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Design and Validity of Student Worksheet Integrated Scientific Literacy for The Use of Physics Practicum KIT

Hidayati[1*], Allin Wel Ningsi[1], Ananda Mahaputra Iskandar[1]

[1] Physics Department, Universitas Negeri Padang, Padang, Indonesia.

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Corresponding Author:
Hidayat
hidayati@fmipa.unp.ac.id

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Abstract: The 2013 curriculum contains 4 components, one of which is literacy skills. One of the important literacy skills in learning physics is scientific literacy. Physics learning is always closely related to practicum which requires practicum tools such as the physics practicum KIT. The reality found in the field is the KIT for physics practicum in schools is available but has not been utilized optimally by teachers and the worksheets used have not been integrated with scientific literacy. This study aims to determine the validity value of the student worksheet integrated scientific literacy for the use of physics practicum KIT. The type of research carried out was research and development on Sugiyono's book which consisted of 10 stages, but in this study it was only limited to the design revision stage. The object that is the focus of research is the student worksheets used in schools. The data analysis technique used in this research is descriptive statistics, namely validity analysis. Based on the research, it can be concluded that the validity score of the LKS integrated with scientific literacy for the use of KIT practicum was obtained from an analysis of content eligibility with a value of 0.87; language component with a value of 0.85; clarity component with a value of 0.87 and a graphic component with a value of 0.89. The average validity value of the integrated scientific literacy worksheet for the use of the physics practicum KIT is 0.87 which is classified as very valid.

Keywords: Practicum KIT; Student Worksheet; Scientific Literacy

Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results. Education is a form of conscious effort carried out by a person or group of people to create quality human beings. Education plays an important role in the development of a nation. Therefore, education is one of the focuses of the Indonesian government which must always be improved. One of the steps taken by the Indonesian government in improving the quality of education is through the education curriculum.

The curriculum used in education must be contemporary so that the education that takes place is in line with the times. One of the curricula used in Indonesia is the 2017 revision of the 2013 curriculum or commonly also called the 2017 revision of K-13. The 2017 revision of K-13 is a curriculum that has gone through various improvements from the previous curricula. The 2017 Revised K-13 opens great opportunities for students to exploit their learning potential. K-13 in the 2017 revision contains 4 components that students must master, namely strengthening character education (PPK), Higher Order Thinking Skills (HOTS) skills, 4C abilities (Critical Thinking, Creativity, Communication, and Collaboration), and literacy skills. The implementation of these components is summarized in three aspects that must be achieved in the curriculum, namely character, skills, and literacy (Asropah, 2017). The demands of K-13 Revision 2017 can be achieved one way by applying literacy in learning.

Literacy is a person's ability which includes reading, understanding, writing and solving problems based on scientific knowledge. Literacy activities are in line with the development of science so that the meaning of literacy will continue to grow. Literacy consists of eight categories, namely basic literacy, scientific literacy, economic literacy, technological literacy, visual literacy, information literacy, multicultural literacy, and global

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awareness literacy (PISA, 2003). The literacy activity that is the focus of this research is scientific literacy. Scientific literacy is knowledge about concepts, scientific processes and understanding needed to be applied in everyday life (Mardianti, 2020). Scientific literacy consists of three components, namely scientific concepts, scientific processes and scientific contexts (Arief & Utami, 2015). This scientific literacy is in accordance with the demands of the 2013 curriculum and learning physics.

Physics studies natural phenomena that occur in everyday life. Physics learning must train students to master the knowledge, concepts and principles of physics, as well as scientific skills and science process skills (Azmanita & Festiyed, 2019). Physics learning can be carried out in the classroom and in the laboratory. Physics learning in class focuses on student knowledge and learning in the laboratory focuses on student skills. This is in line with the explanation of Hidayati and Masril (2019) that learning physics through practicum can improve students' skills. Other research also explains that practicum activities need to be carried out to provide direct experience and involve students actively so that they can support the physics learning process (Hidayati et al., 2019). Physics learning in class needs to be supported with appropriate teaching materials. Teaching materials are tools used to assist teachers in carrying out learning that is arranged in a systematic and interesting manner (Nurdyansyah, 2018). Teaching materials are divided into printed teaching materials, audio teaching materials, visual teaching materials and web-based teaching materials. One of the suitable teaching materials used in learning physics is student worksheets (LKS).

