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Validity And Practicality Of Student Worksheet Integrated With Problem Based Learning In Meteorology And Climatology Subjects

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ABSTRAK

Mata kuliah meteorologi dan klimatologi memerlukan materi pengajaran yang sesuai dan terintegrasi dengan pembelajaran berbasis masalah. Jenis penelitian ini adalah R&D dengan fokus penelitian pada validasi dan praktikalitas lembar kerja siswa. Instrumen pengumpulan data yang digunakan adalah kuesioner. Validasi dilakukan oleh tiga dosen pendidikan geografi sebagai ahli dengan mengisi kuesioner untuk menilai lembar kerja siswa dan melalui diskusi untuk memperoleh saran perbaikan. Validasi lembar kerja siswa yang dilakukan mencakup empat indikator penilaian yaitu validasi konten, konstruksi, bahasa, dan grafik. Praktikalitas lembar kerja siswa diisi oleh dosen dan siswa sebagai pengguna dengan mengisi lima indikator praktikalitas. Hasil penelitian menunjukkan (1) lembar kerja siswa yang terintegrasi dengan model pembelajaran berbasis masalah berada dalam kategori valid untuk digunakan, (2) lembar kerja siswa berada dalam kategori praktis yang berarti lembar kerja yang dikembangkan mudah dipahami, mudah diterapkan, efisien dalam biaya dan waktu, serta mudah dalam menemukan alat dan bahan yang diperlukan untuk pembelajaran.

ABSTRACT

Meteorology and climatology subject requires appropriate teaching materials that are integrated with problem based learning. This type of research is R&D with the focus of research being the validation and practicality of student worksheets. The data collection instrument used was a questionnaire. Validation was carried out by three geography education lecturers as experts by filling out questionnaires to assess student worksheets and through discussions to obtain suggestions for improvement. The validation of student worksheets carried out includes four assessment indicators namely content, construct, language, and graph validation. The practicality of student worksheets is filled in by lecturers and students as users by filling in five practicality indicators. The results showed (1) student worksheets integrated with the problem-based learning model were in the valid category for use, (2) student worksheets were in the practical category which meant the worksheets that were developed were easy to understand, easy to implement, efficient in cost and time, and easy to find the tools and materials needed for learning.

INTRODUCTION

The manuscript's contents, including the Introduction, Methods, Research Results, Discussion, and Conclusions, should be written using Times New Roman font, size 11, with 1pt spacing and left-right alignment (justified). Each sentence should begin with a capital letter, and the first line of each paragraph should be indented by 0.5 cm. The manuscript's margins should follow this template, with a 2 cm margin on the top, bottom, and right, and 2 cm on the left. The manuscript should be at least 8 pages and no more than 15 pages, including the bibliography page.

Ideally, lectures on meteorology and climatology require appropriate teaching materials that enable students to observe and study weather and climate phenomena through a scientific stage. One of the scientific learning models that can help students learn about nature is the problem based learning (PBL) model (Moutinho et al., 2015). PBL raises real problems to be solved through analysis and discussion activities in small groups (Simone et al., 2014). PBL is useful for long-term knowledge retention, learning outcomes (Yew & Goh, 2016), supporting the development of critical thinking (Masek & Yamin, 2011) and creativity and imagination in constructing scientific knowledge (Moutinho et al., 2015). PBL done in groups can impro ve the ability to work together in teams (Mohd et al., 2012). PBL models when combined into worksheets by displaying real and contextual problems effectively improve critical thinking skills (Ragilia et al., 2018);(Dianti & Ambarita, 2018); (Masek & Yamin, 2011).

