

## Newton's Law Learning Transformation: Interactive Android Application with Adobe Flash Professional CS6

**Mochammad Irsyadul Haj, Ahmad Fauzi\*, Sri Budiawanti**

*Physics Education Study Program, Faculty of Teacher Training and Education, Sebelas Maret University, Ir. Sutami No. 36A Street, Jebres, Surakarta, Central Java, 57126, Indonesia*

\*Corresponding Author Email : [fauziuns@staff.uns.ac.id](mailto:fauziuns@staff.uns.ac.id)

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**Abstract.** This study describes the product specifications and user assessment of Android-based physics learning media using Adobe Flash Professional CS6 with a scientific approach to Newton's Law material that is well-criteria in language, material, and media. This research and development uses a qualitative descriptive analysis approach developed by Branch (2009). Data analysis uses analysis techniques developed by Azwar (2007). The procedure for making this learning media is to Analyze, Design, and Develop. The results of this study are in the form of a learning media with (1) Physics learning media made is an android application-based learning media with the extension Application Package (.apk) with minimum specifications OS (Operating System) android v 7.0 Nougat, Snapdragon 435 chipset and CPU Octa-core Max 1.40GHz, with a minimum of having 2 GB RAM, 2 GB ROM, and 480 x 800 resolution. Physics learning media based on the material and lesson plans of Newton's Law material with a scientific approach. Physics learning media contains Learning, Material, Evaluation, and Settings pages with features such as simulation, movie clips, video, UI, scrolling text, swipe gallery, drag and drop, sound, and without internet (offline). (2) The physics learning media made has a validation value on the basha aspect of 43, the material of 71, and media 71, so the learning media validation value is 185 with a very good category. The physics learning media has an assessment response value from 3 teachers, namely 100% of teachers stated very well, and the assessment response value from 30 students, namely, 23% of students stated in the good category and 77% stated in the very good category. This research can be the basis for developing interactive android application with Adobe Flash Professional CS6 for Newton's Law material.

**Keywords:** Adobe Flash Professional CS6; learning media; Newton's Law; physics; scientific approach

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## INTRODUCTION

Education is an effective tool in supporting the development and improvement of human resources in a more positive direction (Sunaryo & Ismayanti, 2019). Based on Law of the Republic of Indonesia Number 20 of 2013 concerning the National Education System article 1 paragraph 1, states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation, and state.

When teachers and students interact through classroom learning activities, education occurs in the classroom—education through the learning process. In paragraph 20, learning is interacting with students, educators, and resources in one learning space. Thus, education will be carried out if students and teachers communicate in the classroom.

Good learning process standards according to Government Regulation of the Republic of Indonesia Number 19 of 2005 concerning National Education Standards can be found in article 19, paragraph 1, which explains that:

*"The learning process in educational units is organized in an interactive, inspiring, fun, challenging, motivating students to participate actively, and providing sufficient space for initiative, creativity, and independence by the talents, interests and physical and psychological development of students."*

In addition, Article 20 explains that the planning of the learning process includes a syllabus and a learning implementation plan that contains at least learning objectives, teaching materials, teaching methods, learning resources, and assessment of learning outcomes. Thus, in learning activities, educators need a plan so that the learning process can run to national standards.

According to Permendikbud No. 59 of 2014 concerning the 2013 Curriculum for Senior High School / Madrasah Aliyah, the curriculum used until now is the 2013 Curriculum. The 2013 curriculum aims to help learners gain attitudes, knowledge, and abilities to use in various situations and conditions in schools and communities. The scientific approach is a teaching method that applies scientific characteristics that can help learners increase their potential in the aspects of attitude, knowledge, and skills. That way, the scientific approach can be implemented in the 2013 curriculum. The scientific approach implemented in the learning process in the 2013 curriculum focuses on students (student-oriented). It aims to enable learners to obtain concepts, laws, or principles through scientific stages. These stages include observing phenomena, formulating problems, formulating hypotheses, collecting or associating data, concluding, and communicating (Hosnan, 2014). Educators in physics subjects have widely applied the scientific approach, so educators in the learning process no longer teach students to memorize the material being taught. Therefore, students must use their abilities in the planned learning process. The abilities needed by students to understand physics concepts, such as reasoning skills. However, this scientific approach has yet to be much in demand or fully used by educators, so students cannot learn optimally. This fact causes students to need clarification on their abilities in learning physics concepts. Thus, there needs to be a way for the scientific approach to be fully used to make it easier for students to find their knowledge.

