes students reluctant to study physics and feel bored. As a result, the success rate of learning physics is low. So that students can learn easily, teachers need to place the elements of learning appropriately, namely: (1) students, (2) teachers, (3) learning objectives, (4) classroom management, (5) approaches, models, learning methods, (6) assessment of learning processes and outcomes (Akbar, 2017). Learning outcomes are real

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changes in student behaviour after the teaching and learning process following teaching objectives (Jihad, 2013).

One of the efforts made by teachers to improve student learning outcomes is to develop innovative alternative teaching materials that can be used in the learning process. Teaching materials are materials or materials systematically arranged by teachers that are used by students in learning that are packaged in printed, non-printed forms and can be visual auditive (Soegiranto in Arlitasari et al., 2013). Teaching materials are all kinds and forms of materials, both written materials and unwritten materials, that are used to assist teachers or instructors in carrying out the learning process (Septiani et al., 2013).

A teacher must be able to take advantage of technology that is developing in the current era. Currently, technology is developing rapidly, and many types of renewable technology will continue to be updated, including the latest technology, namely smartphones. The availability of affordable smartphones can lead to increased use of applications for various aspects of life such as communication, travel, entertainment, productivity and learning (Bano et al., 2018). According to Martono & Nurhayati (2014), their research resulted that the use of mobile learning (M-Learning) aims to help students to be able to access learning materials or information anywhere, anytime, and under any conditions.

Android can be chosen as alternative teaching material. The Android operating system is a device that is on a smartphone. Astuti et al., 2017 that smartphones can be used in learning physics in schools so that students can study independently via smartphones or androids to improve learning outcomes and student motivation.

This research was conducted in MA Raudlatul Ulum Ledokombo, Jember Regency. The learning process at MA Raudlatul Ulum still uses teaching materials in general, such as printed module books. There has been no research using Android-based teaching materials. Most students say that smartphones are important for students, but many think that smartphones cannot be a motivational tool for learning. This shows that smartphones have not been as useful as possible among students. Therefore, it is necessary to develop learning teaching materials that utilize technological developments such as Android.

Based on the description above, efforts to improve and improve the quality of the teaching and learning process must always be carried out. One of these efforts is to choose the right teaching materials. Android-based module teaching materials can be used as alternative teaching materials. Therefore, this study aims to develop an android-based module as a valid product to improve learning outcomes and student motivation on the subject of the First Law of Thermodynamics.

METHOD

This type of research is educational development research. The development carried out is the manufacture of android-based modules. With this Android-based module, it is expected that students can learn independently with minimal assistance from the teacher and experience an increase in learning outcomes and student motivation after using Android-based modules in learning.

This study refers to the development research design (Nieeven et al., 2006). This development research has several stages: 1) preliminary research, 2) prototype stage, and 3) assessment stage.

At the preliminary research stage, problem analysis and conceptual framework development were carried out based on literature studies from previous studies. The results of this introduction

will be the first draft at the development stage. At the design stage (prototype stage), the prototype is designed to be further tested, evaluated and revised. The trial at this stage is intended as a trial by experts for later formative evaluation. The assessment stage is the stage of expert assessment, evaluation, and revision. Then the prototype is tested in learning.

This research was conducted at MA Raudlatul Ulum Ledokombo, Jember district, odd semester of the 2021/2022 academic year, with the research subjects being students of class XI science. The consideration for selecting schools in this study is because the learning process at MA Raudlatul Ulum still uses teaching materials in general, such as using printed module books. There has been no research using Android-based teaching materials.

The data collected is data about the validity of android-based modules. The score given in this assessment consists of a scale of 1 to 4, namely (1: very poor, 2: poor, 3: good, 4: very good). The validity of the android-based module is determined based on the average total score regarding the validity criteria contained in Table 1.

Table 1 Criteria for validity values

Validation Criteria	Validation Level
85,01 - 100,00	Very valid, or can be used with revision
70,01 - 85,00	Valid, or can be used but needs minor revision
50,01 - 70,00	Less valid. It is recommended not to use it because it needs a major revision
01,00 - 50,00	Invalid, or should not be used

(Akbar, 2017)

The N-gain formula is used to measure the scores of students' pre-test and post-test results. The category of improving student learning outcomes refers to Table 2.

