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DEVELOPMENT OF STUDENT WORKSHEET INTEGRATED SCIENTIFIC LITERAC FOR PHYSICS PRACTICUM KIT ON DIRECT ELECTRICITY MATERIAL

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ABSTRACT

The facts found in the field are that literacy activities have not been implemented properly and the lack of teaching materials for the implementation of practicum in the laboratory. One way that can be conducted to finish this is the Development of Integrated Scientific Literacy Worksheets for the Use of Physics Practicum KIT on Unidirectional Electrical Materials. The purpose of this research was to reveal the feasibility of the student worksheet developed. The research type conducted was Research and Development. The data sources of this study were the validator team, physics teachers and students of Senior High School in Padang. The instruments for data collection used were sheets for validation, sheets for practicality, and sheets for effectiveness in the form of student outcomes of learning tests for the assessment of scientific literacy skills. The technique of data analysis used is analysis in descriptive and correlation test analysis. Based on the analysis of data, results of three research were presented. First, the student worksheet with a validation value of 0.88 is a very valid category. Second, student worksheet with student and teacher practicality score of 92.25% and 95.90% with very practical category. Third, the use of student worksheet is effective in learning physics to improve student learning outcomes. From this study it can be concluded that the scientific literacy integrated worksheet for the use of physics practicum KIT on unidirectional electricity is valid, practical and effective to use in physics learning.

Keywords: Student Worksheets, Scientific Literacy, Physics Practicum KIT, Direct Electricity.

I. INTRODUCTION

Science and technology was very important at the time of entering the 21st century. At this time, humans must possess the ability to master, adapt and develop science and technology to be more used. The rapid science and technology development in a civilization will create quality human resources (HR). Human resources can be improved with more equitable education in the world, especially in Indonesia.

Education is a form of government effort in improving existing human resources. Humans can empower themselves and others with a qualified education. Good education basically has a role in quality improve of education in order to produce students who think critically, creatively, logically and take the initiative in dealing with various things. One of the government initiatives to raise the standard of education is the establishment of the 2013 curriculum.

The 2013 curriculum is a curriculum formed by the government by improving the existing curriculum. This form of curriculum implementation is designed based on objectives, content, learning materials and their implementation in accordance with applicable graduate competency standards. Student learning outcomes and the potential that exists within students are expected to be achieved more optimally in this curriculum. The 2013 Curriculum was re-developed in 2017 to become the 2017 revised 2013 Curriculum. This latest curriculum

provides broad opportunities in developing students' interest in learning and potential. The development of the 2013 curriculum carried out by the government requires the support of all schools and communities to realize the goals of implementing the 2013 curriculum to improve the quality of education in Indonesia[1].

Implementation in the use of the 2013 revised 2017 curriculum requires an important role for a teacher. The teacher is the first person involved in the implementation of teaching and learning in schools. In practice, a teacher is required to follow the demands of the 2013 revised 2017 curriculum. The revised 2013 curriculum expects students to master 4C skills (Creative, Critical thinking, Communicative and Collaborative), integrate HOTS (Higher Order Thinking Skill) skills, strengthen student character and integrate literacy activities at school. in every lesson. This is summarized into three aspects that must be achieved in the curriculum, namely character, skills, and literacy[2]. We can achieve the broad demands of the 2013 revised 2017 curriculum, one of which is by emphasizing the application of literacy in learning.

Literacy is a person's ability that includes reading, understanding, writing and solving problems based on scientific knowledge. There are many kinds of literacy activities, one of which is scientific literacy. Thus, scientific literacy activities are activities that can improve one's abilities in the form of reading, writing, and solving problems using scientific knowledge, which is not only fixated on concepts but can also apply them in everyday life. Scientific literacy is scientific concepts knowledge, processes and understandings needed to be applied in everyday life[3]. There are three components of the division of scientific literacy, namely scientific concepts, scientific processes and scientific contexts.

The implementation of physics learning is expected to take place well and students can understand the material presented by the teacher. In the implementation of the teaching and process of learning of physics can be done in the classroom or in the laboratory. In the classroom by presenting and providing understanding to students for theoretical physics material. Meanwhile, in the process of learning physics in the laboratory, it is given further understanding by using experiments to improve students' understanding. However, in reality several problems and obstacles were found in the implementation of physics learning in schools.