The learning process is done by delivering messages or information about teaching materials (commonly called subjects). Physics is a family of science (science or science) which is used as a subject in schools in order to be able to solve problems related to natural events around, both qualitatively and quantitatively with mathematics, and be able to increase knowledge, skills, and confident attitudes (Depdiknas, 2003). This improvement is because physics is a science that can improve the ability to think analytically, inductively, and deductively. In addition, according to Mundilarto's reasoning (2010), physics is a science used to explain beautifully organized natural phenomena that can be mathematically described. However, physics is a subject with poor learning outcomes at school. Based on data from PUSPENDIK in 2019, it was found that the results of the national exam in physics subjects in Indonesia were reported to still need improvement, with an average score of 46.47. Compared to the average value of other extra subjects, this value is lower in contrast to chemistry, with an average value of 50.99.

The material of Newton's Law of Motion for students is quite difficult to learn in school material in physics subjects. The concept of Newton's Law of Motion the difficulties students encounter because they lack an understanding of the concept of force and motion material, which includes inertia, speed, acceleration, friction, gravitational force, and Newton's Law I, II, III and in science practice activities students are rarely involved (Arman, Sutopo, & Parno, 2016) Arman et al. (2016) show that students have difficulty understanding the concept of Newton's Law of motion because students are less involved in science practicum activities. Therefore, in their capacity as facilitators, educators must find ways to help students deal with the problems they experience. Thus, there needs to be a method for educators to teach Newton's Law so that students can understand Newton's Law easily, either conventionally or independently.

Educators must think creatively, effectively, and efficiently when providing knowledge to students. Educators can use conventional methods or use media in the learning process. To convey messages or information that functions instructional or contains learning elements is learning media (Arsyad, 2016). Learning media in physics has developed rapidly. The use of learning media based on digital transformation in the world of education. Digital transformation, according to Danuri's reasoning (2019), is the use of information technology to change the way a job is handled to be more effective and efficient. Thus, the digitalization of education in the learning process is a change or handling of technology to make the learning process effective and efficient. However, educators have not fully used learning media in the learning process.

There are various learning media maker applications, including Adobe Flash. Adobe Flash for animators is a vector-based program that is now used to make various animations (Madcom, 2013). Adobe Flash is now widely used to make learning media, including physics learning. Adobe Flash is a programming language that uses action scripts. An action script is an action or movement on the object that can be generated with a command in Adobe Flash (Madcom, 2013) to make the learning media more interactive. The selection of Adobe Flash Professional CS6 applications in the development of physics learning media is because Adobe Flash Professional CS6 can help the learning process by providing message information through drawn animation, text, and audio media that can facilitate the learning process audio-visually. Setia et al. (2018), in their research using Adobe Flash, explained that there was a difference between the use of learning media and direct teacher explanation because there is a picture animation in the learning media. This causes the delivery of material to be more interesting than conventional explanations. In addition, Adobe Flash also has features for Android-based so that learning media installed on smartphones can facilitate learning physics. The use of smartphones today allows students to access smartphones easily, causing the creation of Android-based learning media. According to Gargenta (2011) and Matsun et al. (2018), Android is a comprehensive platform that can design learning media based on Android. Thus, the existence of smartphones today can facilitate the creation of Android-based learning media using Adobe Flash. However, learning media maker applications such as Adobe Flash are less attractive to educators, so smartphones are only used as intermediaries in learning.

