

Technology of Physics Learning Media Based on Software Macromedia Flash to Enhance Problem Solving Capability in Passive Electronics Topics

Abdin, Hunaidah, Luh Sukariasih, Amiruddin Takda, La Sahara



Abstract: *The purpose of this research is to provide innovations to physics education lecturers in using physics learning media based on Macromedia Flash applications in lectures as a learning medium and students can improve their problem-solving abilities in solving problems in other fields.. Also, motivating physics education lecturers to use technology in conducting lectures in the room. The target of this research is in the form of products resulting from the development of learning media based on Macromedia Flash applications. The resulting product is expected to: (a) improve the ability of problem-solving in students, (b) motivate physics education lecturers to use technology in conducting lectures in the room. This research method is Research and Development by using a development model that consists of five stages : (1) preliminary investigation, (2) design, (3) realization/construction, (4) test, evaluation, and revision. Preliminary results of this study are the feasibility of developing learning media based on Macromedia Flash applications to improve students' problem-solving abilities on the subject matter of passive electronics can be seen based on the assessment or validity of the material experts obtained a mean score of 3.55 with a valid category. For the assessment or validity of the media, experts obtained an average of 3.63 with a valid category. The effectiveness of the results of the development of learning media based on Macromedia flash applications to improve students' problem-solving abilities on the subject matter of passive electronics can be seen based on inferential analysis using the test paired t-test was obtained $t_{count} = 10.60$ dan $t_{table} = 2.05$ with a significant level of 5%, $df = 29$. The results of these calculations show that $t_{count} > t_{table}$ which means that the difference is due to the provision of different behaviours every time they conduct a pre-test evaluation before there is treatment and post-test after there is a treatment.*

Keywords : Learning Media, Macromedia Flash Software, Problem Solving

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* Correspondence Author

Abdin*, Lecture in Department of Physics Education, Universitas Halu Oleo, Kendari, Indonesia. Email: abdin@uho.ac.id

Hunaidah, Lecture in Department of Physics Education, Universitas Halu Oleo, Kendari, Indonesia. Email: hunaidah@uho.ac.id

Luh Sukariasih, Lecture in Department of Physics Education, Universitas Halu Oleo, Kendari, Indonesia. Email: luh.sukariasih@uho.ac.id

Amiruddin Takda, Lecture in Department of Physics Education, Universitas Halu Oleo, Kendari, Indonesia. Email: amiruddintakda@uho.ac.id

La Sahara, Lecture in Department of Physics Education, Universitas Halu Oleo, Kendari, Indonesia. Email: lasahara@uho.ac.id

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I. INTRODUCTION

Instructional media is one of the factors that also determine the success of teaching because learning media can assist students in delivering learning material in connection with the teaching objectives that have formulated in teaching planning [1][2]. In this condition, the use of instructional media can improve the efficiency of the process and the quality of academic quality of students [3]. Besides, the creative use of learning media will enable students to learn better and can improve the quality of learning with the objectives to be achieved [4][5]. Programs in making learning media that are unique and creative are now widely available [6]. In addition to the many kinds of ways to use and get it too easy. Macromedia flash is one of a variety of programs in making learning media [7]. The advantages of Macromedia Flash are in displaying multimedia, the combination of graphics, text, animation and sound is superior [8]. Also, these media can make interactive buttons in a Movie, making animated changes from one form to another, can make animated movements by following a predetermined path, and can be converted and published (publish) into several types (among which are : swf, gif, jpg, png, exe, mov). So that it can make learning more fun, exciting, and prepare students interested in the material being taught. Learning media is one of the factors that determine the success of teaching because learning media can help students in delivering learning material in connection with the teaching objectives that have been formulated in teaching planning [9]. In this condition, the use of instructional media can improve the efficiency of the process and the quality of academic quality of students [10]. Besides, the creative use of learning media will enable students to learn better and can improve the quality of learning with the objectives to be achieved. Programs in making learning media that are unique and creative are now widely available. In addition to the many kinds of ways to use and get it too easy. Macromedia flash is one of a variety of programs in making learning media the advantages of Macromedia flash is that it displays multimedia, the combination of graphics, text, animation and sound is superior [11][12]. Besides, these media can create interactive buttons in a Movie, make animated changes from a form to another form, can make lively movements by following a predetermined path, and can be converted and published (published) into several types (among which are : swf, gif, jpg, png, exe, mov).