LKS is a student learning resource in the form of sheets containing structured activity steps and tasks. This is in line with Oktari (2015), explain that student worksheets are learning resources that can improve understanding of concepts through systematic and directed learning activities. According to the Depdiknas (2008) a good LKS is one that has an attractive appearance and language that is easy for students to understand. The purpose of using LKS is to make it easier for students to understand learning material because the contents are clearer and concise. Physics learning is not only done in the classroom but also in the laboratory. Therefore, the worksheets used in physics learning are also divided into non-practical worksheets and practicum worksheets.

LKS practicum contains practical instructions with tools and materials according to related material. The practicum worksheets used should be LKS designed by looking at the curriculum and students' character in understanding physics material. One of them is the LKS integrated with scientific literacy for practicum KIT. LKS practicum also serves as a guide for students in carrying out practicum activities or problem solving (Andriyatin, 2016). A good LKS must be structured and orderly. In the Depdiknas (2008) it is stated that LKS consists of titles, study instructions, competencies to be achieved, supporting information, tasks and work steps, and assessments. In addition to practicum worksheets, learning activities in the laboratory are also supported by physics experimental tools, one of which is the practicum KIT.

The physics laboratory has experimental tools stored in a box called the Integrated Instrument Component (KIT) for physics practicum (Widayanto, 2009). The high school physics practicum KIT is divided into mechanics practicum KIT, wave and optics practicum KIT, electricity and magnet practicum KIT and wave and thermodynamics practicum KIT. The practicum KIT is equipped with a user manual which is presented in book form, but only contains tools and materials as well as simple work steps. The use of practicum KIT in learning is expected to increase students' interest and understanding in physics lessons. However, in its application in the field, there is a discrepancy with the expected conditions.

The reality found is that there are still many teachers who do not use the practicum KIT as expected and the worksheets used are not yet integrated with scientific literacy. Based on the needs analysis carried out, it was found that there were differences between the ideal conditions and the real conditions in the field. The first real condition encountered is that the physics teacher has not fully utilized the existing practicum KIT. After carrying out a needs analysis through direct observation, it was found that several high schools in West Sumatra already had a complete practicum KIT. Practical KITs available at schools are Hydrostatics and Heat KIT, Waves and Thermodynamics KIT, Mechanics KIT, Optics KIT and Electricity and Magnetism KIT. However, the practicum KIT has not been used properly by physics teachers in practicum. Based on the results of the needs analysis through questionnaires and interviews with students, it shows that the level of student understanding is better if learning physics is accompanied by learning in the laboratory.

The second real condition encountered is that the practicum worksheets used are not yet integrated with scientific literacy. The results of the needs analysis show that several high schools in West Sumatra already have practicum worksheets. However, the worksheets used are still in the form of guidebooks for the use of the practicum KIT only with non-detailed experimental steps. Based on the background presented, the researcher is interested in developing scientific literacy integrated worksheets for the use of the physics practicum KIT. The title of the research to be conducted is "Design and Validation of Scientific Literacy Integrated LKS for the Use of Physics Practicum KIT".

Method

The type of research used is research and development (Research and Development). The object of this study is an integrated scientific literacy worksheet for the use of physics practicum KIT for several physics materials, namely motion of bodies, static fluids, dynamic fluids, temperature and heat, direct current electricity, static electricity, Hooke's law and simple harmonic motion. The practical KITs used are mechanics KIT, hydrostatics and heat KIT, waves and thermodynamics KIT, electricity and magnetism KIT and Hooke's experimental KIT.