Rohmani et al. (2015), in their research, explained that after following the learning process using interactive multimedia-based physics learning media integrated with student worksheets, the achievement of student learning outcomes positively impacted them. The learning media is also able to attract the focus of students to continue to pay attention to the media until the completion of the process of learning activities, which then the results are written in student worksheets. The study showed that the average score of students in the attitude aspect was 84.34, and the psychomotor was 83.9, which was in the very good category. However, there are still shortcomings, such as students not using the media because they have to work on worksheets in different places with learning media. In addition, Mananda et al. (2017) in their research explained that the use of Macromedia Flash learning media on Newton's Law material was able to develop students understanding of concepts on the subject of Newton's Law as seen from the understanding of students through a completeness value of 93.33% with an average normalized gain value of 89.07 including the high category. However, learning media has weaknesses, such as lacking optimization because the design is imperfect. This can happen if the application-making application is not up-to-date or less desirable due to difficulty in operation or lack of reference or information when using the application. In addition, Agustin and Sesunan (2019) stated that Adobe Flash-based interactive learning media meets the validity criteria that have been made by experts with an average construct feasibility score of 3.84, which means very valid, and an average material feasibility score of 3.73, which means very valid. In addition, the readability test obtained an attractiveness score of 3.73 (very interesting), an ease score of 4.00, which means very easy, and a usefulness score of 4.00, which means very useful. The resulting media is not yet optimal because its use requires a computer, so students find it difficult because the media is not flexible enough to be used in the learning process.

Development research is increasingly rapid with the birth of innovations such as research developed by Setia et al. (2018) in his research on learning media on Newton's Law material about motion and its application, which he developed using Adobe Flash Professional CS6 suggests that the

trial results obtained good results based on the validator's assessment. In addition, the percentage of responses obtained was 80.1% (learning media on the material of Newton's Law on motion and its application is suitable for class X SMA). However, there are weaknesses in this study, such as the fact that the use of media is not flexible because it can only be used on computers and does not yet have learning videos and simulation animations to support the learning process. Therefore, students need learning media that is easy to use, practical, and contains learning activities to increase their understanding inside or outside school.

## **METHOD**

This research is a research and development with a qualitative descriptive analysis approach. The research and development (RnD) design uses a design created by Branch (2009), commonly called the ADDIE Approach. Branch (2009) explains that the ADDIE approach includes five stages; 1) *Analyze* (The analysis phase identifies possible causes of performance gaps); 2) *Design* (The design phase has a function to verify the expected performance and the appropriate test method); 3) *Develop* (The development phase has the function of producing and validating the specified learning resources); 4) *Implement* (The implementation phase has the function of preparing the learning environment and engaging learners); and 5) *Evaluate* (The evaluation phase determines the value of the quality of products and processes with indicators before and after implementation).

Sukmadinata (2013) explains that his research and development activities are sufficient to produce a final draft without testing results (Model / Product Test). Thus, this research until the final draft of physics learning media was produced without testing the implementation of learning activities with an explanation of the following stages.

### **Analyze**

The analysis phase identifies possible causes of performance gaps. Literature studies and field surveys are carried out in this stage to identify problems.

### **Design**

The design phase has a function to verify the expected performance and the appropriate test method. In this stage, preparation, planning, making, and testing of the feasibility of learning media are carried out to produce good physics learning media to make it feasible for the next test stage.

### **Develop**

The development phase has the function of producing and validating the specified learning resources. In this stage, the learning media testing on students has three steps: One-One Trial, a Small Group Trial, and a Field Trial.

This study's data generated has qualitative properties obtained through validation questionnaires and assessment responses to learning media supported by interviews, observation, and documentation.

