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DEVELOPMENT OF STUDENT WORKSHEET BASED ON CONTEXTUAL TEACHING AND LEARNING

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ABSTRAK

Peserta didik mengalami kesulitan dalam memahami pembelajaran matematika pada materi perbandingan, terutama penerapannya dalam kehidupan sehari-hari. Selain itu belum tersedianya Lembar Kerja Peserta Didik (LKPD) berbasis Contextual Teaching and Learning pada materi perbandingan. Penelitian ini merupakan penelitian pengembangan yang bertujuan untuk menghasilkan dan mengetahui kelayakan Lembar Kerja Peserta Didik (LKPD) dengan pendekatan CTL pada materi perbandingan. Metode penelitian ini merupakan Research and Development (R&D) dengan berdasarkan model ADDIE yang terdiri dari lima tahapan, yaitu Analysis, Design, Development, Implementation, dan Evaluation. Subjek penelitian ini adalah ahli materi, ahli media dan peserta didik kelas VII E SMP Muhammadiyah 9 Yogyakarta. Instrumen pengumpulan data penelitian ini adalah wawancara dan angket. Hasil yang diperoleh dari validasi ahli materi dengan rata-rata skor sebesar 139 termasuk pada kriteria baik sedangkan rata-rata skor validasi ahli media sebesar 172 dengan kriteria sangat baik. Berdasarkan hasil respon peserta didik diperoleh rata-rata sebesar 61,32 yang termasuk pada kriteria baik. Hal ini dapat disimpulkan bahwa Lembar Kerja Peserta Didik Berbasis Contextual Teaching and Learning pada materi perbandingan layak digunakan.

Kata Kunci: LKPD, Contextual Teaching and Learning, Perbandingan

ABSTRACT

The students had difficulty in understanding comparative material in mathematics subject, especially its application in everyday life. In addition, there was no Contextual Teaching and Learning-Based Student Worksheet (LKPD) on comparative material. This research belonged to a development research that aimed to produce and determine the feasibility of Student Worksheet (LKPD) with CTL approach on comparative material. This research used Research and Development (R&D) method based on ADDIE model consisting of five phases: Analysis, Design, Development, Implementation, and Evaluation. The subjects of this research were material experts, media experts and students of class VII E SMP Muhammadiyah 9 Yogyakarta. Data collection instruments of this research were interview and questionnaire. The validation results by material experts obtained an average score of 139 with good criteria, while the validation results by media experts obtained an average score of 172 with very good criteria. Based on the results of student responses, it was obtained an average score of 61.32 with good

criteria. Therefore, it can be concluded that the Contextual Teaching and Learning-Based Student Worksheet on comparative material was feasible to use.

Keywords: *Student Worksheet, Contextual Teaching and Learning, Comparative*

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I. INTRODUCTION

Education plays a crucial role in all areas of life. Education quality is a direct consequence of the current change and development of learning (Sutjipto in Latifah, 2016). One of the determining factor of success in the educational process is intelligence level and thinking ability possessed. In an effort to increase intelligence and thinking ability, humans must master science. Development of science includes improvement of applied science and basic science, and mathematics is a subject in education. According to Ibrahim & Suparni, (in Hakim, 2014), mathematics as a universal science that underlies the development of modern technology, has an important role in various disciplines and improves human's thinking ability. According to Risnawati (in Dianita, 2016), the purpose of learning mathematics in schools is more emphasized on the arrangement of reasoning, basic and attitude formation, as well as skills in the application of mathematics. Therefore, it is expected that students can master mathematical concepts well. Learning as a process is a system that cannot be separated from other components that interact with one another. A component in learning process is learning resources. Learning resources play a crucial role in preparation of teaching materials. **Teaching materials are all materials (both information, tools, and texts)** completely compiled from the competencies to be mastered by students and used in the learning process with the aim of planning and examining the learning implementation (Prastowo, 2015:17), such as student worksheets (LKPD), modules, leaflets, handouts, teaching materials with audio, and other teaching materials.

According to Prastowo (2015: 204), student worksheet is a printed teaching materials in the form of sheets of paper containing materials, summaries and instructions for the implementation learning tasks to be carried out by students, which refer to the basic competencies to be achieved. According to Department of National Education in Prastowo (2015: 208), student worksheet consists of six key elements, namely title, study instruction, basic competencies/subject materials, supporting information, work steps and evaluation. In addition, the use of student worksheet has benefits in the learning process, including to activate students in the learning process. According to Darmodjo and Kaligis (1992, 41-42) (in Salirawati, 2006), during the preparation, student worksheet must meet three requirements, namely didactic requirements, construction requirements and technical requirements. Based on the description, student

worksheet can be used as a guideline, so that students can carry out activities actively in learning and help direct students to construct the knowledge that has been studied to solve mathematical problems, especially those related to everyday life.

