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PENGEMBANGAN ALAT PRAKTIKUM EFEK FOTO LISTRIK UNTUK MENINGKATKAN KETERAMPILAN PROSES SAINS PESERTA DIDIK SMA.

Aditya Febri Priyantono, Z. A. imam Supardi
Jurusan Fisika, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Surabaya
Email: adityafebri44@gmail.com

Abstract

This research aims to analyze feasibility of photo electric instrument. It contains validity, practicality, and effectiveness. This research was used ADDIE development model. It was implemented in class XII Science 1 in Raden Rahmat Balong Bendo Senior High School. Based on analysis it can be concluded that validity of photo electric instrument and student worksheet have 85,8% and 78,5% and have valid category. Practical of photo electric instrument have 3,71 in learning process and student respon have 79,8%. Effective of photo electric instrument have 0,66 in n-gain score and the n-gain score significant improvement. Based on analysis it can be concluded that it was in category: valid, practical, and effective. So it was feasible to improve scientific process skill of students of Senior High School.
Keywords: Scientific process skills and Photo electric effect

Abstrak

Penelitian ini bertujuan untuk menganalisis kelayakan alat praktikum efek fotolistrik. Kelayakan alat praktikum efek fotolistrik dapat dinyatakan layak dapat dinilai dari nilai validitas, kepraktisan, dan keefektifitas alat praktikum efek fotolistrik. Jenis penelitian ini merupakan penelitian pengembangan menggunakan model ADDIE. Hasil uji coba terbatas alat praktikum efek fotolistrik ini dilaksanakan di kelas XII IPA 1 SMA Raden Rahmat Balong Bendo. Berdasarkan analisis data yang diperoleh, nilai validitas alat praktikum efek fotolistrik beserta LKPD pada materi efek fotolistrik mendapatkan nilai validitas yaitu 85,8% dan 78,5% yang termasuk dalam kategori baik. Kepraktisan alat praktikum efek fotolistrik dinilai melalui nilai keterlaksanaan pembelajaran yaitu dengan nilai 3,71 yang termasuk kedalam kategori sangat baik dan nilai angket respon peserta didik yaitu 79,8% yang termasuk dalam kategori baik. Efektifitas alat praktikum efek fotolistrik pada materi efek fotolistrik baik ditinjau dari hasil peningkatan keterampilan proses sains peserta didik mencapai skor rata-rata 0,66 dengan kategori sedang dan peningkatan keterampilan proses sains tersebut meningkat dengan kategori peningkatan signifikan. Dengan demikian dapat disimpulkan bahwa alat praktikum efek fotolistrik layak untuk dipakai dalam meningkatkan keterampilan proses sains peserta didik SMA kelas XII.
Kata kunci : Keterampilan proses sains, dan efek fotolistrik

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INTRODUCTION

The learning process within the school was always relating to curriculum. Use in the school curriculum is based on constitution no 20 year 2003 on the national education system has given indonesia education can develop abilities and make the character and civilization the more dignified in order to educate the nation, aims to develop their students to get into people who believe and devoted to the God, noble, healthy, , knowledge, competent, creative, independent, and into a citizen who can democratic and responsible. The preparation of the curriculum is intended to achieve the objectives of the constitution.

Curriculum development in the education system, based on the basis of science, technology, art, and culture that is dynamically evolving so that the education system must be developed. On the basis of the development of dynamically developing science, curriculum content must be based on developing science, technology, art and culture so that students can use the development of science that has developed.

Curriculum 2013 is a new curriculum that perfects the previous curriculum. Competence of spiritual attitudes, social attitudes, knowledge and skills in the 2013 curriculum has been integrated. 2013 curriculum is based on graduate competency standards, target learning covers development in the realm of attitudes, knowledge, and skills that are united for each education unit (Permendikbud Number 65, 2013). The development of the attitude, knowledge, and skills domains in the curriculum 2013 can be carried out by scientific learning.

The use of media in the curriculum 2013 is highly recommended. In the curriculum 2013, each stage requires media to stimulate or stimulate students to take part in the teaching and learning process well and can also make students able to understand abstract concepts in the form of concepts that cannot be seen directly by the senses. Azhar, Arsyad (2011) in his book says that the visual media that is used is able to facilitate understanding (for example through the union of structures and organizations) and strengthen memory. Learning media in the form of props are intended to support process skill competencies and also support knowledge competencies.

Learning media in its use has various types such as teaching aids and practical equipment. Props are everything that can be used to explain concepts in learning material that are abstract or less understood to be real and clear so as to motivate students' thoughts, feelings, concerns, and interests in the teaching and learning process. The practicum tool in its application is a form of educational teaching aids that are used to find data during experiments.