### **Questionnaire**

According to Sudaryono et al. (2013), a questionnaire is explained as a way or technique of collecting data indirectly (researchers do not directly ask respondents questions) by using a tool or instrument in collecting data called a questionnaire. The questionnaire contains several statements that must be responded to or given answers by respondents. Data collection techniques use questionnaires to analyze the needs of development research, measure the feasibility of material content, language, and presentation of physics learning media, and provide feedback on research. Questionnaires are given to experts, teachers, and students at the various stages of the study. The questionnaire used here uses the Likert model attitude scale format.

Likert scale is unidimensional, meaning all statement items must measure the same thing (Maolani & Cahyana, 2016; Azwar S. , 2007). The assessment given is a response from respondents with five categories of agreement, namely Strongly Agree (SS), Agree (S), Neutral (N), Disagree (ST), and Strongly Disagree (STS) (Azwar S. , 1998) The method of assessment in the questionnaire is

selecting one option in the column according to the respondents' assessment. Table 3.2 shows the Likert Scale format.

**Tabel 1.** Likert Scale Format

Component	Answer Choices				
	STS	TS	N	S	SS
Statement	1	2	3	4	5

**Observation**

Hadi (1986) include Sugiyono (2017) explain that observation co, commonly called observation, is a complex process composed of various biological and psychological processes. Some of the most important things are memory and observation processes. Data collection techniques by observation when research is related to human attitudes, work processes, and natural symptoms and when the observed respondents are small (Sugiyono, 2017). Observations supporting the needs analysis in this study are observations during learning to find methods, teaching materials, and the ability to understand the material for students. Supporting observations of validation carried out in the study to determine the ability to understand the material for students is when learning takes place in class.

**Interview**

Researchers certainly carry out preliminary studies to examine a phenomenon or problem found. One of the ways Sugiyono (2017) offers is an interview, which is a direct data collection technique. The interview used in this study supports the needs analysis. Interviews were conducted to determine the needs of learning media based on the needs of teachers and students. Direct interviews were conducted with teachers and students to produce accurate data. Interviews supporting validation are carried out in research to determine the utilization of learning media by conducting interviews with teachers and students.

**Documentation**

For research from observations or interviews to have more reliable (credible) results, it can be supported by a personal life history. In addition, the research results will be further enhanced by using academic and artistic papers, photographs, and videos. However, not all documents have high credibility; it is necessary to pay attention so that research can use this technique as a complement.

The quantitative data analysis technique used is the assessment criteria used by Azwar (Azwar S., 2007). Table 2 shows the assessment criteria for the Learning Media Assessment Criteria.

**Table 2.** Learning Media Assessment Criteria

Skor	Criteria
$Mi + 1,5 Sbi < X$	Very Good
$Mi + 0,5 Sbi < X \leq Mi + 1,5 Sbi$	Good
$Mi - 0,5 Sbi < X \leq Mi + 0,5 Sbi$	Good Enough
$Mi - 1,5 Sbi < X \leq Mi - 0,5 Sbi$	Not Good
$X \leq Mi - 1,5 Sbi$	Very Not Good

Description:

X = Respondent's score;

Mi = Ideal mean;

Sbi = Ideal standard deviation;

$Mi = \frac{1}{2}$  (ideal highest score + ideal lowest score);

$Sbi = \frac{1}{6}$  (ideal highest score - ideal lowest score);

Triangulation is a data collection technique that combines various data collection techniques and data sources that already exist (Sugiyono, 2017). Data collection techniques and various sources are used to check and test the credibility of the data. The success of learning media through triangulation

analysis between observers and consultants (experts), researchers (students), and research subjects (students). Figure 1 shows Learning Media Testing Process Scheme presents the validity test technique. This research procedure goes through the following stages.

**Analyze**

At this stage, two steps, namely, a literature study by conducting a study of concepts or theories related to the model or product that has and the results of previous research related to the model or product developed and field surveys by analyzing the needs of learning media development to teachers and students through distributing questionnaires.