Worksheets play functions in different contexts, worksheets can serve as a complement to textbooks, add information (Lee, 2014) and can be used to construct and enhance students' knowledge and skills (James F. Kisiel, 2003). Worksheets are one of the teaching materials that can balance the development of aspects of knowledge, attitudes, and skills in one learning activity at the same time (Dina Syaflita, Asrizal, 2016). The use of student worksheets aims to optimize the achievement of learning objectives. The use of student worksheets in learning can increase student interest in science learning (Sládek et al., 2011). Student worksheets enable students to be more active and give positive responses in learning activities, as well as improve student learning outcomes (Celikler & Aksan, 2012);(Cahyani et al., 2016). Student Worksheets can help students actively present and discuss problem topics given in lectures to solve problems and draw conclusions through the stages of the process of logical and critical thinking (Dwijananti & Yulianti, 2010).

Student worksheets combined with PBL by presenting contextual problems are a form of teaching material development. Teaching materials that are developed before being used in learning must first be validated. According to Kelly in (Masuwai et al., 2016),), the instrument used in measuring a variable affects the quality of research results, the strength of the instrument in measuring what is being measured is called validity. Validation The student worksheet integrated problem based learning consists of four validations, namely content validity, construct validity, face validity, and criteria validity (Masuwai et al., 2016). Face validity refers to the language and clarity of the image (Ramdani, 2012). This can be translated into language validation and graphics.

He validity of student worksheets must be tested in advance for later to be used in learning, to obtain quality student worksheets, student worksheets must also be practical to use, so practicality needs to be tested. Because of the importance of product validity and practicality in obtaining quality learning, this study focuses on the validation and practicality

of student worksheets integrated problem based learning for meteorology and climatology subject.

METHOD

His type of research is research and development (R&D) research. The type of data in this study are validation data and practicality data. The data collection instrument used was a questionnaire using a 1-4 Likert scale. The validation instrument was assessed by three geography education lecturers and the practicality questionnaire was assessed by six product users, namely two geography education lecturers and four students through a limited test. Validation indicators used to evaluate the validation of student worksheets are content, construct, language, and graphic validation. The validation results obtained will be presented by descriptive method. The results of the validation are then converted to the validation criteria shown in Table 1.

Table 1. Validation Criteria of Student Worksheet

No	Persentage	Kriteria
1	3,4 ≤ R ≤ 4,0	High Valid
2	2,8 ≤ R ≤ 3,4	Valid
3	2,2 ≤ R ≤ 2,8	Enough Valid
4	1,6 ≤ R ≤ 2,2	Less Valid
5	R ≤1,6	Invalid

Practicality analysis technique used in this study is a Likert Scale. The final value of practicality is categorized as a percentage according to the provisions in table 2.

Tabel 2. Practicality Categories of Student Worksheet

No	Score	Criteria
1	80<p≤ 100	Very practise
2	60<p≤ 80	Practise
3	40<p≤ 60	Enough practise
4	20<p≤ 40	Less practise
5	0 ≤p≤ 20	Inpractise

RESULTS AND DISCUSSION

Results

The results of this study encompass two significant outcomes, namely the validation of student worksheets on cloud classification, air humidity, and air pressure, weather and climate measuring instruments, climate classification, and rainfall analysis, as well as the practicality of the developed worksheets.

3.1 Results of Validity Analysis

The student worksheets developed in this problem-based learning (PBL) research are worksheets on cloud classification, air humidity and air pressure, weather and climate measuring instruments, climate classification, and rainfall analysis. The validation results of PBL-based student worksheets in the meteorology/climatology course are presented in Figure 1.

