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DEVELOPMENT PHYSICS WORKSHEET INTEGRATED SCIENTIFIC LITERACY USING A CONSTRUCTIVE APPROACH ON PARABOLIC MOTION MATERIALS

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ABSTRACT

The 2013 curriculum requires teachers to be skilled in the process of learning which makes students more active in learning activities. The solution to overcome this problem is to develop physics worksheets with scientific literacy using a constructivist approach. This study aims to produce worksheets filled with scientific literacy using a constructivist approach to parabolic motion for class X high school that is valid and practical. This research is a Research and Development research type using the Plomp development model. The development process in this study is limited to one-to-one practicality which ada at the development stage which functions to see the practicality of the product being made. Validation was carried out by 3 physics lecturers from UNP Faculty of Mathematics and Natural Sciences and practicality was carried out by teachers and students senior high school. The data collection instruments in this study are validity and practicality sheets. The data analysis technique for product validation uses the Aiken's V index. Based on data analysis from the research that has been done, it can be determined the results of the study, namely the validity results of the worksheet with score in average of 0.92 in the category in medium and practicality with an average of 89.7%. . So, it can be concluded that physics worksheets with scientific literacy using a constructivist approach to parabolic motion are appropriate for use by teachers and students in the process of learning..

Keywords : Worksheet; Scientific Literacy; Constructivist Approach; Parabolic Motion..

I. INTRODUCTION

In the 21st century, comparative, innovative, creative, competitive and collaborative human resources are needed in accordance with science and technology. Where in the 21st century requires every human being to have competencies that can improve and master technological sophistication, easily absorb new information and be able to adapt to keep up with the times. In responding to the hope 21st century, the design by government a solution to increase the education quality in Indonesia by evaluating and developing curriculum.

In Indonesia, the curriculum is always changing from time to time. The government always tries to adapt the education curriculum to the challenges global era. Currently, Indonesia uses a curriculum called Curriculum 2013. The curriculum is structured with an emphasis and reinforcement on attitudes, balanced knowledge and skills. Policy preparation is intended to correct various deficiencies that exist in previous curriculum. Curriculum development being conducted by the current government was development of the 2013 curriculum.. In the revised 2013 curriculum, the government integrated four things in learning, known as; 1) Strengthening Character Education , the strengthened character consists of five characters, known as: religious, nationalist, independence, mutual cooperation and integrity, 2) 4C skills (Creative, Critical Thinking, Communicative, and Collaborative), 3) literacy movement which consists of the ability to access, understand,

The current conditions in the field were not in accordance with the desired expectations. According on the results of questionnaires and observations made of students and teachers at school, problems were found, namely literacy activities had not been carried out properly, the desire of students to work on assignments independently was low, the use of worksheets in physics learning was not optimal, and the ability of students to understanding the kinematics of motion is still relatively low. Based on the problems that occur in schools, one of the solutions proposed by researchers to address these problems is to develop teaching materials in the form of Physics Worksheets with Scientific Literacy Using a Constructivist Approach to Parabolic Motion.

To achieve the learning demands contained in the revised 2013 curriculum, learning resources are needed that can make help for process of learning such as teaching materials. Materials of teaching are used as a support for learning resources used by teachers in learning activities in the class. Materials are useful for building student understanding for students can re-understand the material that has been given [2]. In addition, teaching materials are a very important factor which consists of various types to support the learning implementation for teachers and students [3]. Teaching materials can be said to be good or appropriate to be used to support the learning process as well as possible including instructions for learning, skill to be achieved, content of lesson, information for support, exercises, instruction for work, evaluations and responses to these evaluations [4]. One of the material of teaching that can be used in learning physics is worksheet [5].

Worksheet is a student guide that is used to carry out investigations or solve a problem [6]. Worksheet is also defined as a student guide that is used to carry out investigations or solve problems [7]. Worksheet is useful for training students' cognitive and psychomotor abilities which are packaged in a practical way. Therefore, the use of worksheet is expected to be able to contain scientific literacy skills in learning physics.