So that it can make learning more fun, exciting, and prepare students interested in the material being taught.

Macromedia Flash application can be a sophisticated support device that helps stakeholders of educational institutions meet the demand for strong multiliterate capabilities and development for students. Through Macromedia Flash too, lecturers can motivate students to share their ideas and solve various problems for their interests or the community of educational institutions [13]. The use of learning media based on Macromedia Flash applications causes the role of the lecturer to become a collaborator and facilitator in learning, the lecturer is not one source of knowledge [14]. This change indicates that a lecturer is increasing his competence to become a professional lecturer [15].

Based on the description that has been explained, researchers are interested in developing a learning media based on Macromedia Flash applications. With this study, it is expected to be able to help teachers or students improve their problem-solving abilities. The purpose of this study is the purpose of this study are (a) describe the feasibility of the development of learning media based on *Macromedia flash* applications to improve students' problem-solving abilities on the subject matter of passive electronics, (b) review the effectiveness of the results of the development of learning media based on Macromedia Flash applications to improve students' problem-solving abilities on the subject matter of passive electronics

A. Problem of Study

The problems in this study are (a) how the feasibility of the results of the development of learning media based on Macromedia flash applications to improve students' problem-solving abilities on the subject matter of passive electronics is?, (b) how is the effectiveness of the results of the development of learning media based on *Macromedia Flash* applications to improve students' problem-solving abilities on the subject matter of passive electronics?

II. METHOD

A. Development Model

This research is a research development or Research and Development (R & D) is a research method used to produce specific products and test the effectiveness of these products [16]. The development of learning media based on Macromedia Flash applications is a process of activities to produce learning media that is suitable for learning objectives. In the development of this study using the Plomp development model [17]. This model consists of five stages: (1) preliminary investigation, (2) design (3) realization/construction, (4) test, evaluation, and revision (5) implementation.

B. Research Stages

The stages of developing learning media based on Macromedia flash applications in this study use the Plomp (1997) model which can be described as follows:

- Preliminary Investigation Stage

The preliminary investigation stage is also called a needs analysis or problem analysis. At this stage, identification and

analysis include (a) curriculum and material analysis; (b) analysis of student conditions.

- Design Stage

This phase of the activity aims to design the problem solving that was raised during the initial investigation. The steps taken in the design are as follows: (a) preparation of the subject matter and supporting aspects (text, images, animation, audio and video); (b) determination of content; (c) initial design.

- Realization/Construction Stage

Activities at this stage are the realization/construction of the design stage to obtain a solution. Activities carried out at this stage are compiling learning media based on Macromedia Flash applications, compiling tests of problem-solving abilities. The results of this activity are called draft 1.

- Test, Evaluation, and Revision Stage

At this stage, a solution developed must be tested and evaluated in practice. Without evaluation, it cannot be determined that a problem has been solved satisfactorily or the desired situation as described in the formulation of the problem. The activities at this stage are carried out by steps namely validation of draft 1, Analysis of the results of validation, revision. This phase has been carried out, meaning that a learning media based on Macromedia flash application has been obtained which is feasible to be implemented in lectures.

- Implementation Stage

At this stage, learning media based on Macromedia Flash applications that have been valid will be used in field trial activities to get the effectiveness of the results of developing learning media based on Macromedia Flash applications.