Based on the interview conducted at SMP Muhammadiyah 9 Yogyakarta, the teaching materials in learning activities at the school were limited. Teachers and students need teaching materials in the form of student worksheet to optimize the learning process. According to the students, they find it difficult to learn mathematics through only an explanation from the teacher, they better understand the subject through sample and practice questions in the student worksheet. The students are interested to use student worksheet because it has concise materials and steps to solve math problems. According to the teachers at SMP Muhammadiyah 9 Yogyakarta, the teaching materials used by the teacher during learning in the classroom are textbooks, modules and student worksheet, but the available student worksheet is only on linear equations in one variable. Mathematics learning in the classroom has not been effective because it was teacher-centered learning. In addition, student worksheet to encourage students to make connections between their knowledge and its application in their daily lives was not available. Contextual Teaching and Learning is a learning approach to be used by teachers to develop student worksheet.

Contextual Teaching and Learning (CTL) approach is a learning concept that helps teachers link the material being taught with students' real-world situations and encourages students to be able to contain the relationship between their knowledge and its application in their daily lives as family and community members (Siregar and Nara, 2015: 117). CTL approach has seven main components of Contextual Teaching and Learning, namely Constructivism, Inquiry, Questioning, Learning Community, Modeling, Reflection, Authentic Assessment. Comparison is a foundation for learning mathematics, science and is useful in the real world and various situations in everyday life (Utari, et al. 2015). Comparison was chosen as material for the development of student worksheet because the students felt that comparative material was difficult as the students were given only few examples of comparative materials in everyday life. Then, comparison was chosen as the material for the development of student worksheet because student worksheet on comparative material was not available at SMP Muhammadiyah 9 Yogyakarta, given that comparison was closely related in everyday life.

Based on the explanation above, the researcher was interested in conducting a research on "Development of Contextual Teaching and Learning-Based Student Worksheet (LKPD) on Comparative Material".

II. METHOD

The research used ¹ Research and Development (R&D) method using ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). ¹ Research and Development (R&D) method can be interpreted as a scientific method to research, design, produce, and test the validity of resulting product (Sugiyono, 2015:30).

¹ Research and Development (R&D) method can be interpreted as a scientific way to research, design, produce, and test the validity of the resulting product (Sugiyono, 2015:30).

Analysis phase refers to the collection of information on learning needs. At analysis phase, the researcher analyzed the needs of teaching materials, materials and curriculum to serve as a reference to develop student worksheet. At design phase, the researcher collected sources and references of the student worksheet, designed contents of the student worksheet, and compiled research instruments. At the development phase, the researcher created and assembled contents of student worksheet described in the design phase. It consists of 2 phases, namely student worksheet writing phase, and validation and assessment phase. At implementation phase, the student worksheet was implemented to a real situation or in the classroom to determine the feasibility of student worksheet in the learning process. At the implementation phase, work sheet trial was conducted on Class E students at SMP Muhammadiyah 9 Yogyakarta. Then, the students responded to the developed student worksheet by filling out a questionnaire. The trial was held on March 25, 2021 attended by 31 students. ³ Lastly, evaluation phase is a process to determine whether the product can be used or not. ³ The results of validation by material experts and media experts, as well as a questionnaire on the results of product trials were evaluated.

In this study, two types of data were used, namely qualitative and quantitative data. Data collection instruments used in this study were interview and questionnaire. The assessment questionnaire by material experts includes content feasibility, presentation feasibility, and contextual assessment. Assessment by media experts includes graphic feasibility and language feasibility, while assessment by students includes student responses. In this study, the questionnaire used a Likert scale with a check-list method on each assessment item. The Likert scale has a rating scale ranging from Very Good (5), Good (4), Fairly Good (3), Fair (2), and Poor (1).