Table 2 Categories of Improving Learning Outcomes

Improved Learning Outcomes	Category
$g \geq 0{,}7$	High
$0{,}3 \leq g < 0{,}7$	Medium
$g < 0{,}3$	Low

(Jamuri, 2015: 128)

Data on increasing students' learning motivation was obtained from the results of the questionnaire given to students. The questionnaire contained positive statements (1: Strongly Disagree, 2: Disagree, 3: Slightly agree, 4: Agree, 5: Strongly Agree) and negative statements (1: Strongly Agree, 2: Agree, 3: Slightly agree, 4: Disagree, 5: Strongly Disagree). The increase in students' learning motivation is determined based on the scores obtained by referring to the learning motivation criteria in Table 3.

Table 3 Criteria for Student Learning Motivation

Score (%)	Criteria
$0 \leq s \leq 20$	Very Poor
$20 < s \leq 40$	Poor
$40 < s \leq 60$	Average
$60 < s \leq 80$	Strong
$80 < s \leq 100$	Very Strong

(Riduwan, 2010)

RESULT AND DISCUSSION

The results of this development research are in the form of an android-based module in the form of an application (.apk) on the First Law of Thermodynamics. This android-based module was developed on the First Law of Thermodynamics material, and the test of using this android-based module was carried out on class XI IPA MA Raudlatul Ulum Ledokombo students. This android-based module can only be accessed via an Android smartphone. This module is designed to facilitate students in the learning process and is expected to improve student learning outcomes and increase student motivation.

The preliminary research stage consists of 2 activities, namely, needs analysis in learning and studies of previous research related literature in the learning process. The first activity is to collect information about the needs in learning which is the technique of obtaining information by conducting interviews with physics teachers at MA Raudlatul Ulum. The results of the interviews that have been conducted show that the learning resources used in schools are textbooks from the library. The textbooks have not been used optimally in learning because they cannot be used for independent study so that students learn more from notebooks written by students themselves. In addition, the textbooks in the library can only be used when students are at school. The second activity is the study of literature and previous research related to the problems that exist in schools. This research was conducted by searching for and collecting literature reviews from the results of previous relevant studies.

The draft I produced (prototype stage) consisted of product development design, supporting devices, and research instrument design at the design (prototype stage). The first design is the design of product development in the form of an android-based module based on physics learning material, namely the subject of the First Law of Thermodynamics. The second design is the design of learning devices consisting of a syllabus and lesson plans. The products developed are adapted to the Core Competencies and Basic Competencies in the 2013 high school physics curriculum. The third design is the design of research instruments. The instruments of this research include validity instruments, instruments for improving student learning outcomes of physics, and student motivation. The instrument of validity is in the form of expert and user validation assessments. The instrument for improving student physics learning outcomes is in the form of pre-test and post-test questions of 5 items in the form of essays and student motivational instruments in the form of questionnaires.

The assessment phase produces a draft II product in the form of an android-based module to improve student learning outcomes and student motivation on the subject of the first law of thermodynamics. Android-based modules that have met the valid criteria were tested on class XI IPA MA Raudlatul Ulum students. The trial was carried out for two meetings (4x45 minutes). Before this development trial was carried out, students were given pre-test questions to determine the student's initial abilities before using the Android-based module. Then learning activities are carried out using android-based modules to improve student physics learning outcomes on the First Law of Thermodynamics. After the learning activities were carried out, students were given post-test questions to evaluate the improvement in students physics learning outcomes after using an android-based module. Meanwhile, to increase students' learning motivation using questionnaires. The distribution of the questionnaire was carried out after learning using an android-based module. The display of the Android-based module that was developed is shown in Figure 1.

Figure 1 Display of Android-Based Module

The android-based module was validated by two expert validators who are lecturers of Physics Education FKIP Jember University and one user validator who is a physics teacher at MA Raudlatul Ulum. The validation results are shown in Table 4.

