Validity of development of student’s worksheet based on problem-based learning model on parabolic motion materials assisted by digital display practicum

U Fitri, Yukifi* and Syafriani

Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Jl. Prof Hamka, Padang 25131, Indonesia.

*yukifi.amir@gmail.com

Abstract. Physical Competence of students is not as expected. One of the causes is the use of teaching materials that are not in accordance with the established standards and has not maximized the use of practical tools that support the learning process. Therefore, it is necessary to develop student’s worksheet based on problem-based learning model using practicum with digital display. The purpose of this study is to analysis of validity development of student’s worksheet based on problem-based learning model using practicum with digital display. This type of research uses design research which ADDIE model. Technique used for analyzing the data was descriptive percentage. The result of this research is analysis of validity development of student’s worksheet. The result of validity instrument earned value V 0.90. The result of validity student’s worksheet earned value V 0.92. The result of analysis of validity practicum tool by comparing data obtained with actual data earned value 95%, this indicate a valid tool to use. Based on the result of the research, it can be concluded student work sheet based on problem-based learning model in the material of parabolic motion using practicum with digital display with a valid criterion.

1. Introduction

Education is a very influential factor in developing Human Resources, so as to compete in global life. Through education, it is also expected to form Human Resource responsive to the changing world so as to promote its nation. Education is the guidance done consciously by the teacher to the learners with the aim of forming the main personality physically and spiritually [1].

The Government has made various improvements to the education system in the process of achieving educational goals. One of the developments of education system that has been done is the completion of the curriculum into Curriculum 2013. Curriculum 2013 which emphasizes the learning that enables learners, students' thinking ability, creativity and independence of learners to achieve the three expected competencies, namely attitude, knowledge and skills with using a scientific approach in learning. The scientific approach is a student centre learning process so that learners can actively construct concepts, laws or principles through the stages of observing, asking, trying, processing information, and communicating the concepts, laws or principles gained [2]. The scientific approach is intended to provide an understanding to learners in knowing, understanding the various materials using a scientific approach, that information can come from anywhere, anytime, regardless of teacher's
in-line information. Learning conditions created are expected to encourage active learners in finding out from various sources through discussion, observation, and practicum activities.

In reality there is a gap between the expectations of the government and what happens in school. Where the competence of learner knowledge is still low and the average daily re-examination value is still below KKM. Practicum activities at SMAN 3 Pariaman are rarely done because the practice tools are still inadequate, where the practicum tool is available only for certain material only, not including all material that can be practiced because still rely on physics kits. If one component of the physics kit is damaged, the practicum tool can not be used. School practicum tools are still operated manually, so the practicum data obtained is less accurate. Whereas facilities and infrastructure such as laboratory rooms are available in schools. Practicality in measurement using sensors and digital technology is one solution that can be done [3]. Digital display practicum tools are more practical and can optimize the timing of the practicum [4]. In practice practice the use of sensor technology will be more effective and efficient, especially in the preparation of experimental set, measurement, and data recording [5].

Another factor is the lack of availability of students worksheet (Worksheet Learners) to support the activities of practicum learners. Seen from the results of observations of 30 students who were given a questionnaire, as many as 50% said that students worksheet used is still not helpful in the learning process. students worksheet used in school is the Student Working Sheet (students worksheet) by Adip Ma’rifu Sururi, et al (2016) publisher of advertisement Intan on parabolic motion material. From the aspect of content not seen KI, KD, indicator, and deepening of material not yet in accordance with students worksheet standard that is expected to include title, identity in the form of KI, KD, indicator, learning objectives, supporting information and material exposure. However, Adip Ma’rifu Sururi, et al directly provide the learning objectives and exposure of the given material in the form of understanding and formulas. This is less in line with the learning materials in the 2013 curriculum where the learning material is distinguished from facts, concepts, principles and procedures and it appears that there is only a task given to prove real parabolic motion, without any practical guidance. In this task is to see how the jets of water when the angle is altered, but can not get accurate data numbers. Parabolic motion material can be taught to learners through practicum activities. Practicum activities carried out can make learners better understand the concept for the material. Parabolic motion material has been discussed in previous studies but using different models. In this study the implementation of students worksheet practice and use for parabolic motion material is stated to have a significant influence [6].