Scientific literacy is defined as literacy or the ability to read and write. Scientific literacy demands the ability to use scientific investigation processes such as identifying evidence needed to answer scientific questions, recognizing problems that can be solved through scientific investigation [8]. Scientific literacy has three indicators, namely scientific context, scientific process and scientific concept. Through scientific literacy can increase understanding of concepts and application of material in everyday life [9]. Based on this statement, scientific literacy is needed in the current learning process. To support students' scientific literacy, it is necessary to use an approach that is suitable for students, one of which is a constructivist approach. This is due to the learning of students themselves who must find, understand, transform or even revise existing information or problems to obtain problem solving (solutions) [10]. Through physics worksheets filled with scientific literacy using a constructivist approach, it is hoped that this will work.

Based on the background explanation above, this research purposes to reveal the validity of the scientific literacy integrated worksheet for the use of the physics practicum KIT on static electricity material that has been developed. The research result are consist of physics worksheets with scientific literacy using a constructivist approach that can be application by teachers in learning and students for learning, especially to increase students' scientific literacy in parabolic motion.

II. METHODS

The research conducted includes research and development (Research and Development). [11] explained that research and development procedures are research methods used to create specific products and test their efficacy. The development model for this research uses the Plomp model which goes through the preliminary research and prototype stages to create a product in the shape of a physics worksheet with scientific literacy using a constructivist approach to parabolic motion that is valid and practical.

This research begins with the first stage, namely the analysis stage. At this stage, activities include 1) needs analysis carried out on teachers and students through questionnaires and observations with the aim of getting what is needed in physics learning at school, 2) analysis of learning resources which aims to find out which learning resources to develop, and 3) Compile a worksheet map aimed at making an initial product design. The second process was the prototype stage. At this stage, the design of physics worksheets with scientific literacy was carried out using a constructivist approach to parabolic motion which was developed and revised until it was continued at the next stage, namely expert review. At this stage an assessment of the products developed includes; 1) self-assessment conducted by researchers with indicators of analysis and design, 2) validity assessment carried out by experts on validity assessment indicators including content feasibility, language, presentation, and graphics. 3) practicality assessment obtained from students on validity assessment indicators include ease of use, attractiveness, and efficiency.

The technique for data analysis used is through quantitative data analysis, namely determining the validity of the product developed through a questionnaire using a Likert scale [12]. The validity test data results can be determined using Aiken's validity index in Equation 1.

$$\frac{\sum s}{n\,(c-1)}$$

$$S = r - l0 \qquad (2)$$

Information:
V= respondent's agreement index regarding item validity
s = the score set by the respondent minus the lowest score (*s*= r – I0)
I_0= lowest score in the scoring category (in this case = 1)
c =the categories number that respondents can choose from
r =the score of the respondent's choice category
n =number of respondents
Source: Aiken in [13].

Obtained data from the respondent's agreement index is then interpreted using the categories in Table 1.

Table 1. Validity Assessment Criteria

Intervals	Category
≤ 0.4	Low
0.4 < V ≤ 0.8	Medium
0.8 < V	High

(Source: [14])

After the rater agreement index is obtained, the category of the index value is decided.

II. RESULTS AND DISCUSSION

According on the research that has been done, a product has been produced in the form of Physics worksheets filled with scientific literacy use a constructivist approach to parabolic motion for class X High School. The developed worksheet consists of sections which include titles, study guides, competencies to be achieved, information for support, tasks and work steps, assessments. The appearance of the developed worksheet can be seen in Figure 2.