The use of learning media in the teaching and learning process is very helpful for the teacher in explaining the material in the teaching and learning process to students, especially in physics subjects. Physics subjects are considered difficult subjects because the material contained in physics subjects taught contains several abstract concepts such as photoelectric effects and others. Material in physics subjects, especially the material of photoelectric effects in its delivery to students often use mathematical formulas or equations. Submission of intensity material using just mathematical formulas or equations is not enough to understand the material of the photoelectric effect. This makes the knowledge that students will get is less. This condition occurred at Raden Rahmat High School Balong Bendo, namely the absence of learning media to explain the electrical photo effect method in physics subjects. This causes students to be less enthusiastic about following physics subjects, especially electric photo effect material and students have difficulty understanding the concepts contained in the material of electric photo effects. Based on the research conducted by Payudi with the title "Development of Worksheets Assisted by Interactive Media Effects of Electricity Photo Material to Build Science Process Skills in SMAN 2 Bandar Lampung" shows that the use of instructional media in electric photo effect material will increase interest with a score of 3.27 (interesting) , ease with a score of 3.25 (easy), loyalty with a score of 3.21 (beneficial) and student learning outcomes in the form of process skills with an average N-gain of 0.63 (moderate). In addition, research from Agus Setiawan with the title "Development of Practical Simulation of Electric Photo Effects with Inquiry Approach conducted at Metro 1 MAN" shows that the use of instructional media in the photoelectric effect material will increase interest with a score of 3.10 (interesting), ease with a score of 2 , 77 (easy), benefit with a score of 2.70 (useful), and learning outcomes of students get a score above 75.

The use of instructional media in the material of photo electric effects will better explain the concepts contained in the material of photo electric effects using learning media in the form of a practical instrument. As the presentation of the above research shows that the use of practicum tools improves student learning outcomes. In addition, in the use of practical tools, especially in the electric photo effect material, students will be directly involved in the explanation of concepts in the material of electric photo effects. So that effectively the use of practicum tools will further enhance the competency of students' knowledge and skills especially in the material of electric photo effects.

Based on the explanation above, the author is interested in conducting research by developing a practicum tool with the aim of making photo electric effects practicum tools more affordable in terms of procurement of electric photo effect practicum tools in school environments, especially high schools and more practical in use by students so photos electric made will effectively improve learning outcomes in the realm of students' knowledge and skills competencies. Therefore the title of this research is "Development of Photo Electric Effect Practicum Tool on Photo Electric Effect Material to Improve the Student Science Processes Skills of High School".

METHODS

This type of research uses the ADDIE development model. This research was conducted at Raden Rahmat High School Balong Bendo. The sample used is random sampling. The research subjects used were class XII IPA 1 students, amounting to 28 students ..

The feasibility analysis of the electric photo effect practicum tool developed was using validation methods, observation methods, test methods, and questionnaire responses for students.

RESULTS AND DISCUSSION

The validation results of the electric photo effect practicum tool developed were obtained from the validation sheet assessed by the validator, Mr. Abdul Kholiq, S.Pd., M.T. The validation results from the photo electric effect practicum developed are shown in table 1 below.

Table 1. Results of photoelectric effect practicum validation results

No.	Aspek yang dinilai	Persentase (%)	Kriteria
1	Kesesuaian alat dengan konsep yang diajarkan	90	Sangat Baik
2	Kemampuan alat dalam meningkatkan kompetensi peserta didik	90	Sangat Baik
3	Kemudahan perawatan alat	86,6	Sangat Baik
4	Keakuratan alat yang dibuat	86,6	Sangat Baik
5	Kemudahan pengoperasian alat	86,6	Sangat Baik
6	Konstruksi alat aman bagi peserta didik	86,6	Sangat Baik
7	Alat memiliki nilai estetika (warna dan bentuk)	80	Baik
8	Kemudahan mencari, mengambil, dan menyimpan alat	80	Baik
	Rata-rata	**85,8**	Sangat Baik

Explanation of Table 1. The results of the validation of electric photo effect practicum tools are that every aspect contained in the electric photo effect practicum tool has an average percentage value of 85.8%. The percentage value is categorized very well according to Riduwan (2012) because 85.8% ≥ 61% and it is feasible to be tested in this study.

The feasibility of the LKPD is needed to find out the feasibility criteria of the student worksheet (LKPD) before being used in learning. Evaluation of the feasibility of student worksheets (LKPD) through assessment by instructional media expert lecturers namely Mr. Abdul Kholiq, S.Pd., M.T. The results of validation of student worksheets (LKPD) that have been made as follows.

