Validity of student worksheet based on problem based learning model assisted by practical tools with digital display

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Abstract. Student worksheet is one source of learning as a guide for learners in achieving learning objectives during the investigation or problem solving. Practical tools with digital displays will assist the investigation process. Based on the analysis of the needs and characteristics of learners, and limitations of previous validation studies then the validation of student worksheets based on problem based learning model assisted practicum tool with digital display can be a problem solution. The purpose of this study is to produce students' worksheets and practicum tools developed under valid categories. This research method using descriptive statistics. The instrument used is a validation sheet filled by experts and practitioners. LKPD validation gets validity results on aspects of construct (presentation), content, grammar, and language. Validation tools get validity results on aspects of purpose, engineering operations, accuracy of use, and working principles. The average of the four aspects of LKPD validation was 0.91 by the development expert and 0.92 by the practitioner, and for the equipment of 0.93 by the electronics expert. Thus, it can be said that LKPD based problem model based learning and practicum tools with digital displays have valid categories.

1. Introduction
Student worksheets (LKPD) are sheets containing instruction manuals or learning process guides that learners will be doing to improve their competence to achieve learning objectives [1,2]. The learning process undertaken has been listed on LKPD in a systematic manner may include investigation, problem solving, or conclusions. So LKPD can help teachers to enable learners in the process of learning, inquiry and in the discovery of the concept to achieve a predetermined KD [1]. In accordance with the LKPD function, it can be combined with the learning model. The integration of LKPD with this learning model includes the latest kinds of innovations [3]. The chosen learning model is a suggestion from the 2013 curriculum. In addition, the selection of learning models is also based on the results of material analysis and characteristics of learners. In the analysis of circular motion material, the characteristic of knowledge is dominated by procedural, so that learning model is needed to enable learners [4]. Further characteristics of learners are obtained through a sample of a school that their lack of active, critical and curiosity participation leads to passive learning with teacher-centered learning. Thus, the use of learning model that can enable learners that is model problem based learning (PBL).

LKPD prepared with the PBL learning model makes innovative learning that can provide an active learning condition in learners [5]. This PBL model serves to improve the knowledge, attitude
of learners and critical thinking skills in problem solving [6]. Characteristics of PBL models can guide learners to rationally think critically. The PBL model can directly relate the phenomena that occur in real life, so that learning materials can be understood by learners with the occurrence of inter-group discussions [7]. The steps in implementing the PBL model in LKPD consist of five stages: 1) student's orientation to the problem, 2) organizing learners for learning, 3) guiding individual and group investigations, 4) developing and presenting the work, and 5) analyzing and evaluating the learning process [4]. The step of this PBL model has been adapted to the scientific approach stage, due to the 2013 curriculum demands. The scientific approach is the approach that involves the learner actively in the learning process. A scientific approach can involve learner skills in the process such as observing, questioning, trying / gathering information, reasoning and communicating. With a scientific approach is expected to form the ability of learners in solving the problem [8]. Thus, for the PBL investigation stage is the stage of trying on a scientific approach. Experiments are important instruments for understanding the concepts of physics [9]. That is, this stage is able to help learners to improve understanding of the concept of physics, which became the basis of the need for a media or tool for the investigation of learners. In this case learning can use PBL-based LKPD with the help of practicum tool.

In order for learning to follow the development of technology and learners are able to compete in the world of globalization, is expected to use equipment digitally. The advancement of sensor and digital technology opens the opportunity to create practical tools that make measuring more practical and efficient experimental time in the process of its use [10]. In addition, practicum tools with digital displays can minimize data errors that may occur [11]. Research that has been done previously also states that the tool assisted by sensor and digital technology has been facilitated in the data retrieval of a study. Research based on sensor and digital technology such as development of gravity acceleration measurement using simple harmonic motion pendulum method based on digital technology and photogate sensor by Yulkifi, Z Affandi and Yohandri (2018), development of speed measurement system for pencak silat kick based on sensor technology by N Ihsan, Yulkifi, and Yohandri (2017), correlation of seismotectonic parameter and seismic quiescence z-value in West Sumatra Indonesia by Syafriani, Yulkifi, AZ Sabarani, FD Raharjo (2018), development of digital viscometer based on sensor technology and microcontroller by Yulkifi, Yohandri and R Kurniati (2018), and development of low sidelobe level array antenna for synthetic aperture radar sensor by Yohandri, Yulkifi and JTS Sumantyo (2018) [9-14]. Thus, in physics learning can also be utilized based on the development of science and technology that uses sensors and digital circular motion.