Based on the initial study results in conducted, it was found that there were several obstacles and problems that occurred in the process of learning. The initial study was conducted by giving questionnaires to students and supported by interviews with physics subject teachers. The questionnaire sheet given to students contains the classification of the ease of students in studying physics subjects seen from the material, process of learning and implementation of learning. The questionnaire given is more emphasized in looking at the analysis of student characteristics. In addition to the questionnaire given to students, the initial study was also supported by conducting interviews with teachers. Interviews were conducted based on the interview format which contained the needs of the teaching materials used,

Based on the initial study, it was found that there were several conditions in the actual condition. The first real condition, it was found that the process of learning conducted in the laboratory was still rarely conducted by teachers to students. This was obtained from interviews conducted with physics subject teachers. The process of practicum activities is only conducted for one meeting or one experiment in learning activities for one semester. This is because to prepare practicum activities requires special practicum teaching materials and also sufficient time to prepare them. Based on the interviews with teachers results, physics subject teachers said that for practicum activities, teaching materials were needed in the form of student worksheet which were specifically for practicum activities. Where student worksheet guides students in doing practicum with the stages, namely directing students to identify parts, make tables, make observations, and write or draw the results of their observations and finally draw conclusions[4]. In addition, teachers also have time constraints to prepare special worksheets for practicum and also time in its implementation. With the many activities and demands that must be conducted by teachers, making special worksheets for teacher practicums becomes difficult. One of them is in an experiment using a physics practicum KIT. Teaching materials in the form of a KIT guide book already exist and the practicum KIT in schools is also complete, but the available teaching materials are only a practical KIT guide book that is a package with tools and still contains KIT which is described in general.

The second real condition found that the implementation of literacy in learning is still minimally implemented in the process of learning. Literacy activities conducted have been conducted in general with the implementation every Wednesday and Thursday morning every week. However, literacy activities in the process of learning are still minimally implemented considering that there are so many subject matter in the curriculum. Thus, to focus on literacy is still not a special concern for teachers. Meanwhile, in the demands of the 2013 revised 2017 curriculum, students are required to integrate literacy in their learning. For that, one of the literacy that can be used is scientific literacy.

The third real condition was found that in the analysis of student characteristics, students were more happy to carry out learning activities with experiments. This is based on filling out questionnaires by students with as many as 95.7% of students saying this. In addition, the implementation of experimental/practical learning also makes it easier for students to understand the existing material. Students feel that the learning that is conducted in a practical way feels very easy to understand the concept. A total of 89.9% of students agreed with this. Based on the results of filling out the questionnaire, students also hope that learning can take place interspersed with practice, including the many theories in physics. This is certainly a highlight for teachers to pay more attention to the characteristics of students to make it easier to understand the material. It is also inseparable from the fact that the equipment contained in the school is complete, but it is still rarely touched by both teachers and students.

Learning in the laboratory which is supported by the available teaching materials is one way that can be done to improve students' skills and outcomes of learning. The existence of material that is difficult to understand and difficult to understand can be felt more easily understood by students with laboratory activities using teaching materials in the form of special worksheets for practicum. The percentage of ease of use of worksheets in understanding physics according to students is 78.3%. The practicum worksheets that are used should be worksheets designed by looking at the curriculum and the character of students in understanding physics material. One of them is the scientific literacy integrated student worksheet for practical KIT.

With the results of the observations, questionnaire sheets and interviews above, it shows that there are problems faced in the implementation of learning. of course this is not something to be expected. One solution to the problems described above can be overcome by having an integrated scientific literacy worksheet for the use of practical KIT. These the practicum KIT will be used in learning and the teaching materials used are also available in schools. Fun learning will certainly make students' understanding of concepts and material become absorbed and not easily forgotten. This is expected to be able to improve students' skills and outcomes of learning.