**Design**

At this stage, the preparation of the Learning Implementation Plan (RPP) so that the learning media can be optimally used, effectively, and efficiently, which the syllabus of class X high school physics subjects in the 2013 curriculum adjusting, Learner Worksheets (LKPD), practice questions to increase understanding, evaluation questions to test students' understanding, flowcharts to determine the flow of content so that the content is sequential and systematic and storyboards to determine the sketches of content made in each content. After that, learning media will be made through the Adobe Flash Professional CS6 application and other supporting applications. A questionnaire will be used to personally test various mobile devices and validate learning media with experts based on language, material, and media aspects.

**Develop**

At this stage, a validated learning media trial to students with three steps, namely, One One Trial (trial to three high school students), Small Group Trial (trial to nine high school students), and Field Trial (trial to thirty high school students) on condition that students have learned Newton's Law material and continued assessment through questionnaires to teachers and students.

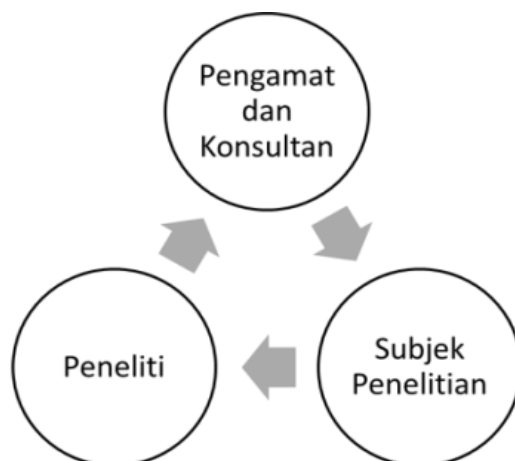


Figure 1. Schematic of Learning Media Testing Process

**RESULT AND DISCUSSION**

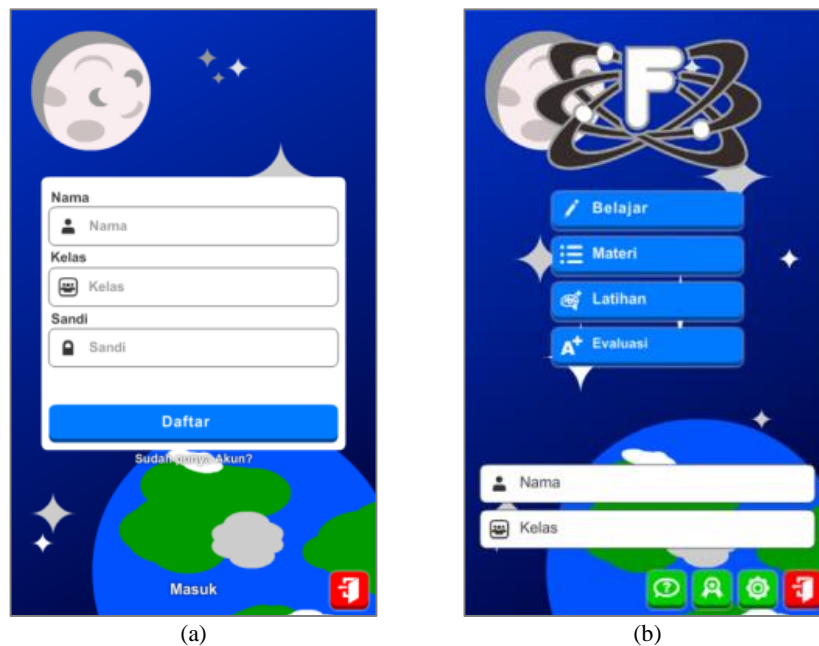
The physics learning media created is an Android smartphone application with the Application Package (.apk) extension. The learning media is installed on a smartphone, but its operation requires a help application, namely the Adobe AIR application. Thus, users who use smartphones with non-android types cannot install applications on these smartphones. This learning media can be used on smartphones with minimum specifications of OS (Operating System) Android v 7.0 Nougat, Snapdragon 435 chipset, and Octa-core Max 1.40GHz CPU, with a minimum of 2 GB RAM, 2 GB ROM, and 480 x 800 resolution. Thus, android users with smartphone specifications below the minimum specifications cannot install the application on the smartphone.