A circular practice tool with digital displays will assist in the investigation of frequency, period, and linear velocity for one wheel and associated wheels. The regular circular motion applied to the practicum with a digital display will make the wheel speed rotate constantly. So the quantities obtained have high accuracy. This can facilitate teachers in using new innovation tools, so that the learning process in accordance with the demands of the 2013 curriculum with scientific approach and can be met in the learning hours due to time efficiency. Based on this, LKPD based PBL model can be assisted by digital display practicum tool.

The developed LKPD consists of: title, study guide, competence to be achieved, supporting information, activity step and assessment [14,1]. The title is on the cover of LKPD that is designed in such a way as to be interesting. On the cover is presented title, subject, semester and place. Furthermore, the drawings on the LKPD cover are based on material analysis by describing circular motion related phenomena. In addition, there are introductory and table of contents to facilitate learners and teachers in their use. The LKPD instructions are provided as a self-learning instruction manual. In the competence to be achieved consist of core competence (KI) and basic competence (KD) which can be seen on syllabus of physics class X High school based on Permendikbud 21 Year 2016 [15]. Indicators and learning objectives created by the authors in the form of competencies that must be achieved in accordance with KI and KD students competence attitude, knowledge, and skills. On the supporting information contains a brief description of the material associated with the daily phenomenon. It is aimed so that learners can more easily understand the material being studied.
Supporting information is accompanied by a brief exposure of material there are facts, concepts and principles of formulas. In learning activities in the form of activities that aim to prove the truth truth of the alleged while the learners. In this case described the objectives of the laboratory along with the tools and materials needed during the lab, the set of tools to be prepared, work steps and data tables that must be equipped learners after the practicum. Next there are questions related to the results of the lab. But the most important thing in the learning activities is the process of observation of learners with the provision of interesting illustrations. In this learning activity is guided by the steps of PBL model. Thus, ending with the assessment stage is limited to knowledge competence that is a matter of essay that can measure the competence of learners in learning.

In accordance with the design of LKPD based PBL model based on the availability of laboratory equipment in schools. The laboratory equipment used in this LKPD practice is circular motion with digital displays. This practicum tool has been designed by a research team that has developed this tool. However, for the use of LKPD that this assistant lab tool, required the validation of tools according to development purposes. So the need for validation of LKPD based on PBL model and validation of practicum tool with digital display on circular motion material.

The purpose of validation is to obtain recognition and validation of the suitability of the device with the needs so feasible and suitable for use in learning. Its characteristics are valid, reliable, and usable [16]. One important thing before building the instrument is the consideration of the variables used in order to measure what should be measured [11]. The LKPD validity test assesses the feasibility aspects of the construct (component of presentation), component content, grammar, and language [17]. Presentation aspect looks at LKPD design consisting of component of LKPD preparation in practice. This presentation is in accordance with the principles of its compilation, the suitability of each component of LKPD preparation, the steps of the worksheet in accordance with the step of the scientific approach into the PBL model. It is appropriate that a valid device contains conformity between each component [18]. In the aspect of LKPD content, it is seen that the material substance matching with the competence to be achieved, the need, the truth, the depth, and the present. On aspects of graphics seen from the use of fonts, types and sizes, layout, illustrations of images and photos, as well as design view [19]. In the linguistic aspect seen from the legibility, clarity of information, conformity with the rules of the Indonesian language is good and right, the utilization of language effectively and efficiently [1]. Furthermore, the validation test of the practicum tool assesses the aspect of objectives, the techniques of operation, the accuracy of use and the working principle.