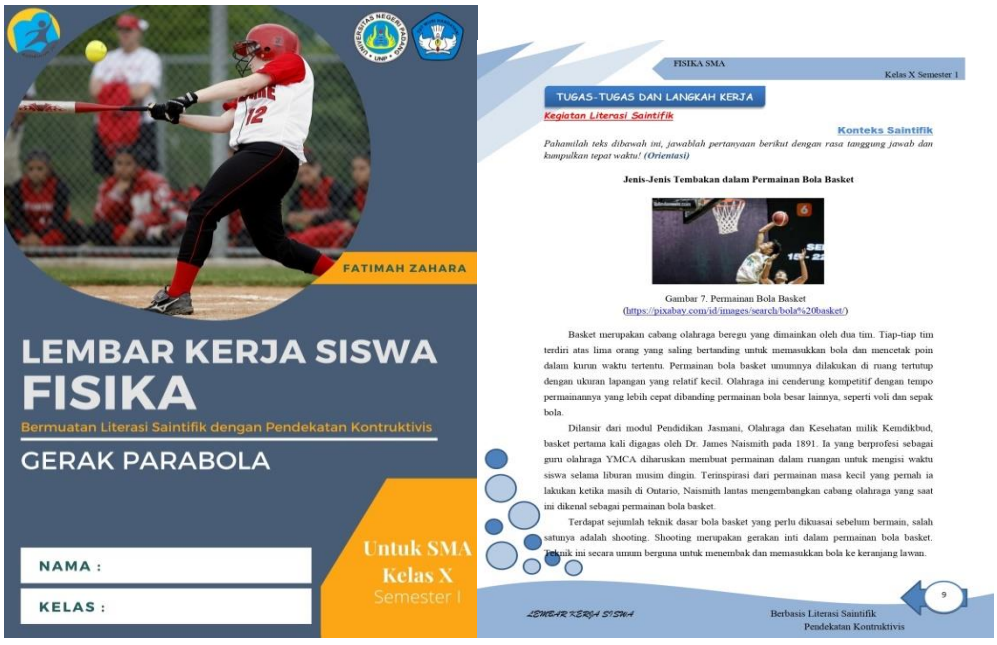

Fig.2. Display of physics worksheets filled with scientific literacy using a constructivist approach to parabolic motion

The results of the validity analysis have been conducted on consisting of 4 components of the validity assessment which include the components of content feasibility, linguistic feasibility, presentation feasibility and graphic feasibility. The results of the first validity test are on component content eligibility. This component aims to determine whether the content contained in the worksheet is in accordance with the demands of the subject. Component from the feasibility of the content consists of 6 assessment indicators and each indicator contains question items. The assessment indicators of the content feasibility component consist of; 1) suitability of core competency and basic competencies , 2) suitability with the development of students 3) conformity with the needs material of teaching, 4) the truth of the substance of the subject matter, 5) benefits to add insight, 6) conformity with values of moral and values of social. The validity assessment results of the content feasibility component shown in Figure 3.

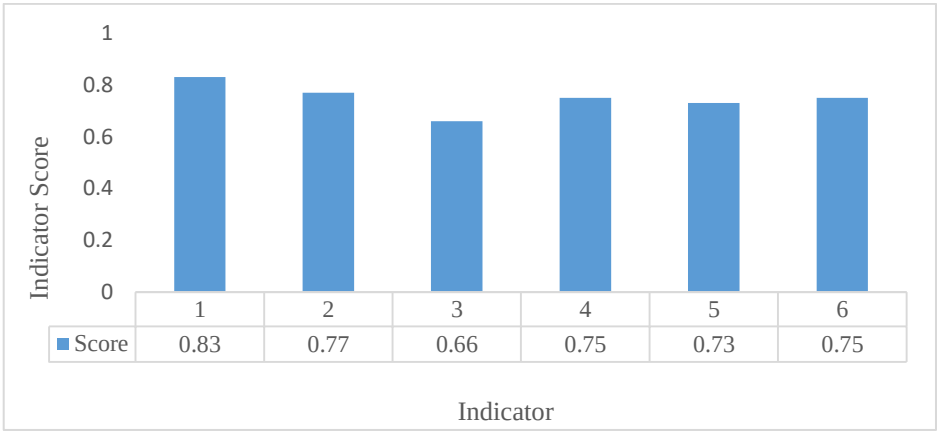

Fig.3. Validity Score on Content Feasibility Components

Data from Figure 3 shown that the validation score on the content feasibility indicator ranges from 0.66 to 0.83. Of the 6 assessment items, five assessment items have a moderate validity category, which ranges from 0.66 to 0.77 and one assessment item has a high validity category, namely 0.83. The average validation score on the content feasibility indicator is 0.74 with the category of moderate validity. Explaining that worksheet is a guide for students to carry out investigative or problem-solving activities. Worksheet includes tasks that students must do in order to meet outcome of learning indicators. Therefore,

The results of the second validity test are on the linguistic component. This component aims to determine whether the language used in the integrated scientific literacy worksheet for the use of the physics practicum KIT on parabolic motion can be easily read and understood by users. The language feasibility component consists of 4 assessment indicators. The assessment indicators of the language feasibility component consist of; 1) language, 2) information clarity, 3) compliance with good and correct Indonesian language rules, 4) effective and efficient use of language, 5) the language used in worksheets is easy for students to understand. The validity assessment results of the language feasibility component shown in Figure 4.