C. Research Design

The product developed was tested to determine the effectiveness of the product. Stages of the trial were carried out in a quasi-experimental design with one group pretest-posttest design. The study design is presented in Table-I:

Table-I: Trial design

Pretest	Treatment	Posttest
O_1	X	O_2

Where:

O_1 = Pre test before treatment is given

O_2 = Post test after treatment is given

X_1 = Development of learning media based on Macromedia Flash applications

D. Research Variables

The variables that will be measured or observed in this study are as follows:

- The validity of learning media based on Macromedia Flash applications is the feasibility of the development of learning media based on Macromedia Flash applications
- Problem-solving ability is the ability that students have in understanding problems, making solving plans, implementing plans and re-examining what has been done



E. Data Collection Technique

Data collection techniques used in this study include:

- Data about the validity of learning media is taken using a validation sheet.
- Problem-solving ability data is taken with a problem-solving ability test.

F. Data Analysis

The criteria for validity and effectiveness of learning media based on Macromedia Flash applications Basic decision making if $t_{count} > t_{table}$ then there is a significant increase in students' problem-solving abilities on the subject matter of passive electronics after receiving a lecture on the development of learning media based on *Macromedia flash* applications.

G. Research Flowcharts

Flowcharts in this study are presented in Fig. 1 following:

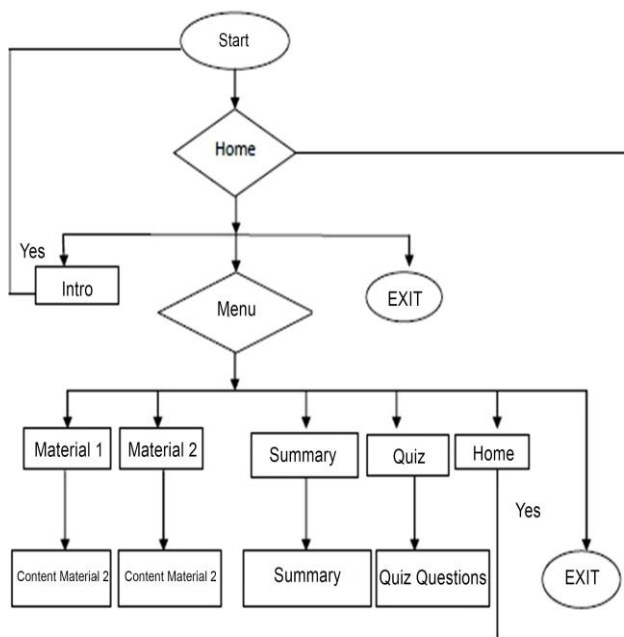


Fig. 1. Macromedia flash learning media flowchart

III. RESULT AND DISCUSSION

A. Preliminary Investigation Stage

At this stage, the problem analysis and information gathering are carried out. This research departs from problems that have the potential to be fixed. Based on the information of the lecturers who teach at the Department of Physics Education that learning analogue electronics 1 is not going well. This is because lecturers who teach are still conventional, students are less motivated in learning passive electronics, Lecturers in teaching passive electronics courses feel they need a learning media that helps in determining the direction, Based on this it is necessary to develop learning media that can help lecturers in the implementation of learning and at the same time can increase student motivation in learning passive electronics. For this reason, this study developed Macromedia Flash-based learning media that can be used, both by lecturers in the learning process and by students in self-study. In this case, the development of learning media for the subject matter of passive electronic

components.

At this stage also an analysis of the curriculum and conditions of students in the Department of Physics education that the curriculum used in the Department of Physics Education is the KBK-based KKNi curriculum, This curriculum contains a set of the semester learning implementation plans (RPPS), syllabi and arrangements regarding objectives, content, and learning materials and methods used as guidelines for organizing learning activities to achieve educational goals in the Department of Physics Education and are developed based on the principle that students have a central position to build their competencies to become students who have the will to learn, intelligence and competitive abilities in physics in general.

B. The Design Stage

The design development phase of this research includes making sketches or intro displays, sketching or displaying learning material and sketching or displaying Learning media design. Sketches or displays of learning media based on Macromedia Flash Applications include: home menu to be displayed, path/content of the material to discuss, summary, and question quiz, appearance and navigation to be used in its use, as well as techniques for its users using the flash slide presentation format. In the sketch or design appearance, several slides will be made, including slide headers for permanent background slides and outline slides that contain the subject matter of the Passive Electronic Component.