LKPD validation research has been done before. W Widodo, E Sudibyo and DAP Sari (2018) have examined the analysis of expert validation on developing integrated science worksheet to improve problem solving skills of natural science prospective teachers. In this study there is no validation review for in-depth LKPD graphics and validators only from experts only [20]. IB Susanti, S Poedjiastoeti and T Taufikurohmah (2018) have examined the validity of worksheet-based guide inquiry and mind mapping for training student’s creative thinking skills. In this study validation data taken only from two aspects namely content and constructs. However, validation data have been viewed from expert and practitioner validators [21]. Furthermore, J Jefriadi, Y Ahda, R Sumarmin (2018) also examined the validity of students worksheet based problem based learning for 9th grade junior high school in living organism inheritance and food biotechnology. Complete research validates four aspects, but validation data is taken only from experts only [22]. Based on the limited research related to LKPD validation, the interested researcher will analyze the validation of LKPD from four aspects namely aspects of construct, content, kegrafisan, and language. LKPD validation is also done by 3 experts and 2 practitioners. In addition, the LKPD validation based on PBL model-assisted practice tools has also not been tested before. So that will be validated LKPD based PBL model on four aspects of experts and practitioners. As well as, validation of practicum tools on four aspects namely objectives, engineering operations, accuracy of use, and the working principle of the expert.
The purpose of this research is to know the validity of LKPD based on PBL model assisted by practicum tool with digital display. The research question formulation is how is the validity of LKPD based PBL model and practicum tool with digital display based on assessed aspect?

2. Research
This research method using descriptive statistics. Descriptive research is not intended to test a particular hypothesis [23]. Descriptive research is conducted to describe, interpret and describe or explain what it is about a variable or state [24]. This research will explain the results of the validation stage on the development of LKPD for circular motion.

The data collection instrument uses a validation sheet filled by 3 expert validators and two practitioners for LKPD validation and an electronics expert for validation of practicum tools. The validation sheet used has been validated first by the expert validator. The validation sheet can assess the four components of presentation, content feasibility, grammar and language of LKPD [1]. In addition validation of display practicum tool the designed digital is judged from the aspect of purpose, the technique of operation, the accuracy of use, and the working principle. Validity analysis using Likert scale which has four scale with criteria that is very good (4), good (3), enough (2), and less (1). The total score of each validator for all indicators is summed up and the validity value is given by using Aiken's V formula:

\[ V = \frac{\sum s}{n(c - 1)} \]  

Where:
- \( s = r - lo \)
- \( lo = \) The lowest validity score (in this case = 1)
- \( c = \) The highest validity score (in terms of this = 4)
- \( r = \) The number given by the validator

The validity category of LKPD development can be seen in Table 1 [25].

| Value   | Criteria |
|---------|----------|
| ≥ 0.6   | Valid    |
| <0.6    | Invalid  |

3. Results and Development
Validation of LKPD based on PBL model includes component of presentation, content, grammar and language. The indicators were assessed at each component can be seen in Table 2.

| Table 2. Validation LKPD Sheet Indicators |
|-----------------------------------------|
| Indicators rated                        | Expert | Practitioners |
| Presentation of the PBL model based LKPD assisted practicum tools with digital displays according to LKPD structure | 1.00   | 1.00          |
| LKPD structure is related to each other | 0.89   | 0.83          |
| description of general guidance on LKPD is clear and easy to understand | 0.89   | 0.83          |
| Learning activities in LKPD in accordance with scientific approach | 0.89   | 0.83          |
| LKPD presentation is adjusted to the PBL model stages | 1.00   | 1.00          |
| Step-by-step instructions on how to use the tool lab with digital displays in accordance with the actual step | 0.89   | 0.83          |
| About evaluation in accordance with the learning objectives | 0.89   | 1.00          |
B. Component Content
material presented in LKPD is in conformity with the demands of KI, KD and indicators are formulated
material presented in LKPD consists of facts, concepts, principles and procedural
LKPD presented in accordance with the science truth
LKPD presented in accordance with the depth of the material
Presentation of problems given in accordance with the facts in everyday life
Facts given relevant with learning materials
Activities and observations related to life
Activities in LKPD encourages students to learn scientifically
LKPD presented following technological developments
LKPD presented contains instructions how to use practicum tool with digital display
Working steps on LKPD can guide the practicum

C. Components of Charging The
font used is clear and read
Proportional LKPD layout and layout
Illustration of LKPD images and pictures exactly according to the material
LKPD display design attracts the reader
Psynthesizing color in LKPD dancing
LKPD giving interaction to the reader in the form of stimulus