The research and development model used in this research is the Borg and Gall model in Sugiyono's book (Sugiyono, 2008). Sugiyono's model consists of 10 stages, but in this study it is only limited to the fifth stage, namely product revision as shown in the following figure:

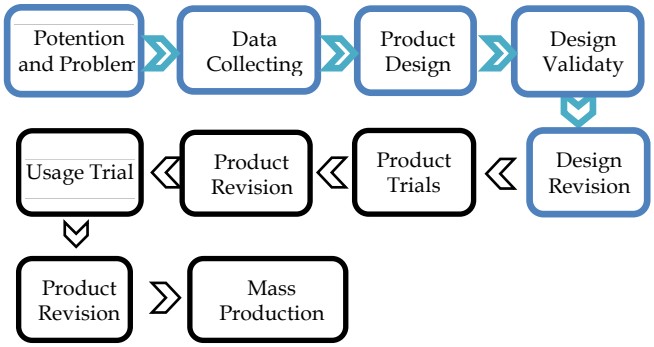

Figure 1. Research Procedures

The product developed in this study is an integrated scientific literacy worksheet for the use of physics practicum KIT. The LKS design is based on the LKS structure of the Depdiknas (2008), scientific literacy is integrated into the worksheet in the content section, where scientific literacy has 3 main aspects namely scientific context, scientific process and scientific concept (Group, 2003). The product design consists of three main parts, namely cover, introduction and content.

Design validation was carried out by 3 validators. The validator is an expert from the Department of Physics, Padang State University. The research instrument used in the research is the validation sheet. The data analysis technique used is descriptive statistics in the form of validity analysis. The data obtained from the validity test results were analyzed using Aiken's (V) validity index formulated as follows:

$$V = \frac{\Sigma s}{n\,(c-1)} \quad (1)$$

With s = r - I0, V is the validator agreement index, I0 is the lowest validity rating score (in this case = 1), c is the highest validity rating score (in this case = 5), r is the number given by a rater and n is the number of validators. The validity value category of an LKS after being analyzed using equation (1) above can be seen in table 1.

Table 1. Decision table based on Aiken's V Index

Interval	Category
≤ 0.4	Less
0.4 < V ≤ 0.8	Currently
0.8 < V	Very Valid

(Retnawati, 2016)

Result and Discussion

Result

This research produced integrated scientific literacy worksheets for the use of the physics practicum KIT. LKS is arranged based on the 2008 Ministry of National Education structure, namely (1) title; (2) study guide; (3) competence to be achieved; (4) supporting information; (5) tasks and steps, and (6) assessment. The developed worksheets are also based on the 2003 PISA scientific literacy which consists of scientific contexts, scientific processes and scientific concepts. LKS also contains a physics practicum KIT. The details of the results of the LKS development design are carried out as follows.

The resulting product is in the form of scientific literacy integrated worksheets for the use of physics practicum KIT which can help students understand physics learning carried out with practicum. LKS designs are made in accordance with the curriculum and structure of teaching materials. The LKS design that has been made can be seen in Figure 2.

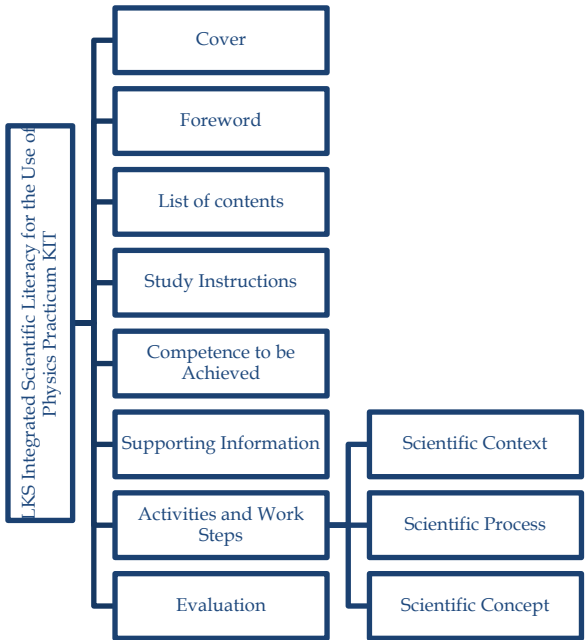

Figure 2. Design of LKS Integrated Scientific Literacy for the Use of Physics Practicum KIT