One of the materials in physics that uses the practical KIT is unidirectional electricity. There are various kinds of physics practical kits available with different materials, including: mechanics kits, optics kits, electricity and magnetism kits, heat and hydrostatics kits, and general physical tools [5]. Where the practical KIT used for this student worksheet is the Electric and Magnetic KIT. In this KIT, it is used to conduct experiments to strengthen students' understanding of one of the basic competencies 4.1 when they are in class XII. The basic competencies 4.1 which contains presenting the results of experiments on the working principle of a direct electric circuit (DC). The experiment that will be conducted will be taken with three titles of direct electrical experiments, namely measuring current and voltage in a closed circuit and planning and conducting series resistor experiments and conducting parallel resistor experiments.

Based on this background, researchers are interested in developing Physics worksheets that are integrated with scientific literacy. The use of this student worksheet is also only intended for the use of practicum KITs in the laboratory. In this worksheet, the material contained is material about direct electricity. Therefore, the title of this research is "Development of Integrated Scientific Literacy Worksheet for the Use of Physics Practicum KIT on Unidirectional Electrical Materials.

II. METHOD

The type of research used in this research is research and development (R & D). Research and development methods or R&D methods are research methods used to produce certain products, and test the effectiveness of these products[15]. The ultimate goal of using this research method is to develop new products or improve existing products. Meanwhile, the development model used is the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. By using this model, there are five stages to go through, namely analysis, design or planning, development or production, implementation and evaluation. These stages must be passed to develop products in the form of worksheets that are integrated with scientific literacy for the use of physics practicum KIT on unidirectional electricity. The ADDIE model schematic can be seen in the following figure:

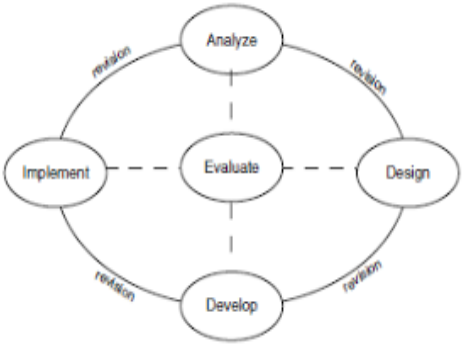

Fig 1. ADDIE Model Schematic

In figure 1, we can see the procedure of this research and developmnet from branch,2009 [6]. The first stage in this research procedure is the analysis stage. The analysis in this study includes needs analysis, curriculum analysis, and analysis of student characteristics. At the analysis stage, the level of need and usability of the developed student worksheet will be seen which is adjusted to the curriculum and student characteristics. Next is the design stage, which is the stage in designing the developed product, starting from the instrument, structure to all components that must be in the developed student worksheet. In the third stage, namely the development stage, which in this stage consists of three tests that will be conducted. The three tests are validation tests by experts, test of practicality by teachers and students, and the third is an effectiveness test conducted with a limited trial for the use of student worksheet that has been developed. In the next stage, namely implementation, at this stage the student worksheet is used with a wider range after the student worksheet is declared feasible to be used with valid, practical, and effective categories. As for the fifth stage is evaluation. This fifth stage can be done every time one stage is completed. So that the evaluation stage must exist at every stage of the research.

The data collection instrument in this study consisted of three parts, namely: test of validity instruments, test of practicality instruments, and effectiveness instruments for using scientific literacy integrated worksheets for the use of physics practicum KIT. The instrument used to determine the validity of the scientific literacy integrated worksheet is the expert validation sheet. The components assessed in the student worksheet consist of a content feasibility component, a linguistic component, a presentation component, and a graphic component [7]. The statistical test conducted is descriptive analysis, which is depicted through graphs. The weighting is based on the Likert scale.

There are two test of practicality sheets used, namely: test of practicality sheets by physics teachers and test of practicality sheets according to students. The test of practicality sheet according to the teacher is used to find out the opinions and assessments of high school physics teachers on the student worksheet developed, as well as for students' practicality sheets. In the test of practicality sheets there are several indicators with several criteria in it. The indicator consists of four components, namely indicators of ease of use, indicators of attractiveness or attractiveness of presentations, indicators of clarity and indicators of benefits[8]. Practicality refers to the use of the product, the product will be declared practical if the product can be applied in the field and the minimum level of product implementation is in the good category.