Data analysis technique was used to analyze each questionnaire item. The data obtained based on the results of questionnaires from experts and student responses were qualitative data converted into quantitative data using a Likert scale. Then, the average score was determined. After determining the average score obtained from the assessment by experts and student responses, the data was then converted into qualitative data based on the ideal assessment criteria. The ideal assessment criteria can be seen in the following table:

Table 1. Ideal Assessment Criteria

No	Score	Criteria
1	¹ $\bar{X} > \bar{X}_i + 1.80 SB_i$	Very Good
2	$\bar{X}_i + 0.60 SB_i < \bar{X} \leq \bar{X}_i + 1.80 SB_i$	Good
3	$\bar{X}_i - 0.60 SB_i < \bar{X} \leq \bar{X}_i + 0.60 SB_i$	Fairly Good
4	$\bar{X}_i - 1.80 SB_i < \bar{X} \leq \bar{X}_i - 0.60 SB_i$	Fair
5	$\bar{X} < \bar{X}_i - 1.80 SB_i$	Poor

Source: Widoyoko (2019:238)

Description:

\bar{X}_i = Ideal mean

$\bar{X}_i = \frac{1}{2} \times (\text{ideal maximum score} + \text{ideal minimum score})$

SB_i = ideal standard deviation

$SB_i = \frac{1}{6} \times (\text{ideal maximum score} + \text{ideal minimum score})$

\bar{X} = validity score

with,

Ideal maximum score = number of criteria items \times highest score

Ideal minimum score = number of criteria items \times lowest score

III. RESULT AND DISCUSSION

Trial data in the development of Contextual Teaching and Learning-based Student Worksheet on comparative material for class VII students at SMP Muhammadiyah 9 Yogyakarta includes Analysis, Design, Development, Implementation, and Evaluation. .

a. Analysis

Analysis phase consists of analysis of the needs for teaching materials, material and curriculum. The results of analysis of the needs for teaching materials were as follows: (1) Teaching materials used in classroom learning were limited; (2) Teaching materials used by teachers in classroom learning were only math textbooks; (3) The teachers used lecture method to teach the class; (4) Teaching materials in the form of Contextual Teaching and Learning-based Student Worksheet were not available at SMP Muhammadiyah 9 Yogyakarta; (5) Many semester 2 students experienced difficulties in understanding the materials, including comparative material; (6) The students needed to be accompanied by a teacher during assignment. The result of material analysis indicated that comparison was the

selected material because according to the teacher's teaching experience, comparative material was considered difficult by the students. Meanwhile, the results of curriculum analysis were as follows: (1) Core Competence (KI) used was KI 3 on knowledge and KI 4 on skills, while Basic Competence (KD) used was KD 3.4; (2) Competency Achievement Indicators.

b. Design

Design phase consists of 4 steps: make an outline of student worksheet contents, prepare the design of student worksheet contents, collect sources or references and compile an assessment instrument. In the step of making an outline of student worksheet contents, the results indicated that there were 4 main activities to develop student worksheet, namely activity 1 (understanding comparison, activity 2 (comparison worth), activity 3 (comparison turns value), and activity 4 (scale). The next step is to prepare the design of student worksheet contents, the results indicate that the developed student worksheet consists of 3 parts as follows: (1) initial part (front cover, inside cover, student worksheet identity, acknowledgement, table of contents, competencies, instructions for use, student worksheet symbols, and concept maps); (2) the content consists of 4 key parts where each activity consists of Constructivism, Inquiry, Questioning, Learning Community, Modeling, Reflection, Authentic Assessment; (3) Closing (conclusion of evaluation questions, answer keys, assessment guidelines, references)

In the step of collecting sources and references, the results indicated that references were examined to be used for the preparation of materials in the developed student worksheet. In the final step of compiling the assessment instrument, the results indicate that assessment instrument of material expert consists of 34 items covering aspects of content feasibility, presentation feasibility and contextual assessment; assessment instrument of media expert consists of 36 items covering aspects of graphic feasibility and language feasibility, while the questionnaire of student response consists of 16 assessment items.

c. Development

At the development phase, the design of student worksheet was realized. The phase has the following steps: (1) Writing student worksheet using Microsoft Word 2013 software. In writing student worksheet, the author used Indonesian in accordance with the General Guidelines for Indonesian Spelling; (2) Validation and assessment aims to ensure that the developed product receives assessment and input from experts. Based on the validation, it was found several students worksheet shortcomings. Then, the shortcomings were corrected according to suggestions from the validator.

d. Implementation

Histogram: ² **Jurnal Pendidikan Matematika, Vol (No), Tahun - Halaman**
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At the implementation phase, student worksheet trial was conducted on Class VII E students at SMP Muhammadiyah 9 Yogyakarta. The trial was attended by 31 students on March 25, 2021. The trial was carried out by giving student worksheet and questionnaire to students, the questionnaire was used to obtain student assessment data regarding the quality of the developed student worksheet.

e. Evaluation

The last phase is student worksheet evaluation. Evaluation is a process to determine whether the product can be used or not. The evaluation of ³ validation by material experts and media experts, as well as a questionnaire on the results of product trial. The following are figures of the developed worksheet.