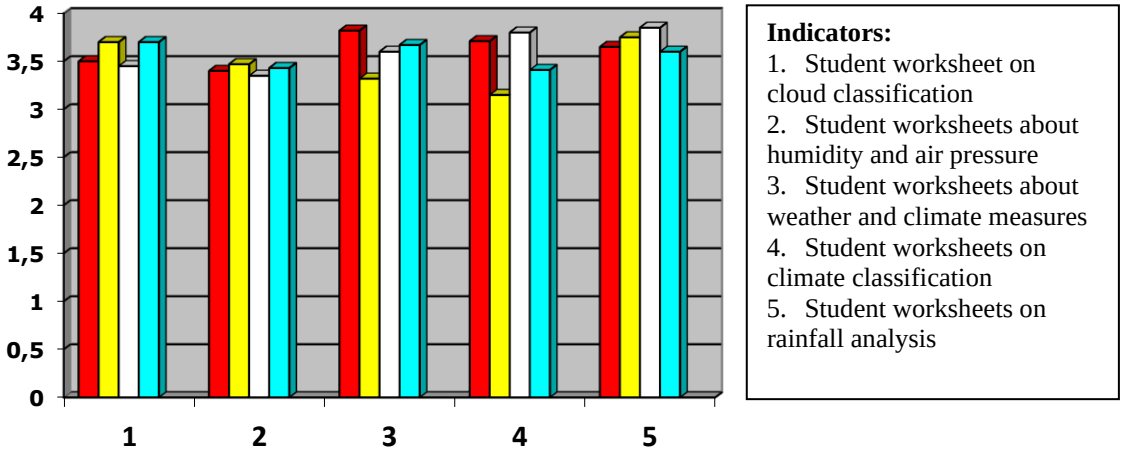

Figure 1. Results of Student Worksheet Validation Assessment
Source: Data processed (2019)

The red-colored diagram represents the results of the "Content Validity" assessment. Content validity consists of five indicators, namely: 1) The developed concepts align with the learning achievement indicators, 2) Student worksheets are arranged according to the accuracy of the knowledge, 3) Student worksheets are organized according to the depth of the material, 4) The assessment instrument aligns with the intended competencies to be assessed, and 5) The developed student worksheets demonstrate scientific learning. The content validity scores for each worksheet are above 3. Thus, it can be stated that the developed student worksheets are in the highly valid category, and for the student worksheets on humidity and air pressure, they are in the valid category.

The yellow-colored diagram represents the results of the "Construct Validity" assessment. Construct validity consists of four indicators, namely: 1) The developed student worksheets align with the problem-based learning stages, 2) Instructions or activity steps in the student worksheets are rational and follow the sequence of problem-based learning stages to be implemented, 3) Activities in the student worksheets allow students to be active in learning, and 4) The assessment items in the student worksheets cover the desired competencies. Based on Figure 1, it can be seen that the student worksheets on climate classification are in the valid category, and the other student worksheets are in the highly valid category.

The white-colored diagram represents the results of the "Language Validation" assessment. Language validation consists of five indicators, namely: 1) The grammar used conforms to the rules of good and correct Indonesian language writing, 2) The instructions provided are systematic, 3) The language used is not ambiguous, 4) Consistency in using terms/symbols, and 5) The terms used conform to the KBBI (Great Dictionary of the Indonesian Language) and/or agreed-upon technical terms in science. The language validation scores indicate that the student worksheets are in the highly valid category linguistically, and in the valid category for humidity and air pressure materials. Specifically for language validation, the student worksheets were also reviewed by two Indonesian language experts.

The blue-colored diagram represents the results of the "Graphical Validation" assessment. Graphical validation consists of four indicators, namely: 1) The text on the student worksheets is clear and readable, 2) The layout of images and tables is proportional,

3) The images are clear and assist in activities, and 4) The combination of colors and design of the student worksheets is appealing. The graphical validation scores for the student worksheets in general are in the highly valid category, and in the valid category for the student worksheets with climate classification materials.

The validation conducted yields two main outcomes, namely validation scores and improvement suggestions. The improvement suggestions obtained in this validation are as published by the (Arif & Syam, 2019) The validators suggest that the selected images should be real and appropriate to represent the objects being studied. The validator's suggestions for the climate classification material include incorporating all climate classification techniques into the student worksheets so that students can gain comprehensive skills and knowledge of the subject matter. Similarly, for the rainfall analysis material, it is recommended to add polygon and isohyet techniques. In the weather and climate measurement equipment material, the validator suggests providing instructions on how to use the measurement equipment as a group task. This is beneficial for campuses that lack weather and climate measurement equipment, as students who are unable to use the equipment yet will at least learn how to use it.