Based on the results of observation and analysis that have been done can be concluded students worksheet used in schools not in accordance with the standards Curriculum 2013, learning in schools are still dominated to achieve knowledge competence has not covered the three competencies. Teachers difficulty in implementing practicum so that the skills of learners can not be developed optimally, learning in schools can not provide direct experience to learners. It is therefore necessary to increase the three competencies of the learners in a balanced way through direct experience to learners by having a learning resource in accordance with the standards of the Curriculum 2013. The core activities in the learning process should use learning models, learning methods and customized learning resources with the characteristics of learners and subjects. One of the recommended learning models to use is Problem Based Learning. The problem-based learning model is a learning model based on the many problems that require authentic investigation i.e. investigations that require real solutions to real problems [7]. The main principle of PBL is the use of real problems as a means for learners to develop knowledge and simultaneously develop critical thinking skills and problem-solving abilities. Problems in PBLs are open-ended problems, those that have many answers or coping strategies that encourage learners' curiosity to identify those strategies and solutions. It can be concluded that the Problem Based Learning model is very aptly used to improve the competence of students' attitudes, knowledge and skills.

Therefore, it is necessary to develop the worksheet of students based on problem-based learning model on parabolic motion material using the digital display practicum tool. And perform validation
3. Result and Discussion
Validation performed includes: content validation, construct validation and language validation. The validation of the content is valid by the validator because the developed learning device is in accordance with the material that should be presented. Whereas construct validation according To test the validity of the construction can be used expert opinion [9]. So in this study, validation assessment is emphasized on content validation, constructs and languages whose instruments are assembled in a single list of assessments by designated validators. An instrument is said to be valid if it can be used to measure what should be measured [10].

Students worksheet and practicum tools that have been designed are tested for validity. Validation was done by 3 lecturers from UNP and 2 physics teachers. Because the product developed is students worksheet assisted by digital practicum tool, then validation is done on two things, namely students worksheet and parabola motion practice tool. Validation students worksheet done by validator YO, RA and US and 2 physics teacher that is DS and RT, whereas tool validation is done by comparing actual calculation with calculation using practicum tool with digital display. Validation results are described as follows:
3.1. Instrument Validation Results

Before validating the product, validation of the instrument used to validate the product is developed. The result of instrument validation can be seen in Table 2. Based on Table 2 it can be stated that the instrument has been developed in the valid category, where the value of V is greater than 0.6. Thus this instrument can be used.

| Validation Instrument      | V Value | Category |
|---------------------------|---------|----------|
| Students Worksheet Validation Sheet | 0.94    | Valid    |
| RPP Validation Sheet      | 0.90    | Valid    |
| Practicality Validation Sheet | 0.86    | Valid    |

3.2. Students Worksheet Validation Results

Students worksheet validity test is performed after validation validity validation test. The instrument assessment uses a validation sheet that includes the following indicators: clarity of the validation of the validation sheet, the statements made in accordance with the indicator, the objectives to be achieved, do not contain multiple meanings, using simple and easily understood scoring formats, and the corresponding language with good and true EBI rules. Validation of student workbook oriented model problem based learning consists of three aspects: content aspect, construct aspect and language aspect. The result of students worksheet validation based on Problem Based Learning model can be seen in Table 3.

| Aspect       | V Value | Category |
|--------------|---------|----------|
| Contents     | 0.92    | Valid    |
| Construct    | 0.93    | Valid    |
| Language     | 0.90    | Valid    |

Based on Table 3 it is stated that the developed students worksheet is a valid category, where in the content, construct and language aspects obtained a large V value of 0.6. students worksheet validation results on the content feasibility aspects are in valid category with an average of 0.92, the construct aspect is in valid category with an average of 0.93 and the language aspect is also in valid category with an average of 0.90 Overall students worksheet is declared valid as it obtains a value of ≥ 0.6. A product is said to be valid if each indicator is at ≥ 0.6 and not valid <0.6 [8]. Validation results are used as a guide to see if students worksheet sufiah is feasible to use [11]. Thus this students worksheet can be used in the learning process.

3.3. Tool Validation Results

In the validation of the parabolic exercise tool (Table 4), validation is done by comparing data obtained from the tool with the actual data. The percentage of very high accuracy is approximately 95%, indicating a valid tool to use.

It has a very high accuracy of about 95%, indicating a valid tool to use. So, it can be concluded that student’s worksheet-oriented Problem Based Learning model on parabolic motion metering and digital display practicum tool can be used and done real test in learning in school. Implementation of Practicum using digital display practicum also enables students to obtain accurate and precise result data [12].
Table 4. Validation Results of Parabolic Motion Practicum Instrument with Digital Display.