The effectiveness sheet is used to collect data on the effectiveness of the implementation of the process of learning using scientific literacy integrated worksheets. The effectiveness test was conducted by giving a limited trial to 12 students of class XII with 4 people in the high category, 4 people in the medium category, and 4 people in the low category. The data to determine the effectiveness of the student worksheet is determined by the knowledge assessment instrument to obtain student outcomes of learning. Student outcomes of learning in the aspect of knowledge are determined by pretest and posttest. Pretest is given to students before being given treatment. Posttest is given to students after receiving treatment, namely the use of the Integrated Scientific Literacy Worksheet for the use of practical KIT. The pretest and posttest were given in the form of multiple choice questions with a total of 15 items.

The significance of differences in students' pre-test and post-test scores was tested using statistics using the formulation of the t test. The comparison test of the two averages in this study used a two-party independent t-test with the condition that student learning outcomes scores were normally distributed and the data came from samples that varied homogeneously. To determine that student learning outcomes are normally distributed, a normality test is carried out using the Liliefors test for both data. Meanwhile, in determining homogeneous varied samples, homogeneity tests were carried out using the F test on both data sample[9].

III. RESULTS AND DISCUSSION

Results

The results of this study have three main results in general. The three research results include: The validity of the student worksheet which was validated by several physics lecturers at FMIPA UNP, the practicality of using the student worksheet integrated scientific literacy for the use of practical KIT by physics teachers and class XII students and the third is a limited trial conducted to see the effectiveness of the integrated student worksheet. scientific literacy. In the results of each test conducted, if there are still improvements to improve the student worksheet, an evaluation stage will be conducted at each stage. This aims to make the worksheets that are made more perfect in structure and content.

The first result in this study is the student worksheet validation result which was validated by three experts. Validation is done by using the student worksheet assessment sheet which has several components. The components contained in the student worksheet assessment are the content feasibility component, the linguistic component, the presentation component, and the graphic component. The average value of student worksheet validity with these four components can be seen in Figure 2 below.

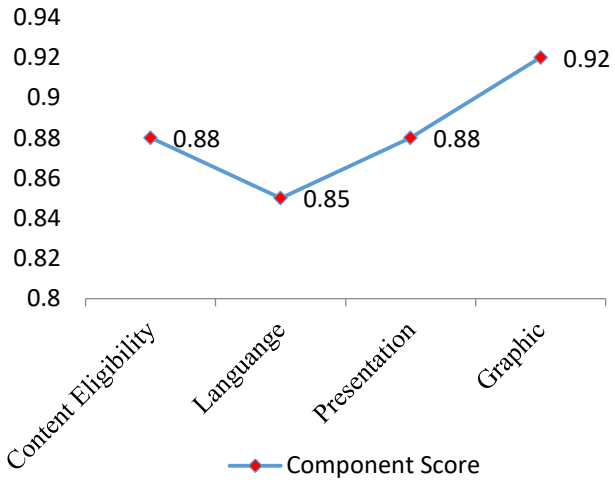

Fig 2. Validity Value of Integrated Scientific Literacy student worksheet

In the picture above, it can be seen the value of each component in the assessment of the validity of the scientific literacy integrated student worksheet for the use of the physics practicum KIT on unidirectional electrical material in the range of 0.85-0.92. Based on the four components, the average value of the validity of the integrated scientific literacy worksheets is 0.88. This the scientific literacy integrated worksheet for the use of KIT practical physics on unidirectional electricity is very valid.

The scientific literacy integrated worksheet was revised based on inputs and suggestions from three validators. Suggestions were given such as paying attention to the structure of the student worksheet and integrating scientific literacy components into the student worksheet structure, drawings of KIT tools that were adapted to the original KIT, drawings of electrical circuits that were more real, highlighting product advantages and writing correct sentences. All of these suggestions have been corrected in the scientific literacy integrated worksheet.

The student worksheet integrated scientific literacy in its development is adjusted to the structure of the development of teaching materials in the form of student worksheet at the Ministry of National Education 2008. The student worksheet structure includes titles, competencies to be achieved, study instructions, supporting information, tasks and work steps, and assessments. Worksheets are sheets that contain assignments which are usually in the form of instructions or steps to complete assignments that must be done by students [10]. And at the beginning of the worksheet there is a cover, foreword and table of contents. The cover made is adjusted to the material that will be studied by students. The worksheet cover can be seen in Figure 2.