The LKS design contained in Figure 2 shows that the scientific literacy integrated LKS consists of: Cover, which contains the identity of the author, title, material and year of manufacture of the LKS; Preface, which displays an overview of the contents of the LKS in general; Table of contents, which displays the pages contained in the LKS; Study guide, which displays study instructions regarding the practicum to be carried out; Competence to be achieved, which displays KI, KD, indicators and learning objectives; Supporting information, which displays information about the practicum KIT used and information on the material to be practiced; Activities and work steps, which contain a scientific literacy component consisting of three components, namely scientific context, scientific process and scientific concept. Scientific context, which contains information related to everyday life regarding the material to be practiced. Scientific process, which is related to the process of implementing practicum starting from the purpose of the experiment, tools and materials, work steps, data tables, data analysis, questions and conclusions. Scientific concepts, which contain questions about physics concepts that are understood from the context components and scientific processes; Assessment, which displays the teacher's assessment of the practicum results that have been done by students. In the following, there is a display of the LKS design integrated with scientific literacy.

Figure 3. LKS's Cover

Figure 4. Scientific Context

After the worksheet has been developed, it can proceed to the design validation stage. Design validation is an activity of assessing a product whether the product made is valid or not. LKS design validation was carried out by experts, namely Physics Lecturers at FMIPA UNP to assess the products being developed. Besides the experts providing an assessment, they can also provide input and suggestions that can be used to revise and improve the developed LKS. The instrument used in collecting validation data is the LKS validation sheet. The LKS validation component consists of LKS assessment and aspects of scientific literacy. The components in the LKS assessment include content feasibility, language, clarity and graphics. The aspect of scientific literacy has a scientific context, scientific processes and scientific concepts. Based on the results of design validation on the LKS assessment components from experts, the following is obtained.

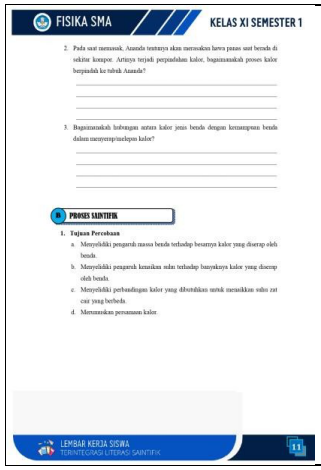

Figure 5. Scientific Process

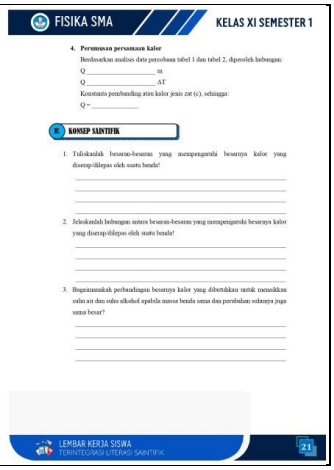

Figure 6. Scientific Concept

Table 2. LKS's Validity Result

Component	Average
Content Feasibility	0.87
Language	0.85
Clarity	0.87
Graphics	0.89
Validity Average	0.87

The results of the LKS assessment were obtained from the components of content feasibility, language, clarity and graphics. Each LKS assessment component has an assessment indicator. The value of each component is obtained from the average assessment indicators. LKS assessment components have a very valid category. This is obtained from the average value of the LKS assessment component. Furthermore, the assessment of aspects of scientific literacy in LKS can be seen in table 3.