3.2 Practicality Analysis Results

The practicality of the product is analyzed based on a questionnaire filled out by lecturers and students who use the developed product. Practical response questionnaire contained statements related to the use of student worksheets using the PBL model in meteorology and climatology courses. For practicality analysis questionnaires used five measurement indicators namely easy to understand material, easy to understand instructions, student worksheet activities are easy to implement, tools and materials are easy to obtain, the time allocation provided is appropriate for activities on student worksheets.

The practicality questionnaire was given to two lecturers and four geography education students. This limited testing is used to see the practicality of the product in a small scale. If on a small scale the product is declared practical then it can be continued for testing on a larger scale. The results of the practicality questionnaire assessment by six respondents are shown in Figure 2.

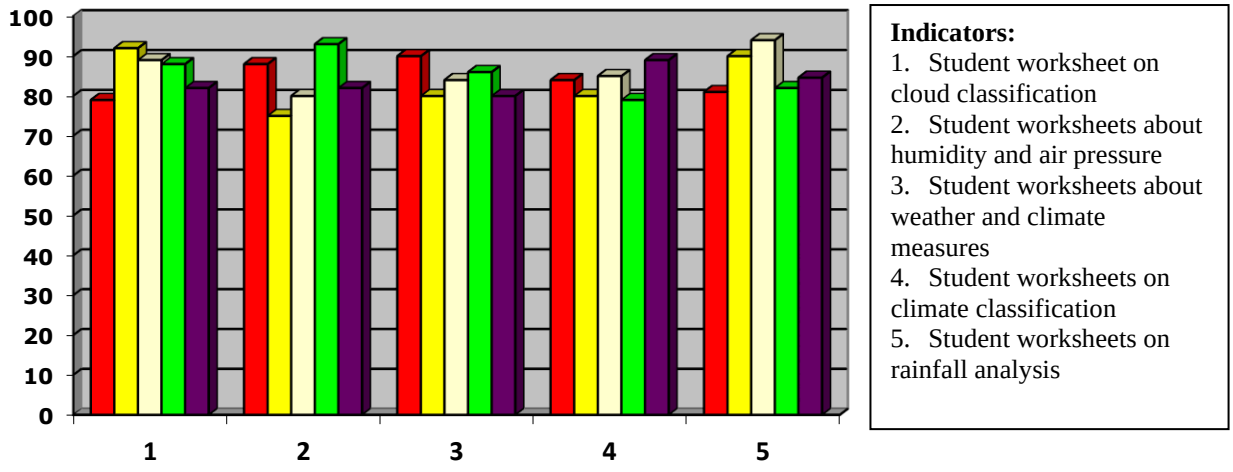

Figure 2. Student Practical Worksheet Assessment Results
Source: Data processed (2019)

The red diagram is the diagram of the assessment results of the indicator "Easy to understand material". Figure 2 shows that all student worksheets that are developed make it easier for students to understand lecture material. Yellow diagram is a diagram of the assessment results of the indicator "easy to understand instructions". In Figure 5, it can generally be stated that the instructions on student worksheets are made easy for students to understand. The white diagram is a diagram of the results of the assessment of indicators "Student worksheets are easy to implement". The green diagram is a diagram of the results of the assessment of indicators "Tools and materials easily obtained". The purple diagram is a diagram of the results of the assessment of the indicator "Time allocation does not take long".

The results of the practicality analysis of student worksheets with cloud classification material using five statement indicators show that this student worksheet is in a very practical category with an average value of 86.75. Student worksheets on humidity and air pressure material show this student worksheet in the category of very practical with an average value of 84. Student worksheets for weather and climate measuring instruments have practicality with a value of 85. Student worksheets climate classification students are in the practical category with an average value of 79.5%. Student worksheets on rainfall analysis material show that this student worksheets are in a very practical category with an average value of 87.5%.