Table 2. Results of LKPD validation

No	Aspek yang dinilai	Validator	Kriteria
	Konsep		
1	Materi Mengacu pada kurikulum 2013	3	Layak
2	Mencakup sebagian konsep utama	3	Layak
3	Kegiatan yang dilakukan mendukung pemahaman konsep	3	Layak
	Kontruksi		
4	Pencantuman petunjuk pengerjaan secara sistematis	3	Layak
5	Menggunakan kalimat yang sederhana yang jelas dan mudah dipahami	4	Sangat Layak
6	Menggunakan kalimat yang sesuai	3	Layak
	Gambar		
7	Gambar yang diilustrasikan dengan jelas dan menarik serta mendukung tujuan eksperimen	3	Layak

The LKPD validation score used in the electric photo effect material was 78.5%. According to Riduwan (2012) 78.5% ≥ 61% including eligible criteria. Implementation of learning in this study was observed by two observers namely Mr. Prasetyo Utomo, S.Pd. as the physics teacher of class XII and the second observer namely brother Yonie Abdul Salam, S.Pd. this learning is done for 2 x 45 minutes or one meeting. The average learning outcomes of class XII IPA 1 were 3.65 with very good criteria. Thus, the teacher has carried out all stages of learning using photoelectric effect practicum tools along with the LKPD on the photoelectric effect material starting from the introduction, core activities, closing, and class atmosphere. The average value of science process skills of students is 3.125 with category C. The highest average value of students 'science process skills is at the observing stage, which is 3.5 which belongs to category B. The lowest average value of students' process skills is interpreting stage which is 2.9 which is included in category D. Based on the results of the questionnaire responses of students to the photoelectric effect practicum tool, the lowest percentage obtained was 73.2%, namely in the aspect of the photoelectric effect practicum tool making students motivated to conduct experiments. This is because some students who do not understand the purpose of naming each component contained in the photoelectric effect practicum tool. The next lowest aspect is to grow feeling happy in learning using photoelectric effect practicum tools, which is 78.6%. This is because some students do not like practical activities because every physics learning in the photoelectric effect material is accustomed to only through explanation from the teacher. While the highest percentage gain is 84.8% in the design aspect of an attractive and easy tool to conduct experiments in any place because of its small and easy to

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carry form. Based on the results of the analysis of the response of the students as a whole, the response of students to the photoelectric effect practicum tool is included in the good category. The overall percentage obtained was 79.8%

The normality test aims to find out that the population is normally distributed or not. The value used for the normality test is the pre-test value of students. The normality test for the pre-test value gets a value of 11.03. Based on the normality test value, it is normally distributed because X2 counts <X2 table. So that H0 is accepted.

The results of the n-gain value of students, the lowest increase in science process skills is 0.4 with the pre-test value of 5 being the value in the post-test, namely 7. The lowest increase is in the medium category. The highest increase of science process skills in the table shows the value of 1.0 with the pre-test value of 3 being the value in the post-test which is 10 which falls into the high category. The average for the n-gain value obtained in this study is 0.66. This comes from the average value of the pre-test which is 4.2 and the post-test average value is 8.03. The average increase is included in the medium category. The average increase can be seen in Figure 1. Graph of the average pre-test and post-test values

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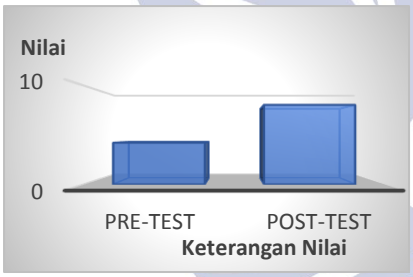

Figure 1. Graph of average pre-test and post-test values

The lowest n-gain value of the students is 0.4 which is included in the medium category. The highest result of n-gain value of students is 1.0 which is included in the high category. These results, if shown in the graphical form, are the lowest and highest differences in n-gain values as shown in Figure 2.

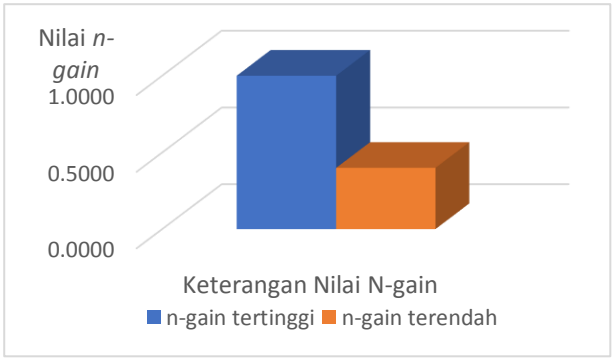

Figure 2. Graph of comparison of lowest and highest n-gain values

The second comparison is the comparison of the results of the pre-test and post-test in each aspect of the question of science process skills that are answered by students. In the pre-test value graph, every aspect of the question is the science process skills of students which shows that there are still many aspects of the process skill questions that do not get satisfactory values. The highest value in the highest pre-test score was in the question aspect of science process skills, namely the observing aspect that received total students who answered correctly was 23 students. The value graph of each aspect of the science process skills of students in the pre-test is shown in the figure.