C. Realization/Construction Stage

This stage is the design of a paper-based computer application with Macromedia Flash Application. The prototype I design was made complete than the sketch or appearance of the paper-based design. In this prototype I, media design has developed into an initial product. The development of paper-based design sketches into prototype I am shown by the addition of animation. The visual display of physics learning media based on the Macromedia Flash application that has been developed ;

- Display Intro



Fig. 2. Display research intro

Based on Fig. 2 in this display the process of waiting (please wait) by bringing up the title of the subject that will be discussing on Macromedia flash-based learning media. Then can display the home menu has several options to enter the main menu



▪ Home Menu Display

Fig. 3 show home menu display which has several other main menus namely main menu display has several choices namely topic 1, topic 2, summary and quiz.



Fig. 3. Home menu display

Display the Mome Menu



Fig. 4. Display the home menu

From Fig. 4 displays information about the indicator, i.e. (1) explains the definition of the resistor. (2) to mention the kinds of resistors according to the material and its construction. (3) explains the characteristics of various resistors. (4) describes the colour and letter codes on the resistor.

▪ Display Content of Resistor Material

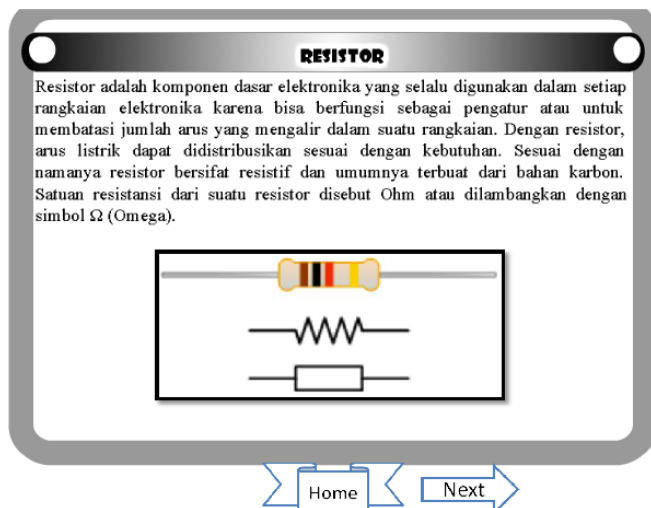


Fig. 5. Display content of resistor material

Based on Fig. 5 the display contains the contents of the resistor material, and there are many explanations about resistors accompanied by similar resistor images.

▪ Display Capacitor Material



Fig. 6. display capacitor material

Part Fig. 6 displays information about the capacitor with the indicator, i.e. (1) explains the definition of the capacitor. (2) to mention the types of capacitors according to the materials and their construction. (3) explains the characteristics of various capacitors. (5) describes the filling and emptying of capacitors.

▪ Display Contents of Capacitor Material

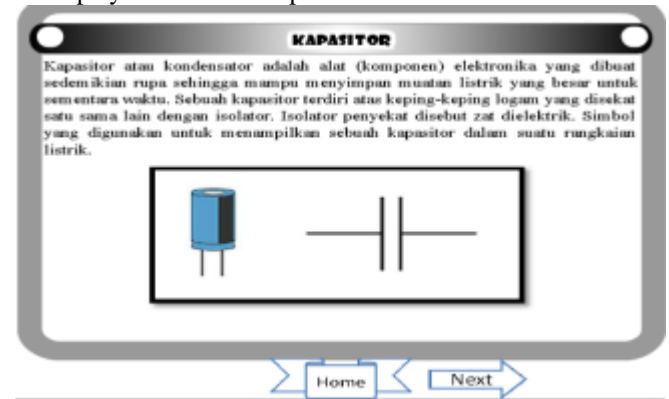


Fig. 7. Display contens of capacitor material

Based on Fig. 7 discusses the contents of the capacitor material, and there are many explanations about capacitors accompanied by images of similar capacitors

▪ Summary Menu Display



Fig. 8. Summary menu display

Fig. 8 displays information at a glance the contents of a summary of the subject matter of passive electronic components both resistor material and capacitors, accompanied by a summary content display containing a summary display of each element contained in the subject matter of passive electronic components.