This physics learning media can be used offline or without the internet. Because this learning media still needs to have online storage, students can only access learning media in one lesson or work that has previously been deleted when students exit the application. Learning media has several features:

simulation, movie clips, video, UI, scrolling text, swipe gallery, drag and drop, and sound. Learning media use classroom teaching materials and independent distance learning materials. However, the learning media must remain under the teacher's guidance to ensure students understand the learning process.

The results of making learning media are as follows

1. Loading Page  
The loading page functions to focus the learners' attention on the application.
2. Log In Page  
The Log-in page to fill in the identity and enter the password that the creator has determined. Figure 2 show the display of Log-In Page.
3. Main Page (Home)  
The Main Page (Home) functions to display features in the application that students can use. Figure 2 show the display of Main Page (Home).



(a) (b)  
**Figure 2.** (a) Log-In Page Display (b) Main Page Display

4. Learning Page  
The Learning page functions to display a selection of learning activities provided by the author. Learning activities use a scientific approach and contain several pages with the following explanation. Core Competencies, Basic Competencies, Indicators, and Learning Objectives page
  - a. Observing Page
  - b. Questioning Page
  - c. Information Gathering Page
  - d. Analyzing Page
  - e. Communicating Page
  - f. Activity Result Report PageFigure 3 show the display of this each part of learning page.
5. Material Page  
The Material page functions to display the choice and presentation of materials provided by the author. Figure 3 show the display of Material Page.
6. Exercise Page  
The Exercise page functions to display the Exercise package options and presentation of exercise questions provided by the creator. Figure 3 show the display of Exercise Page.

7. Evaluation Page  
The Evaluation page displays the Evaluation package options and presentation of evaluation questions provided by the creator. Figure 3 show the display of Evaluation Page.
8. Assessment Page  
The Assessment page functions to display the results of learning activities and the results of evaluation activities.
9. Instruction Page  
The Instruction page displays a selection of instruction pages provided by the author for students.
10. Setup Page  
The Setup page to manage or set up the application.



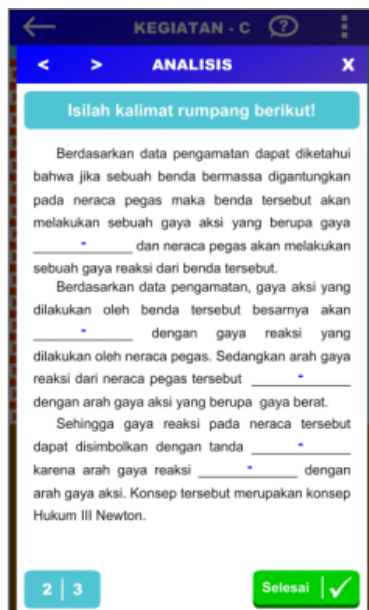
(a)



(b)



(c)