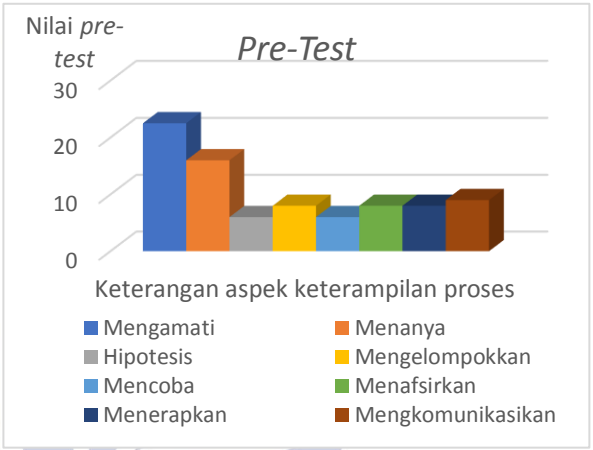

Figure 3. Graph of values for each aspect of the science process skills pre-test

The results of the scores of each aspect of the science process skill questions of the post-test students gained a significantly increasing value. This is evidenced in Figure 4 which shows a graph of the increase in value in the post-test. In the graph shows that the highest value is found in the question aspects of science process skills, namely applying the concept and communicating which gets 27 students who answered correctly on the question.

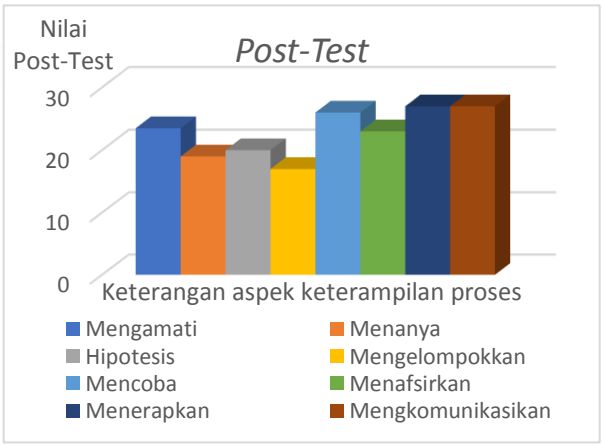

Figure 4. Graph of values for each aspect of the science process skills post-test

Further review of the development of electric photo effect practicum tools occurred in students of class XII IPA 1. It can be seen that the accuracy of the electric photo effect practicum tool developed was derived from the results of the electric photo effect practicum data tool which obtained the Planck constant value of 3.05×10^{-15} eVs. Then compared with the Constancy Planck theory, which is 3.34×10^{-15} eVs. Then the relative error is 8.68%. So that the accuracy of the electric photo effect practicum tool developed has an accuracy of 91.32%.

Improving the science process skills of students is obtained based on the results of the pre-test and post-test. The value of the pre-test and post-test was then analyzed so as to obtain a value of skill improvement or n-gain. The n-gain value obtained in this study is 0.66 which is included in the medium category.

After pre-test and post-test analysis to get the value of increasing science process skills or n-gain, to find out whether or not the increase was significant, a paired t-test was conducted. From the paired t-test, it was found that the improvement of science process skills of students using photoelectric effect practicum tools developed was with a $t_{count} = 16.59$. Because $t_{count} > t_{table}$, H0 is accepted so that in class XII-IPA 1 it can be concluded that the improvement of students' science process skills is significant.

The results of this study are in line with Agus Setiawan's research with the title Development of Electric Photo Effect Practicum Simulation with Inquiry Approach conducted at MAN 1 Metro with an effectiveness value of 77%. Then the research from Payudi with the title Development of LKS Assisted by Interactive Electricity Effect Photo Multimedia Material for Building Science Process Skills at SMAN 2 Bandar Lampung with an increase in the average n-gain value of 0.63 with the medium category.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the feasibility of the photoelectric effect practicum tool developed is feasible in its use to improve science process skills in terms of the following values.The validity of the photoelectric effect practicum tool along with the LKPD in the photoelectric effect material the results of the practical instrument validation obtained a percentage of 85.8% and the results of the LKPD validation were 78.5%. The percentage value is included in the very good category, and the results of the trial found that the accuracy of the tool is 91.32%.The practicality of the photoelectric effect practicum tool along with the LKPD in electric photo effect material obtained the results of the learning implementation score of 3.71. In addition, the value of the questionnaire responses of students to the use of photoelectric effect practicum tools developed was 79.8% and included in the good category.The effectiveness of practicum tools and worksheets on the photoelectric effect material is good in terms of the results of improving science process skills students achieve an average n-gain score of 0.66 with a moderate category and the increase increases significantly with a $t_{count} = 16.59$ while at $t_{table} = 2.045$.

So the photoelectric effect practicum tool developed meets the eligibility requirements (valid, practical, and effective) to be used in improving students' science process skills in the photoelectric effect material.

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