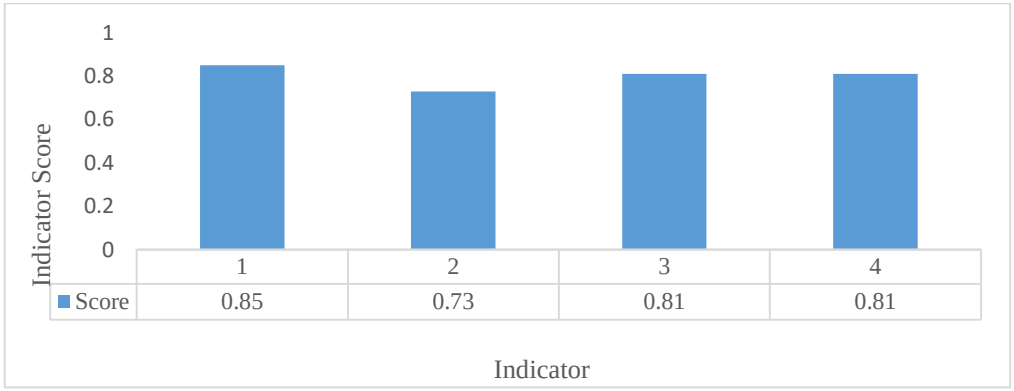

Fig.4. Validity Score on the Language Feasibility Component

Data from Figure 4 shown that the validation scores on the language feasibility indicators range from 0.73 to 0.85. Of the 4 assessment items, one assessment item has a moderate validity category with a score of 0.73 and three assessment items have a high validity category with a range of 0.81 to 0.85. The average validation score on the language feasibility indicator is 0.8 with the category of moderate validity. The research results are in accordance with the opinion of belawati [16] explaining that the use of language in developing teaching materials using language includes choosing words, using effective sentences and composing colorful paragraphs. [16] stated that using language that is easy and appropriate to the level of development of students will make it easier for students to understand material of learning. Therefore, it can be stated that the physics worksheet containing scientific literacy using a constructivist approach to the developed parabolic motion has a moderate validity category in terms of the language feasibility component.

The results of the third validity test are on the presentation feasibility component. This component aims to determine whether the worksheet has presented the information needed in learning. The presentation feasibility component consists of 5 assessment indicators. The assessment indicators of the presentation feasibility component consist of; 1) clarity of goals to be achieved, 2) order of presentation, 3) provision of attractive motivation, 4) interaction, and 5) completeness of information. The results of the validity assessment of the presentation feasibility component shown in Figure 5.