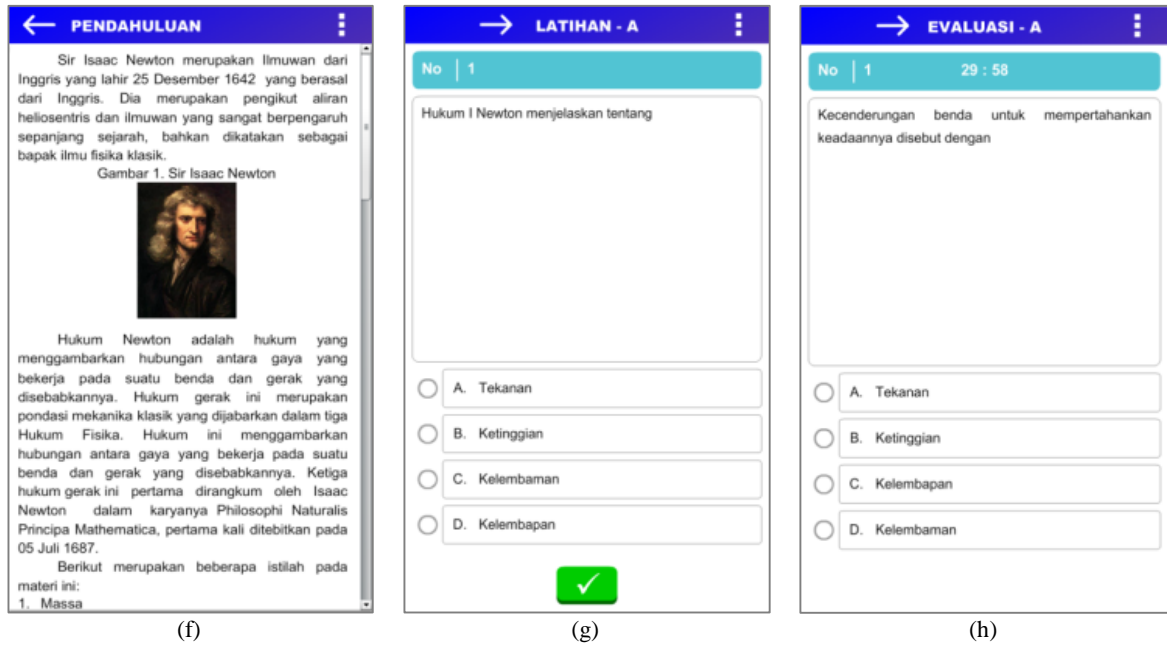


(d)



(e)





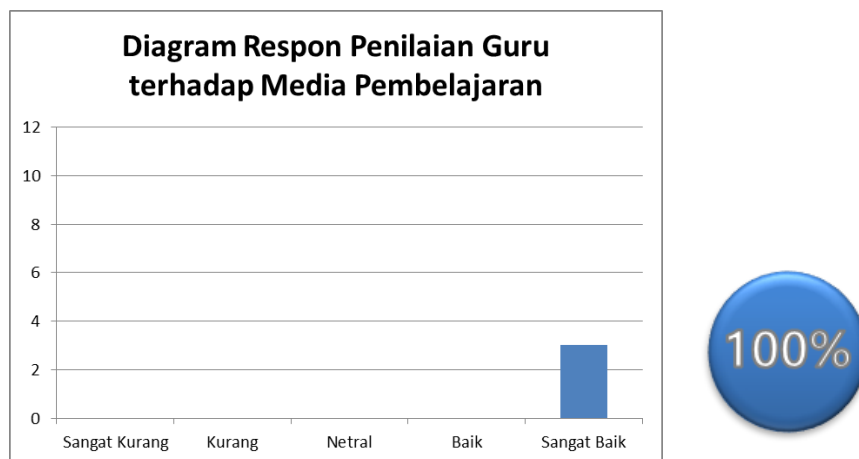
**Figure 3.** (a) Display of Observing Page; (b) Display of the Questioning Page; (c) Display of Information Gathering Page; (d) Display of Analyzing Page; (e) Display of the Communicating Page; (f) Material Page Display; (g) Exercise Page View; and (h) Display of the Evaluation Page

This physics learning media is validated by experts on the aspects of language, material, and media to determine if the learning media made is a learning media with a good category. Table 2 shows the physics learning media validation.