1. Initial Part

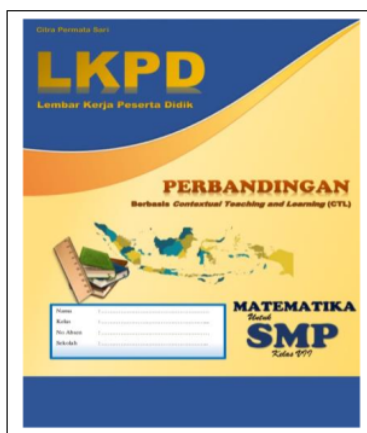


Figure 1. Front Cover

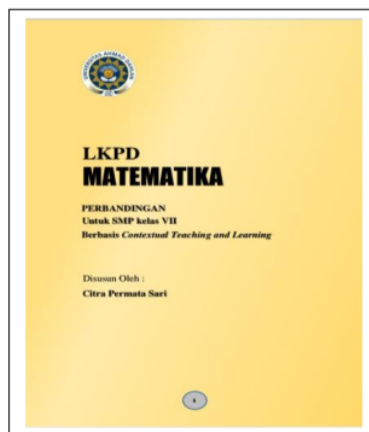


Figure 2. Inside Cover

2. Content

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The content consists of 4 key parts where each activity consists of Constructivism, Inquiry, Questioning, Learning Community, Modeling, Reflection, Authentic Assessment. One of the activities in the student worksheet can be seen in the figure below.



Figure 3. Activity 1

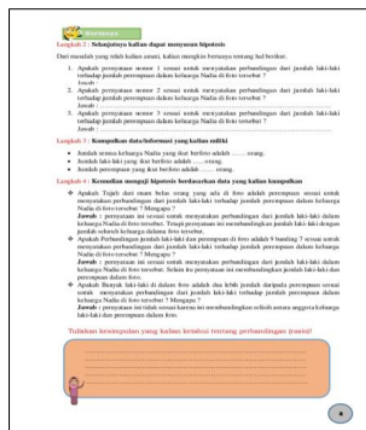


Figure 4. Continuation of Activity 1

3. Final Part

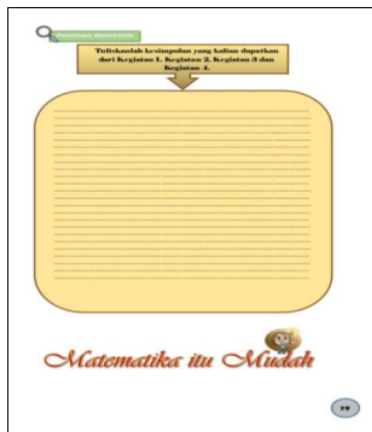


Figure 5. Authentic Assessment

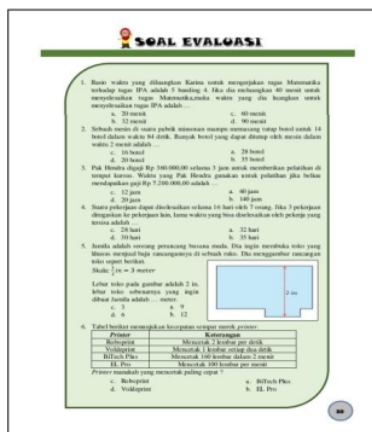


Figure 6. Evaluation Questions

Product Quality by Material Expert

Material feasibility of the developed student worksheet was assessed by two material experts, Mrs. Dian Ariesta Y., M.Sc as a lecturer in the Mathematics Education Study Program at Ahmad Dahlan University and Mr. Arif Masyari, S.Pd as a mathematics teacher at SMP Muhammadiyah 9 Yogyakarta. The assessment of student worksheet by the material experts can be seen in the table below.