Fig 2. Worksheet Cover

The worksheet developed in this study is devoted to the implementation of experimental activities in the laboratory. Experimental activities are conducted using a physics practicum KIT which is a component of a simple designed practicum tool so that students can do practical work[11]. The worksheet developed is devoted to unidirectional electricity in the electric and magnetic KIT experiment. Furthermore, student worksheet was developed with the integration of scientific literacy components. The scientific literacy component consists of three components, namely the scientific context, the scientific process and the scientific concept.

The second result is the results of the test of practicality of using scientific literacy integrated worksheets which are categorized into two, namely the practicality of using scientifically integrated worksheets according to teachers and according to students. Practicality according to the teacher is obtained from an analysis of the test of practicality instrument according to the teacher which includes the components of ease of use, attractiveness, clarity and benefits. The analysis of the four components of the practicality sheet is shown in the following figure:

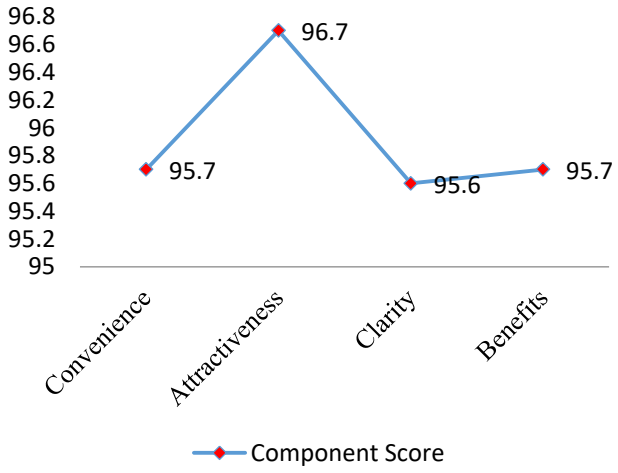

Fig 3. Practical Value of Student Worksheets According to Teachers

In Figure 3 above, it is found that the practical value of student worksheet Based on the assessment elements on the instrument sheet, the teacher's opinion. According to the teacher, the student worksheet practicality assessment's overall average score is 95.9%. So according to the results of the assessment analysis by the teacher, the integrated scientific literacy worksheet is very practical to use in learning physics.

The results of the test of practicality according to students were analyzed from the assessment questionnaire sheet given to students. In practicality instruments, according to students, they also have the same components as the teacher's practical instruments. Where each component has several indicators. This test of practicality was conducted on 39 students. The practical value of each component is shown in the following figure:

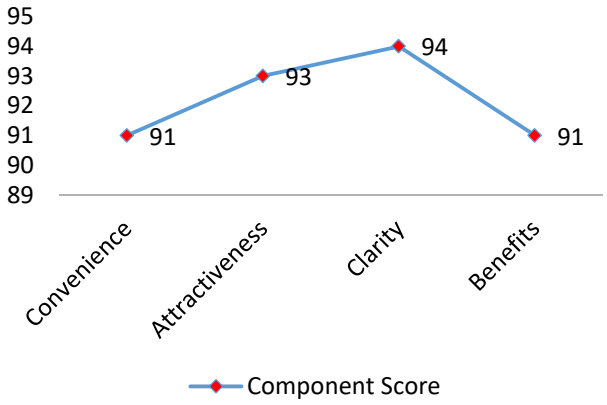

Fig 4. The Practicality Value of Student Worksheets According to Students

In Figure 4, the results of the analysis of the practical value of student worksheet according to students in assessing the use of student worksheet in learning activities are obtained. Based on the analysis results in Figure 4 above, it can be seen that the average of all components is 92.25%. So that the practical assessment of the use of scientific literacy integrated worksheets for the use of practical KIT according to students is very practical to use.