▪ Quiz Menu Display



Fig. 9. Quiz menu display

The Quiz menu display contains display instructions for using the Quiz that students must understand when taking the quiz test. Guidelines about the Quiz that must be followed by students include; (1) the form of questions in multiple-choice as many as 10 items by having 4 options, namely options A, B, C, and D, (2) choose the answer that you think is right by clicking on the problem option, (3) cooperation is not allowed in answering questions, (4) Student participants in working on Quiz questions must pay attention to the time that runs during the Quiz and the time given is maximized when working on the questions, (5) the selected answers cannot be corrected; therefore participants answer with caution in answering questions, and the chosen answers cannot be repeated.

▪ Display of Quiz Questions

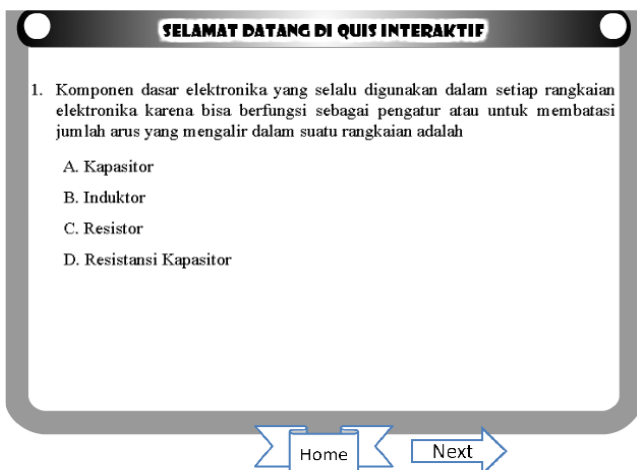


Fig. 10. Display of quiz questions

The Quiz Problem display above contains the number of questions about 10 multiple-choice questions. Each various choice question item has the same option out of the 10 question items which are 4 options (A, B, C, and D). When choosing the correct answer according to the participant by clicking on the selected option, then proceed with the next item question questions by clicking Next on display.

▪ Quiz Display of Quiz Work Results



Fig. 11. Quiz display of quiz work results

Based on the Fig. 11 contains a display of the results obtained by the value of Quiz work done by the user or the user, in this stage can provide information on the number of true and false questions when working from 1 to 10 items, after that it can also display the value obtained by the user or the user is set with the formula the number of values obtained from the number of correct answers times 10, the highest score is 100.

D. Test, Evaluation, and Revision Stage

At this stage, a solution developed must be tested and evaluated in practice. Without evaluation, it cannot be determined that a problem has been solved satisfactorily or the desired situation as described in the formulation of the problem. Activities at this stage are carried out by steps namely validation of draft 1 (validity of material experts and media experts), analysis of results of validation, revision.

Before the validation of physics learning media based on Macromedia, applications is carried out; an instrument the first developed.

The type of device used in this phase is the validation sheet. Before being used, it is first validated by experts to test the appropriateness or inadequacy of the instruments used to measure the specified aspects, in terms of the clarity of the measurement objectives formulated, the relevance of the questions for each element, the use of language, and the clarity of instructions use of instruments.

Content validation and construct validation activities of physics learning media are carried out by providing validation instruments to experts. The experts who act as validators are physics education experts and experienced in developing instructional media, material experts, media experts. Suggestions from these experts are used as a basis for refinement or revision of physics learning media based on Macromedia Flash applications. The activity carried out at the time of validating the physics learning media, asks for expert consideration on the feasibility of the learning media (in prototype 1) which has been realized. For this activity, an instrument in the form of a validation sheet is required to be submitted to the validator. Analyze the validation results from the validator.