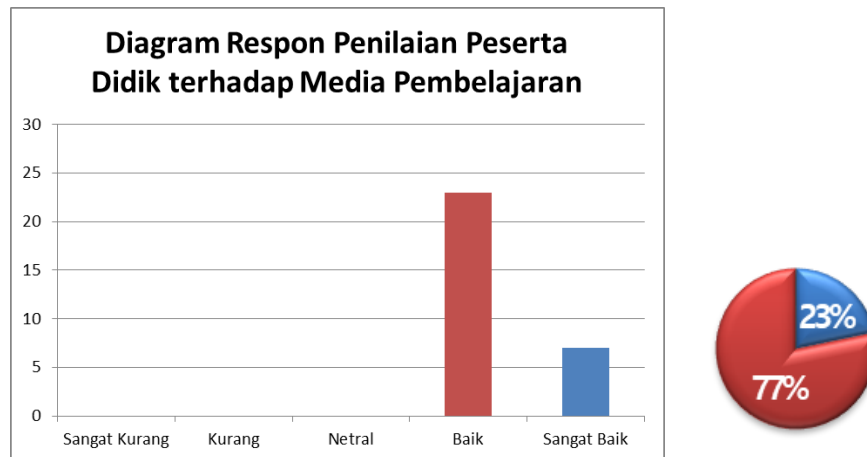
**Table 2.** Learning Media Validation Results

Sub-Aspect	Total Score
Language	43
Content	71
Media	71
<b>Total</b>	<b>185</b>

Based on Table 2, the total number of learning media validation scores in Table 3 of 185 is a score with an outstanding category suitable for use in the next stage. This physics learning media was tested on three teachers and 30 SMA Negeri 8 Surakarta students. The test results obtained from the student's assessment responses are shown in Figure 12. Graph of Teacher Assessment Results of Learning Media and Figure 13. Graph of Student Assessment Results of Learning Media.



**Figure 4.** Graph of Teacher Assessment Results of Learning Media



**Figure 5.** Graph of the Results of Student Assessment of Learning Media.

According to the learner assessment criteria table in Table 2, it was found that 100% of teachers stated that the response to the learning media assessment was very good. 23% of students stated that the response to the learning media assessment was good, and 77% stated it was very good. The advantages and disadvantages of the learning media are as follows:

*Advantages of*

1. It has learning activities.
2. It has open analysis activities.
3. It has materials, exercises, and evaluations.
4. It has a large capacity.
5. It has simulation, video, a scrolling page, a swipe gallery, drag and drop, and sound features.
6. It can be used offline.

*Disadvantages of*

1. It does not have a complete simulation.
2. It cannot be used on smartphones with specifications below the minimum.
3. It cannot be used on non-android smartphones.
4. It does not have a local database.
5. It does not have full internet access.
6. It does not yet have features such as auto-rotation, auto size, zoom, multi-language usage, and folding.

## CONCLUSION

Physics learning media comprises Android application-based learning media with the Application Package (.apk) extension. This physics learning media can be used on smartphones with minimum specifications of OS (Operating System) Android v 7.0 Nougat, Snapdragon 435 chipset, and Octa-core Max 1.40GHz CPU, with a minimum of 2 GB RAM, 2 GB ROM, and 480 x 800 resolution. Physics learning media is based on the material and lesson plans of Newton's Law material with a scientific approach. The physics learning media contains a Learning page to conduct learning activities, a Material page to improve understanding, an Exercise page to improve understanding of the material, an Evaluation page to test understanding of the material, and a Settings page to adjust or set the state and explanation of the operation of learning media. Physics learning media contains features such as simulation, movie clips, video, UI, scrolling text, swipe gallery, drag and drop, and sound. It can be used without the internet (offline). The physics learning media made has a validation value on the basha aspect of 43, material aspects of 71, and media aspects of 71, so the learning media validation value is 185 with a very good category. The physics learning media made has an assessment response value from 3 teachers, namely 100% of teachers stated very well, and the value of the assessment response from 30

students, namely, 23% of students stated in the good category and 77% of students stated in the very good category.

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