Table 3. Scientific Literacy Aspects

Aspects	Average
Scientific Context	0.85
Scientific Process	0.89
Scientific Concept	0.86

The results of the scientific literacy aspect are obtained from scientific contexts, scientific processes and scientific concepts. Every aspect of scientific literacy has an assessment indicator. The value of each scientific aspect is obtained from the average assessment indicators. The value of each aspect of scientific literacy has a very valid category. Based on the results of the LKS assessment and aspects of scientific literacy obtained from expert revisions, the LKS can be declared very

valid. So that the LKS developed is feasible to be used in the physics learning process.

Discussion

This discussion presents a study of the results of research that has been carried out during the research. The purpose of this researcher is to develop scientific literacy integrated worksheets for the use of physics practicum KIT, namely to produce products that are carried out with several procedures that refer to the Borg and Gall method in Sugiyono (2012), with this LKS it is hoped that students will become more interested in learning physics and easily understand physics concepts. The evaluation of this product includes LKS assessment, and aspects of scientific literacy. After the LKS is developed, the validity test is carried out on the LKS.

The validity test was carried out by three experts, namely Physics Lecturer at FMIPA, Padang State University who were then given the instruments and worksheets that had been developed. Before conducting the LKS assessment, a product revision process was carried out according to expert advice. This is done to reduce the shortcomings of the developed LKS. After revisions have been made according to expert advice, the LKS can be assessed based on expert instruments. The assessment in the instrument includes an assessment of the LKS and aspects of scientific literacy.

The components of the LKS assessment include content feasibility, language, clarity, and graphics. Based on the results of the assessment, information was obtained that the value of the eligibility component was 0.87 with a very valid category. This shows that the developed LKS is in accordance with the competencies to be achieved, accurate sources and clear guidelines for using LKS. So that it can improve student competence.

Based on the results of the assessment of the indicators contained in the language component, an average value of 0.85 is obtained with a very valid category. This shows that the developed LKS is in accordance with the information, illustrations, language and symbols used in the LKS. So that the LKS developed can improve students' learning abilities. The results of the assessment of the clarity component contained in the expert instrument obtained an average value of 0.87 with a very valid category. This shows that the developed LKS already has clear learning objectives and is in accordance with the structure of the LKS. So that it can increase students to carry out literacy activities contained in LKS.

The graphical component contained in the expert instrument obtained an average value of 0.89 with a very valid category. This shows the suitability of illustrations, colors and an attractive appearance of worksheets. Appropriate illustrations can attract and motivate students to use scientific literacy integrated worksheets. Aspects of scientific literacy contained in worksheets in accordance with PISA 2003 consist of scientific contexts, scientific processes and scientific concepts. Based on the results of the validation, information was obtained that the average value of the scientific contest aspect was 0.85 with a very valid category. This shows that the developed worksheets are in accordance with scientific concepts and contexts related to application in everyday life.

The scientific process has an average value of 0.89 with a very valid category. This shows that the practicum experimental procedure is in accordance with the use of the practicum KIT. The procedure used by LKS is clear. So as to make students learn independently and be able to find concepts after conducting experiments. The scientific concept has an average value of 0.86 with a very valid category. This shows that the presentation of the LKS is in accordance with the concept of physics which can increase student competence. Based on the results of the study it can be stated that the LKS integrated with scientific literacy for the use of the physics practicum KIT is feasible to use.

Conclusion

Based on the research and data analysis conducted, it can be concluded that the validity score of the LKS integrated with scientific literacy for the use of KIT practicum was obtained from an analysis of the four components of the LKS, namely content eligibility with a value of 0.87; language component with a value of 0.85; clarity component with a value of 0.87 and a graphic component with a value of 0.89. The average validity value of the integrated scientific literacy worksheet for the use of the physics practicum KIT is 0.87 which is classified as very valid.

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