Discussion

The student worksheet developed is a student worksheet that integrates problem-based learning models by presenting contextual problems in lectures. The student worksheet that was developed consisted of five materials namely cloud material classification, humidity and air pressure, weather and climate measurement tools, climate classification, and rainfall analysis. The material on the student worksheets developed was material on the subjects of meteorology and climatology.

Content validation shows how well the product being developed represents the curriculum or indicator to be achieved. Content validation for developed MFIs consists of five indicators whose values are in the valid to very valid categories. Suggestions and improvements for the validation of the contents of the MFI as already published by (Arif & Syam, 2019) are about achieving the learning boundary. In this case, if the LKM developed is LKM for climate and weather classification material, then students should get a complete activity and a broader understanding where students are able to classify climate and weather using various methods. Likewise with rainfall analysis material. According to Furqon in (Nurdyansyah, 2018), good teaching materials have properties where the substance discussed must include complete, correct, complete and actual competence. There are teaching materials that are informative and non-informative. Informative teaching materials (designed in full) are presented directly while noninformative teaching materials (designed in incomplete) are teaching materials that require the ability to think in order to develop competence (Ramdani, 2012); (Hernawan et al., 2012). Informative and non-informative about the nature of the teaching material, the body of competence it represents must remain intact.

The construct validation will show the extent of the suitability of the product developed with the theory and with other products that have a common concept or consistency (Ihsan, 2015); (Zulfaneti et al., 2016). The validation assessment of PBL integrated LKM constructs for meteorology and climatology courses developed in general from Figure 1 can be stated to be in

the valid to very valid categories. This shows the consistency of MFIs developed with theory. In addition, in construct validation there is also a predictive statement that the MFI allows active learning. According to (Ihsan, 2015), construct validation also includes predictive validation.

Language validation illustrates the readability and compliance with the Indonesian language study rules (Zulfaneti et al., 2016). Language validation describes how the use of language, terms, or symbols in student worksheets is integrated with the problem-based learning model developed. Good teaching materials must use good and correct Indonesian, standard, sentence adjusted to the level of user development, and help students understand the material (Hernawan et al., 2012); (Nurdyansyah, 2018). Based on Figure 1 regarding the results of product validation, it can be seen that the student worksheet writing integrated with the problem-based learning model that is developed is in accordance with the rules of good and correct Indonesian language study.

Validation of graphic and language can be classified into face validity (Masuwai et al., 2016). The grading validation assessment conducted by experts is more on the shape, size, fan format of the writing or image that is in the teaching material (Zulfaneti et al., 2016). Graphic validation refers to the assessment of layout, proportions, and suitability of images, colors, and writing (Arif & Syam, 2019).

The assessment of the quality of student worksheets developed in addition to validity is practical. The practicality of a product shows the value of whether users can work with certain interventions or treatment(Plomp, Jan van den Akker, Brenda Bannan, Anthony E. Kelly, Nienke Nieveen, 2007). The practicality of a product is assessed by users of the product itself, namely students and teachers. An assessment of the practicality of integrated student worksheets in the PBL model is more on ease of use, cost, and time efficiency of LKM usage time. Practicality research was also carried out by the efficiency of (Y P Sari and F Gazali, 2019), in his research the practical indicators assessed were ease of use, time efficiency, and benefits. Based on the results of practicality assessment in Figure 2, student worksheets are integrated with PBL for lectures on meteorology and practical climatology used in lectures.

CONCLUSION

Student worksheets validation is obtained through assessment of content validation indicators, constructs, language, and graphics. Vaidation assessment results that have been carried out stated that students worksheets developed are valid for use in learning. The results of the practicality analysis of the developed student worksheets can be concluded that the student worksheets for problem-based learning are easy to understand, easy to implement and easy to find the tools and materials needed in learning. Indicators of assessing the practicality of student worksheets include ease of use, cost efficiency and time efficiency of implementation. Based on the results of the validity and practicality analysis, the MFI integrated problem based learning is very valid and practical to use so it makes learning more interesting and interactive.

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