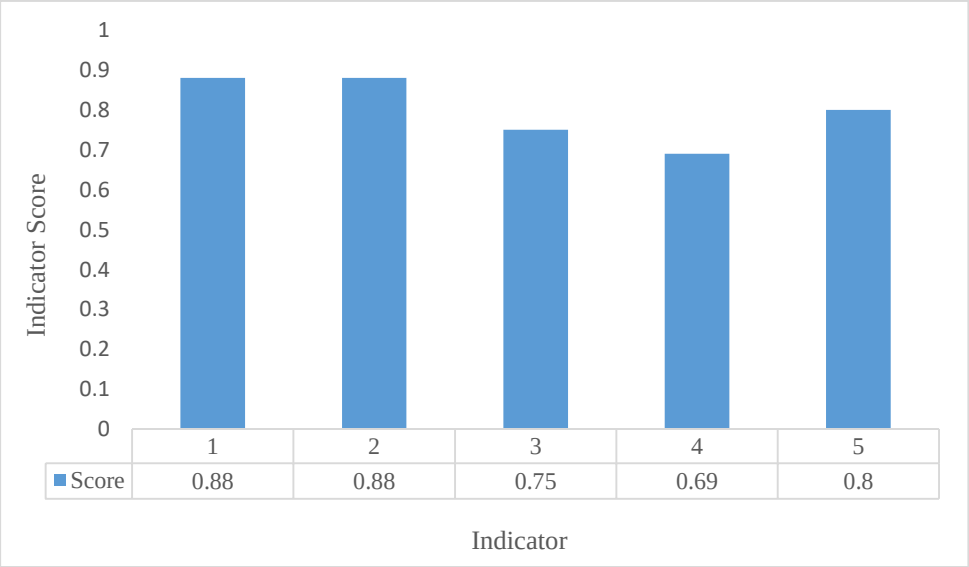

Fig.5. Validity Score on the Feasibility of Presentation Component

Data from Figure 5 shown that the validation score on the presentation feasibility indicator ranges from 0.69 to 0.88. Of the 5 assessment items, there are two assessment items that have a moderate validity category, namely with a score of 0.69 to 0.75 and three assessment items that have a high validity category with a range of 0.80 to 0.88. The average validation score on the presentation feasibility indicator is 0.8 with the category of moderate validity. The research results are in accordance with the guidelines in developing [17]. Therefore, it can be stated that the physics worksheet containing scientific literacy using a constructivist approach to the developed parabolic motion has a moderate validity category in terms of the presentation feasibility component.

The results of the fourth validity test are on the graphical feasibility component. This component aims to determine whether the display on the worksheet can be enjoyed by users. The graphical feasibility component consists of 4 assessment indicators. The assessment indicators for the graphical feasibility component consist of; 1) use of fonts (type and size), 2) layout and layout, 3) illustrations, pictures, and photos, 4) display design. The results of the validity assessment of the graphical feasibility component shown Figure 6.

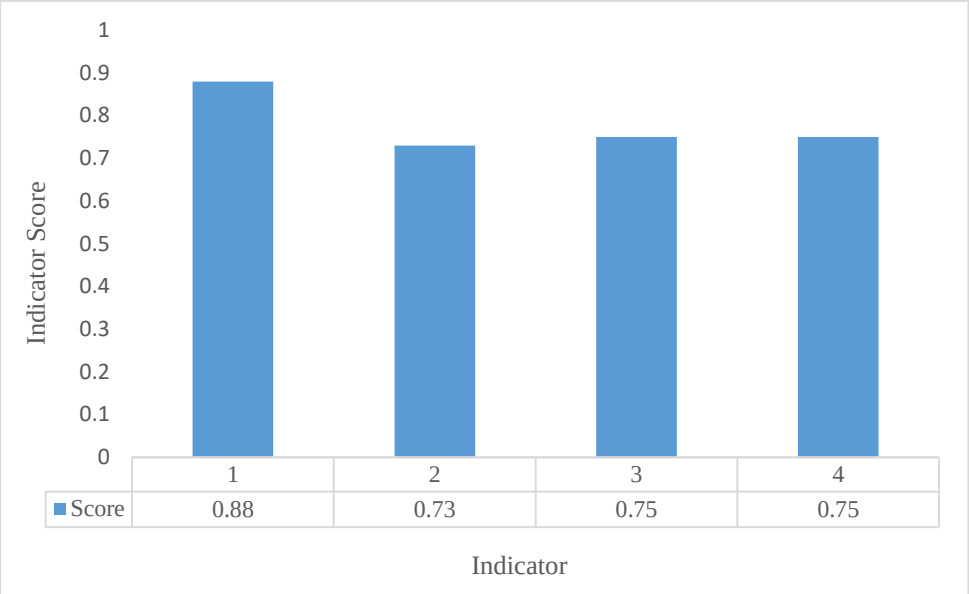

Fig.6. Validity Score on Graphical Feasibility Components

Data from Figure 6 shown that the validation score on the presentation feasibility indicator ranges from 0.73 to 0.88. Of the 4 assessment items, there are three assessment items that have a moderate validity category, namely with a score of 0.73 to 0.75 and one assessment item that has a high validity category with a range of 0.88. The average validation score on the presentation feasibility indicator is 0.78 with the category of moderate validity. Where in making worksheet the combination of colors and images used and interesting and colorful pictures will attract more students' interest in reading so that students will be happier in the learning process and learning will not be boring [18]

According on the validity assessment results that has been conducted on all aspects of the validity assessment can be seen in Figure 7.