Table 2. Assessment of Student Worksheet by Material Experts

No	Name of Material Expert	Score	Quantitative Data Criteria
1	Dian Ariesta Y., M.Sc	142	Good
2	Arif Masyari, S.Pd	136	Good
Total Score		278	
Average Score		139	Good

Table 3. Ideal Assessment Criteria by Material Expert

Score Range	Criteria
$\bar{X} > 142.68$	Very Good
$115.56 < \bar{X} \leq 142.68$	Good
$88.44 < \bar{X} \leq 115.56$	Fairly Good
$61.32 < \bar{X} \leq 88.44$	Fair
$\bar{X} < 61.32$	Poor

Based on ideal assessment criteria by material experts in table 3, ¹ the average score of the results of questionnaire assessment by material experts is 139 as seen in Table 2. This indicates that the developed student worksheet in terms of material is included in good criteria.

Product Quality by Media Expert

Media feasibility of the developed student worksheet was assessed by a media expert, Mr. Syariful Fahmi, M.Pd as a lecturer in the Mathematics Education Study Program at Ahmad Dahlan University. The following are the assessment results by media experts:

Table 4. Assessment Results of Student Worksheet by Media Expert

No	Name of Media Expert	Score	Quantitative Data Criteria
1	Syariful Fahmi, M.Pd	172	Very Good
Total Score		172	
Average Score		172	Very Good

Table 5. Ideal Assessment Criteria by Media Expert

Score Range	Criteria
$\bar{X} > 151.2$	Very Good
$122.4 < \bar{X} \leq 151.2$	Good
$93.6 < \bar{X} \leq 122.4$	Fairly Good
$64.8 < \bar{X} \leq 93.6$	Fair
$\bar{X} < 64.8$	Poor

Based on ideal assessment criteria by media expert in Table 5, ¹ the average score of the results of questionnaire assessment by media expert is 172 as seen in Table 4. This indicates that the developed student worksheet in terms of media is included in good criteria.

Product Criteria by Student Response

Students' responses to the developed student worksheet can be seen from the results of questionnaire distributed during the trial. The following are the calculation results of students' responses:

Table 6. Assessment Results of Student Worksheet by Student Response

Respondent	N	Min	Max	Sum	Mean	Std. Deviation	Variance
Student	31	48	78	1901	61.32	7.15	51.12

Table 7. Ideal Assessment Criteria by Student Response

Score Range	Criteria
$\bar{X} > 67.206$	Very Good
$54.402 < \bar{X} \leq 67.206$	Good
$41.598 < \bar{X} \leq 54.402$	Fairly Good
$28.794 < \bar{X} \leq 41.598$	Fair
$\bar{X} < 28.794$	Poor

Based on ideal assessment criteria by student response in table 7, the average score of the results of the questionnaire assessment by student response is 61.32 as seen in Table 6. This indicates that the developed student worksheet in terms of student response is included in good category. Based on the research results from material experts, media expert and student responses, the student worksheet is included in good criteria. Therefore, the student worksheet is feasible to use.

IV. CONCLUSION

Based on previous research conducted by Musbihin (2017) entitled "Development of Student Worksheet (LKS) Using Contextual Teaching and Learning (CTL) Approach on Basic Material of Set with Mathematical Critical Thinking-Based Questions for Junior High School", the purpose of this research was to determine the feasibility of student worksheet using Contextual Teaching and Learning (CTL) approach with mathematical critical thinking-based questions and to determine the responses of students and teachers to the developed student worksheet. Based on the data analysis obtained from material experts and media expert, it was stated that the developed student worksheet was feasible to use, and the data analysis obtained from students and teachers stated that the developed student worksheet was interesting. It means that the student worksheet developed by the researcher can be used as a learning resource for class VII students and teachers at Junior High School.

Based on the results of previous research, the developed Contextual Teaching and Learning-Based Student Worksheet on Comparative Material at SMP Muhammadiyah 9 Yogyakarta received a good response. The results from material expert validation obtained an average score of 139 included in good criteria. Meanwhile, the results of media expert validation obtained an average score of 172 included in very good criteria. Further, the results of students' responses obtained an average score of 61.32 included in good criteria. In addition, the developed student worksheet was in accordance with the Contextual Teaching and Learning components. The results in terms of the assessment of Contextual Teaching and Learning (CTL) components by material experts obtained an average score of 37.5 included in good criteria. The results of data validation by material experts and media expert, as well as student responses indicated that the student worksheet was in good criteria. It means that the student worksheet developed by the researcher was feasible to use and utilize in learning activities.

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