The third study result is the limited trial result to test the effectiveness of the integrated scientific literacy worksheets. The implementation of the limited trial aims to see the effectiveness of the use of scientific literacy integrated worksheets in the process of learning. We can see this from the aspect in outcomes of learning obtained by students by comparing the value of student knowledge between the pretest and posttest scores. The student worksheet developed is expected to be able to improve students' skills as scientific literacy has been integrated. Scientific literacy is defined as the capacity to use scientific knowledge[12].

Table 1. Results of Statistical Data Analysis of Daily Test Values

No	Statistical Parameters	Pretest Score	Posttest Score
1	Average	68.3	80.7
2	Standard Deviation	9.53	6.78
3	variance	90.79	46.06
4	Lowest Value	53.00	73
5	The highest score	87.00	87
6	median	67,00	80.00
7	Mode	67,00	87.00
8	Value range	34.00	20.00

Based on the statistical data results in the table above, it can be seen that there are differences in the value of student outcomes of learning before and after the use of worksheets. The posttest value has a higher average value than the pretest value. The average difference between the two classes has a significant difference of 12.4. This indicates a significant difference for the sample.

The results of the statistical data that have been described need to be analyzed again to see if there is an effect on the use of integrated scientific literacy worksheets for the two sample classes. The effect can be known by doing a comparison test of two averages. The comparison test of two averages can be conducted after the normality test and homogeneity test on student outcomes of learning in daily tests. The stages of normality test, homogeneity test and comparison of two averages can be explained as follows:

a) Normality test

Normality test is performed to see whether the data from the sample is normally distributed data or not. The normality test can be done using the Liliefors test. From the test, the values of L0 and Lt were obtained for both samples with a significance level of = 0.05. Where n1 = n2 = 12 can be seen in the following table:

Table 2. Normality Test Results of Learning Outcomes in Pretest and Posttest

Score	n	α	L_0	L_t	Information
Pretest	12	0.05	0.145	0.202	Normal
Posttest	12	0.05	0.175	0.202	Normal

Based on the normality test results that has been conducted using the Liliefors test, it can be explained that the pretest and posttest values have data that are normally distributed. It is indicated by L0 < Lt for both samples. The posttest value has an L0 of 0.175, while the pretest value has an L0 of 0.145. The Lt used in both is 0.202.

b) Homogeneity Test

After the data obtained are normally distributed, then proceed with the homogeneity test. The homogeneity test aims to determine whether the two data from the sample class can be said to be homogeneous or not. The homogeneity test was conducted by the F test with the quotient of the largest and smallest variance values, where a comparison of the Fh value and the Ft value would be conducted. The calculation results for the two sample classes are as follows:

Table 3. Results of Homogeneity of Student Learning Outcomes at Pretest and Posttest

Score	n	S^2	F_h	F_t	Information
Pretest	12	90.79	2.81	2.85	Homogeneous
Posttest	12	46.06			

Based on the table above, it can be seen that the Ft value for the pretest and posttest data with dk1 = dk2 = 12 with a significance level of 0.05 is 2.81 while the Fh obtained is 2.85. So, it can be said that Fh < Ft which means that the two samples have homogeneous variance.

c) Hypothesis testing

After the normality test and homogeneity test for both samples, it was found that the two data were normally distributed and had homogeneous variance. Furthermore, hypothesis testing is conducted, namely by using the t test with the aim of knowing whether the hypothesis is accepted or rejected. The hypothesis test used is a comparison test of two averages. The results of the calculation of the hypothesis test can be seen in the following table:

Table 4. Comparison Test Results of Two Averages

Score	n	X	S^2	S	t_h	t_t
Pretest	12	68.33	90.79	68.42	2,074	2,179
Posttest	12	80.67	46.06			

Based on the calculation data above, it can be explained that the tcount value obtained is 2,074 which is in the Ho rejection area. So that H1 means that it is accepted at the 0.05 level of significance. These results indicate that there is a significant difference in student outcomes of learning in terms of knowledge before students use student worksheet and after students use student worksheet.

Discussion

In the discussion, the results obtained in conducting the research, obstacles, limitations encountered during the research, solutions, alternatives and inputs to overcome the problems encountered during the research are explained. The results of the study include the results of validation by experts, the results of test of practicality s and effectiveness tests on the developed worksheets, namely scientific literacy integrated worksheets for the use of physics practicum KIT on unidirectional electricity.