Table 4 Results of Expert and User Validation of Android-Based Modules

Validation	Score	Category
Expert validator 1	75.0	Valid
Expert validator 2	75.0	Valid
Average expert validator	75.0	Valid
User validator	92.8	Very Valid

Based on the data analysis of the validity score of the android-based module by validator expert one and expert 2 in Table 4, the same score was obtained, namely 75.0 with a valid category. In addition, the validity score by the user validator obtained a score of 92.8, with a very valid category. Thus, android-based modules to improve learning outcomes and students' motivation to learn physics can be used in classroom learning on the subject of the First Law of Thermodynamics. This follows previous research, namely the development of an Android-based physics e-module that can be used or is feasible to be an alternative learning media with trial results of 86% for material experts and 78% for media experts (Sulistyawati et al., 2019). Meanwhile, Hadi's research Marhadini et al. (2017) conducted android-based development research with an average score of 77.91% or was in good criteria.

Android-based modules that have met the valid criteria were tested on class XI IPA MA Raudlatul Ulum students. The trial was carried out for two meetings (4x45 minutes). Prior to this development trial, students were given pre-test questions to determine the student's initial abilities before using the Android-based module. Then, learning activities are carried out using an Android-based module. After the learning activities were carried out, students were given post-test questions to evaluate the improvement in students physics learning outcomes after using an android-based module.

The pre-test and post-test results were analyzed using the N-gain test. The

results of the N-gain test from the pre-test and post-test data are shown in Table 5.

Table 5 Results of N-gain Test Analysis

Component	Pre-test	Post-test	Difference	N-gain	Category
Total students	30	30			
Highest Score	65.0	95.0		0.72	High
Lowest Score	20.0	65.0			
Average	33.8	81.7	47.9		

The analysis of the increase in physics learning outcomes for 30 students of class XI IPA MA Raudlatul Ulum showed that the average pre-test and post-test scores were 33.8 and 81.7, with a difference of 47.9. The data obtained were then analyzed using the N-gain test to see the improvement in physics learning outcomes for students of class XI science. The results of the N-gain test showed that the increase in students' physics learning outcomes obtained a score of 0.72 in the high category. Thus, it is stated that the android-based module can improve student physics learning outcomes on the subject of the First Law of Thermodynamics. This is following previous research, namely the android-based mobile learning media that succeeded in improving student learning outcomes with the results of field trials of 83.92% (Ardiansyah & Nana, 2020).

To increase students' motivation to learn using the distribution of questionnaires. There are 15 statement items in the questionnaire. The distribution of the questionnaire was carried out after learning using an android-based module. The average increase in student motivation for each indicator is shown in Table 6.

Table 6. Results of the Analysis of Increasing Students' Learning Motivation

Indicator	Percentage (%)	Criteria
Attention	77.7	Strong
Relevance	86.5	Very strong
Confidence	82.7	Very strong
Statisfaction	86.8	Very strong
Average	83.4	Very strong

Based on Table 6, it is known that students' learning motivation after learning using android-based modules each indicator has a score above an average of 60%. This shows that there are no indicators of learning motivation in class XI IPA MA Raudlatul Ulum, which are in the criteria of sufficient, weak, and very weak. Suppose the student learning motivation indicator score is interpreted according to the motivation criteria. In that case, the attention indicator with a score of 77.7% is on the strong criteria, the relevance indicator with a score of 86.5% is on the very strong criteria, and the confidence indicator with a score of 82.7% is in the very strong criteria, and the satisfaction indicator with a score of 86.8% is in the very strong criteria.

The average value of increasing student motivation is 83.4% in the very strong criteria. So it can be stated that the android-based module is very strong in increasing student learning motivation. This is following the results of previous research; namely, the development of android-based learning media can increase students' learning motivation (Lubis & Ikhsan, 2015).

CONCLUSION

Based on the results of data analysis and discussions that have been carried out, it can be concluded that the validity of the android-based module based on expert validation results obtained an average of 75 with a valid category, while the user validation results obtained a score of 92,8 with a very valid category so that it can be implemented in MA Raudlatul Ulum Ledokombo; the improvement of

student learning outcomes after using the android-based module K shows high N-gain criteria with a score of 0,72, so the android-based module is stated to be able to improve student learning outcomes; the increase in students' learning motivation obtained an average score of 83,4% in very strong criteria.

Based on the results of the research and discussion, the suggestions given are that the authors hope that teachers can develop innovative teaching materials to be able to improve student learning outcomes and motivation; for other researchers, it is hoped that this development research can be carried out by studying Android-based modules with different materials.

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