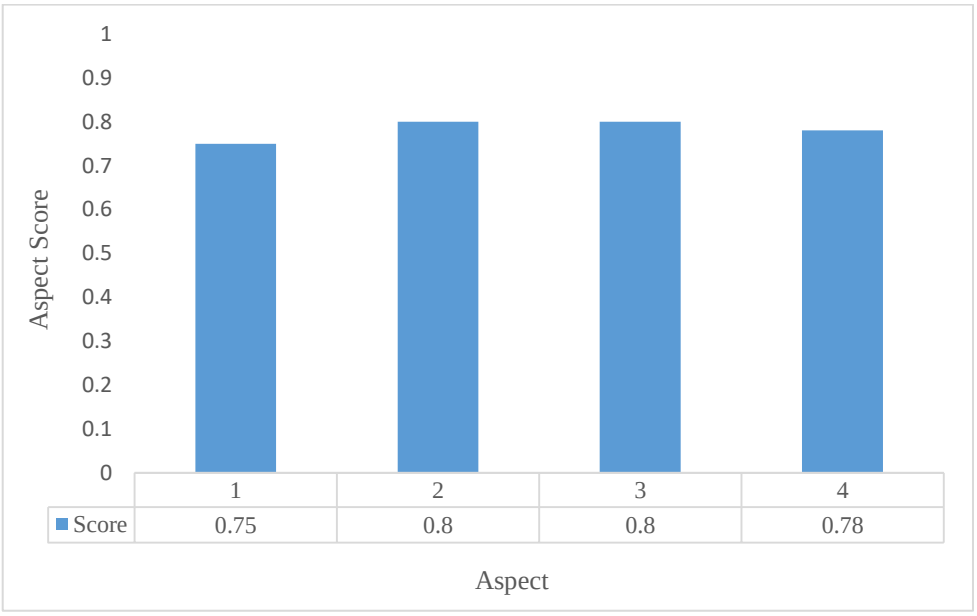

Fig.7. Results of Validation of Physics Worksheets Loaded with Scientific Literacy Using a Constructivist Approach to Parabolic Motion

According on the results of the validity assessment that has been conducted, for the results of the validity assessment of worksheets and scientific literacy using a constructivist approach to parabola motion, the average score for the validity of student worksheets is obtained with a validity score of 0.78 in the medium validity category. Therefore, we got conclussion that Physics worksheets filled with scientific literacy use a constructivist

approach to parabolic motion developed in this study is very valid and appropriate for use by teachers in providing learning and for students to learn parabolic motion in order to increase scientific literacy.

After the product was declared valid, the further research results obtained were the one-to-one practicality assessments results conducted by teachers and students. The practicality research results conducted by the teacher shown in Figure 8.

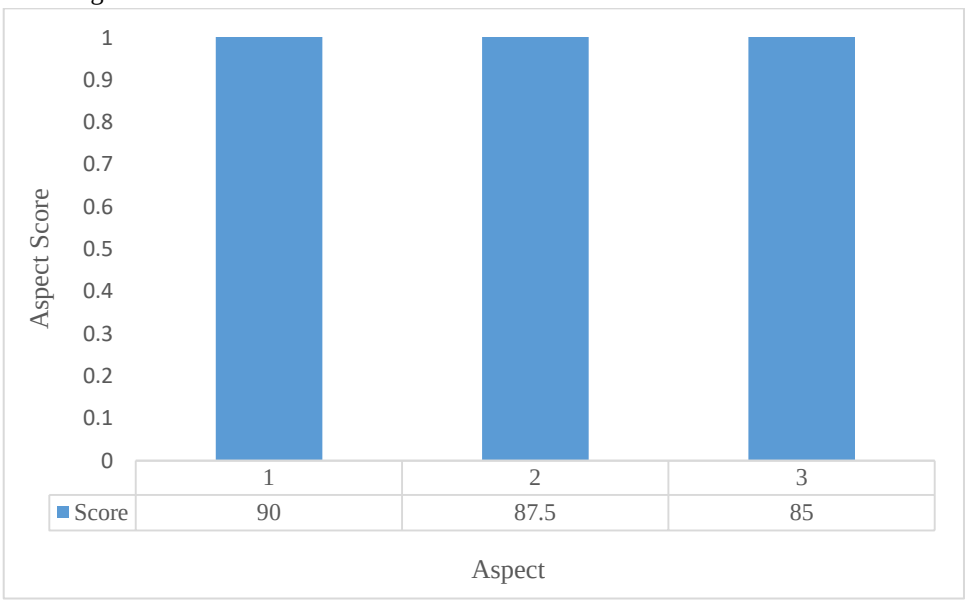

Fig.8. The results of the practicality assessment by the teacher

The worksheet practicality assessment results for teachers for each aspect of the assessment are obtained. The easy-to-understand aspect obtained a practicality score of 90% with very practical criteria, the attractiveness aspect obtained a practicality score of 87.5% with very practical criteria, and the efficiency aspect obtained a practicality score of 85% with very practical criteria.