| Angle | Timer Launcher | Timer Tool Standard | Accuracy  | % Accuracy |
|-------|----------------|---------------------|-----------|------------|
| 15    | 12.08          | 12.25               | 0.9861    | 98.61      |
| 20    | 12.688         | 12.75               | 0.9951    | 99.51      |
| 25    | 12.692         | 13                  | 0.9763    | 97.63      |
| 30    | 12.696         | 13                  | 0.9766    | 97.66      |
| 35    | 12.136         | 12.75               | 0.9518    | 95.18      |
| 40    | 12.152         | 12.5                | 0.9722    | 97.22      |
| 45    | 12.16          | 12.5                | 0.9728    | 97.28      |
| 50    | 11.624         | 12.25               | 0.9489    | 94.89      |
| 55    | 11.608         | 12                  | 0.9673    | 96.73      |
| 60    | 12.068         | 13                  | 0.9283    | 92.83      |
| 65    | 12.008         | 12.5                | 0.9606    | 96.06      |
| 70    | 11.584         | 12.5                | 0.9267    | 92.67      |
| 75    | 12.008         | 12.75               | 0.9418    | 94.18      |

3.4. RPP validation results
The result of RPP validation by entering Problem Based Learning model can be seen in Table 5.

Table 5. Results of RPP Validation

| Aspect      | V Value | Category |
|-------------|---------|----------|
| Contents    | 0.82    | Valid    |
| Construct   | 0.79    | Valid    |
| Language    | 0.82    | Valid    |

Based on Table 5 it can be stated that the RPP is designed in all three aspects i.e. content, constructs and language aspects are in valid category. Therefore, this RPP can be used in the learning process. Based on the validation result that has been done, it is found that the developed product included in the category is valid. However, there are some suggestions given by validators. The validators provide suggestions, advantages and disadvantages that are useful for formative evaluation and revision of student’s worksheet.

4. Conclusions
Students worksheet validation results on the content feasibility aspects are in valid category with an average of 0.92, the construct aspect is in valid category with an average of 0.93 and the language aspect is also in valid category with an average of 0.90 Overall students’ worksheet is declared valid as it obtains a value of ≥ 0.6. Product is said to be valid if each indicator is at the value of ≥ 0.6 and invalid <0.6. In the validation of the parabolic exercise tool, validation is done by comparing data obtained from the tool with the actual data. It has a very high accuracy of about 95%, indicating a valid tool to use.

References
[1] Ahmad. D. Marimba 2009 Pengantar Filsafat Pendidikan Islam (Bandung: AL – Ma’Arif).
[2]Daryanto 2014 Pembelajaran Tematik, Terpadu, Terintegrasi (Kurikulum 2013) (Jogjakarta. Gava Media).
[3]Ihsan N, Yulkifli and Yohandri 2017 Development of Speed Measurement System for Pencak Silat Kick Based on Sensor Technology IOP Conferences Series: Materials Science and Engineering 180 (1) 012171
[4] Yulkifli, Zurian Afandi and Yohandri 2018 Development of Gravty Acceleration Measurement Using Simple Harmonic Motion Pendulum Method Based on Digital Technology and Photogate Sensor. *IOP Conferences Series: Materials Science and Engineering*. 335 (2018) 012064

[5] Yulkifli, Usmeldi, Yohandri, Anggreni 2017 Pengembangan Thermobalance Digital Berbasis Teknologi Sensor dan Lembar Kerja Peserta Didik Menggunakan Model Research Based Learning. *JPMIPA*. Vol 22, No 1.

[6] Yulkifli, Ifzi Ihsan, Yenni Darvina 2017 Penggunaan STUDENTS WORKSHEET Materi Gerak Melingkar dan Gerak Parabola Berbasis Discovery Learning Terhadap Kompetensi Peserta Didik Kelas X SMAN 1 Pariaman. Risalah Fisika. Vol 2, No 1.

[7] Trianto 2013 *Mendesain Model Pembelajaran Inovatif-Progresif: Konsep, Landasan, dan Implementasinya pada Kurikulum Tingkat Satuan Pendidikan (KTSP)* (Jakarta: Kencana Prenada Media Group).

[8] Sugiyono 2011 *Metode Penilitian Kuantitatif, Kualitatif dan R&D* (Bandung: Alfabeta)

[9] Riduwan 2009 *Belajar Mudah Penelitian Untuk Guru, Karyawan dan Peneliti Pemula* (Bandung : Alfabeta).

[10] Azwar, S. 2015 *Metode Penelitian* (Yogyakarta : Pustaka Pelajar).

[11] R Anggraini, Yulkifli, Y Darvina, dll 2018 Electronic Module Design with Scientifically Character Charged Approach on Kinematics Material Learning to Improve Holistic Competence of High School Students in 10th Grade. *IOP Conferences Series: Materials Science and Engineering*. 335 (2018) 012075

[12] Yulkifli, Yohandri and R Kurmiati 2017 Development of Digital Viscometer Based on Sensor Technology and Microcontroller. *IOP Conferences Series. Journal of Physics: Conf.Series* 1040 (2018) 012047