Based on the analysis of the results of the validation of the two validators showed valid without revision, then the next activity is a field trial. Then back to the event asking for expert judgment to get an accurate learning media. After obtaining a valid learning media application, then the material experts and media experts are validated. The results of the validation carried out by material experts can be seen in the following Table - II:

Table-II: The results of the validation carried out by the Material Expert

No	Learning Aspects	1	2	3	4	5	Average item
1	Material compatibility with basic competence				v		4
2	Conformity of Indicators with essential competencies			v			3
3	Consistency between essential competencies, Indicators, Materials, and evaluation				v		4
4	Accuracy in material coverage				v		4
5	Material truth					v	5
6	Recency of matter				v		4
7	Material digestibility				v		4
8	Submission of coherent material				v		4
9	Useful material				v		4
10	Depth of Material				v		4
11	Material interests			v			3
12	Material victory				v		4
13	Ease of conveying material				v		4
14	Providing evaluations to measure student ability				v		4
15	Providing a continuous evaluation of each sub material			v			3
16	Involvement of the role of students in learning activities				v		4
17	Learning resources are accurate and can be trusted			v			3
18	Use of language			v			3
19	Quality of presentation of material			v			3
20	Quality of feedback to students			v			3
Amount							71
V_a = Table Average Score for all aspects							3.55

Based on Table-II that the results of data validation conducted by material experts have a *V_a* value of 3.55, indicating the learning media is valid in terms of material. Meanwhile, to find out the results of the validation carried out by media experts, see Table-III:

Table-III: Results of validation conducted by media experts

No	Media Display Aspects	1	2	3	4	5	Average Item
A. Media Display							
1	Font selection				v		4
2	Choice of font size				v		4
3	Colour			v			3
4	Graphic					v	5
5	The accuracy of the background selection			v			3
6	Image display			v			3
7	Animation				v		4
8	Accompany music			v			3
9	Sound				v		4
10	Screen design				v		4
11	Use of language			v			3
B. Display Aspects of the Program							

No	Media Display Aspects	1	2	3	4	5	Average Item
1	Navigation			v			3
2	Consistent button			v			3
3	Clarity of usability instructions				v		4
4	Ease of use				v		4
5	Efficient use of the screen			v			3
6	Efficient use of text				v		4
7	Speed				v		4
8	Anticipate possible student responses				v		4
Amount							69
V_a = Table Average Score for all aspects							3.63

Table-III provides information that the results of validation carried out by media experts have a *V_a* value of 3.63, indicating that learning media are valid in terms of media. This phase has been carried out, meaning that a learning media based on Macromedia flash application has been obtained which is feasible to be implemented in lectures.

E. Implementation Stage

At this stage, learning media based on Macromedia Flash applications that have been valid will be used in field trial activities to get the effectiveness of the results of developing learning media based on Macromedia Flash applications. Before the activity of floating learning media can measure the ability of students' problem solving using pretest. This pretest was carried out just before the results of the program developed by the physics learning media based on the Macromedia Flash application. After the development of Macromedia Flash learning media is finished, it is implemented the development of the learning media in the learning process in the lecture room and after the material held posttest. The goal is to hold a post-test to find out whether or not the problem-solving ability of students is increasing or not. This can illustrate the pretest and post-test data in Table-IV:

Table-IV : Pretets and Posttest Data

No.	Responden	Pretes	Postes
1	ADE	57	85
2	ILYAS	57	80
3	RAIS	70	85
4	ARDIM	70	91
5	ARIS	65	91
6	ASMI	65	91
7	KARI	63	91
8	NATAL	63	76
9	INTAN	67	80
10	DEWI	63	85
11	SERLI	63	85
12	ELVI	65	80
13	LAZ	50	56
14	FAH	69	96
15	WAT	76	80
16	FTIR	65	96
17	FIT	70	96
18	GEB	65	96
19	HAF	67	76
20	ZHIR	69	96
21	YUS	72	76
22	JAY	69	70
23	JUL	69	70
24	LIL	63	70
25	LIND	57	91