Further practicality assessment results obtained from students can be seen in Figure 9.

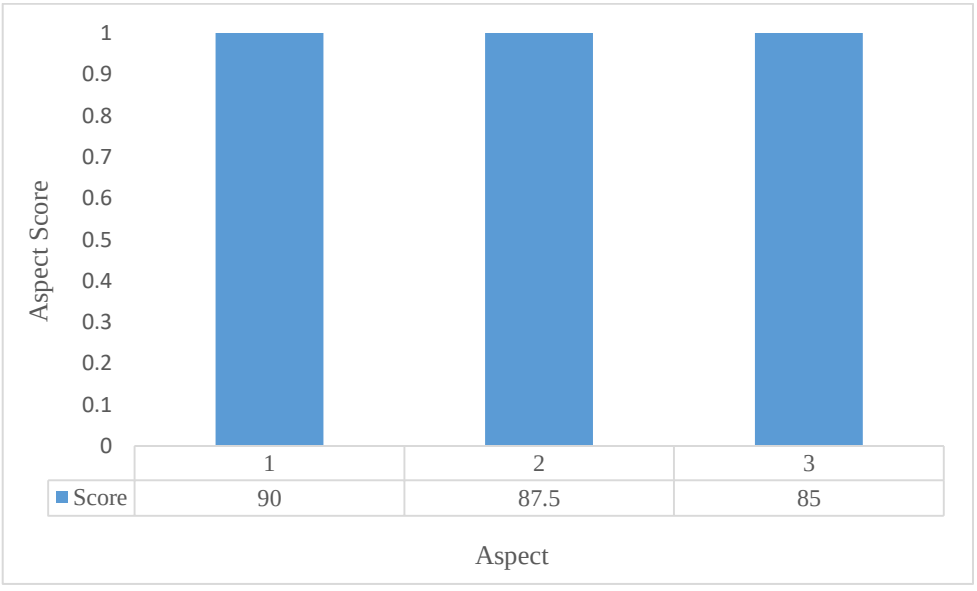

Fig.9. Practicality assessment results by students

Based on Figure 9 above shown the practicality assessment results for students for each aspect of the assessment are obtained. The easy-to-understand aspect obtained a practicality score of 93% with very practical

criteria, the attractiveness aspect obtained a practicality score of 91.25% with very practical criteria, and the efficiency aspect obtained a practicality score of 93% with very practical criteria.

Based on the results of the practicality assessment for the three aspects, it can be stated that the worksheet containing scientific literacy using a constructivist approach to parabolic motion has very practical practicality with an average score of 87.5% according to the teacher and 92.4% according to students. Research that is relevant to this research is that with the title The Effectiveness Of Science Literacy To Improve Science achievement. This study was aimed at determining the effectiveness of the use of science literacy teaching materials on improving science learning achievement of fourth grade elementary school students. The method used was research and development. The quasi-experimental with simple random sampling was used to select the sampling. In the implementation of the test, two sample groups were used, namely the experimental group and the control group. The testing phase of this product was carried out in two elementary schools in Gunungpati sub-district with a sample of 56 students of grade IV elementary school in the 2017/2018 school year. They consisted of 30 students of elementary school A and 26 students of elementary school B. The data were collected using tests. The results show that science-based science literacy teaching materials were effective in improving student learning achievement with the t-test calculation of 0.031. The results of the t test prove the difference between pretest and posttest values in the control and experimental groups. It can be concluded that the use of science teaching materials based on science literacy is effective to improve science learning achievement of fourth grade elementary school students. Worksheets that are made provide ease of use for students, make it easy for students to carry out learning activities, have attractiveness, and have benefits for students to be able to actively discuss and express ideas in learning. worksheet can provide immediate feedback, that is students can know the level of learning outcomes and generate strong motivation to try as hard as possible.

III. CONCLUSION

Based on the results of the research that has been conducted, the research results are obtained in consist of physics worksheets with scientific literacy using a constructivist approach to parabolic motion. Based on the assessment of the validity of the physics worksheet containing scientific literacy using a constructivist approach to parabolic motion, it can be concluded that the developed worksheet has a moderate validity category and has very practical practicality. Therefore, the developed worksheet can be used in the process of learning physics in schools, especially in increasing students' scientific literacy in parabolic motion.

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