The results of the first research are at the development stage. After the design is completed, it is continued with the validation of the student worksheet product which is validated by 3 validators who are physics lecturers at the Faculty of Mathematics and Natural Sciences, UNP. With the assessment contained in the validation instrument, which includes the feasibility of content, presentation of content, language, and graphics[13]] The results achieved in this stage are scientific literacy integrated worksheets for the use of physics practicum KIT on unidirectional electricity material which has a very good level of validity, which is a very valid level. Product design validation is an activity process to assess whether it is appropriate and whether the product design is more effective than the old one or not[14]. The developed scientific literacy integrated worksheets already have complete materials and are in accordance with the core competencies and basic competencies of class XII high school physics subjects. The illustrations used in the student worksheet can provoke students' interest in reading and make it easier for students to understand the material. The language used in the student worksheet uses effective and standard sentences to make it easier for students to understand the material and the experiments to be conducted. The worksheets presented are also equipped with real pictures of tools and materials as well as their series and interesting color combinations which also make it easier for students to understand the material and experiments that will be conducted. The results of the validation and suggestions from the validator for the developed student worksheet become a reference in product revision.

The results of the next development stage are at the test of practicality stage for scientific literacy integrated worksheets with two categories of testing, namely test of practicality s by students and test of practicality s by teachers. The test of practicality by the teacher was conducted by two physics subject teachers who teach in class

XII of Senior High School 3 Padang. Furthermore, the test of practicality by students was conducted to all students of class XII MIPA at Senior High School in Padang, totaling 39 people. The instrument used is an instrument containing several indicators, namely ease of use, clarity, attractiveness and benefits. The data from the test of practicality questionnaire analysis was adjusted based on the practicality category[15]. Assessments given by teachers and students are useful for knowing the responses and opinions of teachers and students on the integrated scientific literacy worksheets. The results of the assessment for the four components in the test of practicality sheet by teachers and students obtained very practical results. So that the developed worksheets can be used in the process of learning activities in the laboratory. This is in accordance with the statement In measuring practicality by looking at whether the teacher considers that the material is easy and can be used by both teachers and students[16] .

The results of further research are in the development stage, at this stage conducted by carrying out limited trials on students of class XII 3 mathematics and natural science by taking 12 students. This aims to see the effectiveness of the developed scientific literacy integrated worksheets. The effectiveness of the student worksheet conducted was seen from the results of the analysis of student scores before using the student worksheet and after using the student worksheet by using a comparison test of two averages. Based on the data analysis results, it is known that the use of scientific literacy integrated worksheets for the use of practical KIT is effective for improving student outcomes of learning and scientific literacy skills. This can be seen from the difference after using the scientifically integrated student worksheet with before using the scientific literacy integrated student worksheet.

Based on the research results described above, which generally consist of the validity, practicality and effectiveness of the worksheet, the product developed can be used in the physics process of learning on unidirectional electricity. Scientific literacy integrated worksheets can be a source of learning in carrying out experimental activities in the laboratory for unidirectional electricity. This is in line with the research of Asrizal, et al. (2021), Which States that use the science learning material integrates new literasy in learning activities to become more practical and make the student can get the memorable experiences, motivation and and make interesting of the learning material[17]. This is in accordance with the results of the study which showed that the scientific literacy integrated worksheets for the use of the physics practicum KIT showed that the worksheets had been tested to be valid, practical, and effective for use in the class XII physics process of learning.

IV. CONCLUSION

Based on the research that has been done and the results of data analysis, the conclusions of the study are as follows: First, the value of the validity of the integrated scientific literacy worksheet for the use of physics practicum KIT on unidirectional electrical material is 0.88 which is in the very valid category based on aspects of content feasibility, linguistics, presentation and graphics. Second, the practical value of using scientific literacy integrated worksheets for the use of practical KIT on unidirectional electricity material for test of practicality s by students is 92.25 and by teachers is 95.9 which is in the very practical category based on aspects of ease of use, clarity, attractiveness. and benefits. Third, the use of integrated scientific literacy worsheets for the use of the practicum KIT on unidirectional electricity is effective for improving student learning outcomes.

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