D. Language Component Language
used good and true according to Indonesian rule
Language used communicative
language used is easy to understand and does not mean double
Information presented in LKPD jel as
spelling used refers to EYD
Consistency in using the terms
Consistent in using symbols / symbols
Scientific / foreign names on LKPD true and correct
Terms used in accordance with Big Indonesian Dictionary and / or term technical science agreed

Based on data obtained on each indicator, summarized validation results for four components assessed by experts and practitioners. The results of this LKPD validation can be seen in Table 3.

| Aspect                  | Value of Agreement | Category |
|------------------------|--------------------|----------|
| Presentation           | 0.92               | 0.90     | Valid    |
| Contents               | 0.91               | 0.91     | Valid    |
| Channel                | 0.91               | 0.94     | Valid    |
| Language               | 0.89               | 0.92     | Valid    |
| Average                | 0.91               | 0.92     | Valid    |

Table 3. LKPD Validation Results

Table 3 explains that the average value of LKPD validation agreement from expert validators is 0.91 and 0.92. The value of the agreement obtained exceeds 0.6, which means that the validation of the components of presentation, content, grammar and language has a valid category. This validation
result is clear that LKPD-based PBL model-assisted practicum tools with digital displays have an average assessment that tends to be the same between experts and practitioners. Thus LKPD can be used for the learning process, although some suggestions from the validator for LKPD better.

Validation for practicum tools with digital displays viewed from the aspect of purpose, operation technique, accuracy of use, and working principle. The result of validation of tools from electronics experts for each indicator can be seen in Table 4.

| Table 4. Indicator Sheet Validation of Practicum Tools with Digital Display |
|-----------------------------------------------------------|-----------------|
| Indicators rated                                         | Expert          |
| A. Purpose                                              |                 |
| The circular motion practicum tool has a clear display   | 1.00            |
| Circular practice tools based on digital technology      | 1.00            |
| Circular motion practical instrument based on digital    | 1.00            |
| technology has a good level of precision                 |                 |
| Circular motion practice tools in accordance with       | 1.00            |
| learning materials                                       |                 |
| B. Operating Techniques                                 |                 |
| Simple circular motion tools are easy to operate         | 1.00            |
| Circular motion practical tools have a safety level for  | 1.00            |
| the user                                                |                 |
| Tools practicable circular motion has simplicity in     | 0.67            |
| assembly                                                |                 |
| C. Accuracy of Usage                                     |                 |
| Circular motion practice tools can be used for           | 1.00            |
| individuals and groups                                   |                 |
| Circular motion practice tools can provide an opportunity| 1.00            |
| for the assembly to use them in lab activities           |                 |
| Circular practice tools have competitiveness against     | 1.00            |
| other media                                             |                 |
| D. Working Principle                                     |                 |
| The circular motion practicum has a working principle    | 1.00            |
| in accordance with circular motion material              |                 |
| Circular motion practicative tools have a good level of  | 0.67            |
| stability                                               |                 |

Based on data obtained on each indicator, it can be summarized validation results for four components assessed by an electronic expert related to a practicum tool with a digital display. The validation results of this tool can be seen in Table 5.

| Table 5. Results of Validation of Practicum Tools with Digital Display |
|----------------------------------------------------------|-----------------|
| Aspect                              | Value of Agreement | Category |
|-------------------------------------|--------------------|----------|
| Objectives                          | 1.00               | Valid    |
| Operating Techniques                | 0.89               | Valid    |
| Accuracy of Use                     | 1.00               | Valid    |
| Working Principle                   | 0.83               | Valid    |
| Average                             | 0.93               | Valid    |

Table 5 explains that the average value of the validation agreement of the practicum tool with the digital display on the circular motion material is 0.93. The value of the agreement obtained ≥ 0.6 which means validation on the aspect of purpose, the technique of operation, the accuracy of use, and the working principle of practicum tools with digital displays have valid categories. It states that practicum tools with digital displays on circular motion material are feasible and can be used in assisting learning process with LKPD based on PBL model.
4. Conclusion
Based on the results presented it can be concluded that LKPD based PBL model developed has valid categories according to expert and practitioner validator on presentation aspect, content, graphics, and language. As well as practicum tools with digital displays on the material also have valid categories according to the electronics experts on aspects of objectives, techniques of operation, accuracy of use, and working principle. Overall LKPD-based PBL model-assisted practice tools with digital displays on circular motion materials have valid categories that can be implemented in the learning process.

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