No.	Responden	Pretes	Postes
26	LIS	63	85
27	MAHE	73	85
28	MPT	65	85
29	NFA	59	80
30	SNA	57	80
Amount		1946	2504
Average		64.87	83.47

Based on Table-IV shows that the problem-solving ability of students increases. It can be seen that the pretest average results are 64.87, while the average posttest results are 83.47. In full, you can see Fig. 12 following charts:

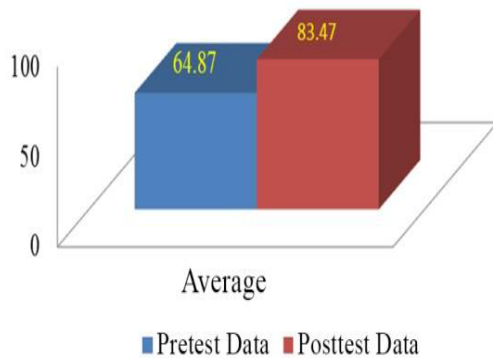


Fig. 12. Graph pre-test and post-test data

After observing the data of the results of the pretest and posttest the problem-solving ability of students increased then analyzed inferentially using paired t-test obtained $t_{count} = 10.60$ and $t_{table} = 2.05$ with a significant level 5%, $df = 29$. The calculation results show that $t_{count} > t_{table}$ which means that the problem-solving ability of posttest student data is significantly higher compared to the pretest result data. The existence of these differences due to the provision of different behavior. Provision of behavior used in the posttest stage implements the results of the development of learning media based on Macromedia Flash applications, whereas in the pretest stage conventional learning is applied. This is based on the stages of learning media based on Macromedia flash applications in the process of implementing student learning activities centred and focused. In learning activities, students are allowed to actively discuss, develop their knowledge and given the opportunity to complete Quiz or exercises that have been provided by learning media.

Therefore, the stages of improving students' problem-solving abilities through the development of physics learning media based on the Macromedia Flas application provide a stimulus or a significant influence on students' problem-solving skills for the better

IV. CONCLUSION

Based on the description that has been explained so that the conclusions of this study are as follows :

- The feasibility of the results of the development of learning media based on Macromedia flash applications to improve students' problem-solving abilities on passive electronics subject matter can be seen research results based on the assessment or validity of the material experts obtained a mean score of 3.55 with a valid category. For the assessment or validity of the media,

experts obtained an average of 3.63 with a valid category.

- The effectiveness of the results of the development of learning media based on Macromedia flash applications to improve students' problem-solving abilities on the subject matter of passive electronics can be seen research results based on inferential analysis using paired t-test obtained $t_{count} = 10.60$ and $t_{table} = 2.05$ with a significant level of 5%, $df = 29$. The results of these calculations show that $t_{count} > t_{table}$ which means that the difference is due to the provision of different behaviours each time conducting a pre-evaluation evaluation before the treatment and post-test after the treatment

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AUTHORS PROFILE



Abdin, S.Pd., M.T. He is a junior lecture at Department of Physics Education, Universitas Halu Oleo, Indonesia. His research is focused on Electronic and instrumentation.



Assoc. Prof. Dr. Humaidah, M.Si. She is a senior lecture at Department of Physics Education, Universitas Halu Oleo, Indonesia. Her research is focused on learning model, instructional design and strategy in learning process.



Luh Sukariasih, S.Pd., M.Pd. She is a lecture at Department of Physics Education, Universitas Halu Oleo, Indonesia. Her research is focused on learning instruction and pedagogy.



Dr. Amiruddin Takda, M.Si. He is a senior lecture at Department of Physics Education, Universitas Halu Oleo, Indonesia. His research is focused on learning model and instructional design .



La Sahara, S.Pd., M.Pd. He is a lecture at Department of Physics Education, Universitas Halu Oleo, Indonesia. His research is focused on evaluation education and learning model