

DEVELOPMENT STUDENT'S WORKSHEET BY INSTILLING MATHEMATICAL CREATIVE THINKING ABILITY ON SETS THEORY STUDENTS GRADE VII

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ABSTRACT

This research was aims to know the development procedure, validity, practicality, and effectiveness of the student's worksheet by instilling mathematical creative thinking ability on junior high school student are that meets valid and practical criteria, as well to know the effectiveness of student's worksheet towards student's mathematical creative thinking ability at SMP Muhammadiyah 2 Depok Sleman in the academic year 2019/2020. The types of research that were conducted the development research. The model used in this research was the ADDIE (Analysis, design, development, implementation, evaluation) model. The subject in this research was student's grade VII at SMP Muhammadiyah 2 Depok Sleman, with the subject of the small-scale trials were five students, and the subject of the big-scale trials were 29 students. In this research, the data collection instruments with the validation test questionnaire for material experts and media experts, the student's response questionnaire, and the student's creative thinking test sheet. The data analysis technique used in this research was data analysis of validity, practicality, and effectiveness. The research outcomes based on validation test of student's worksheet include in category valid from validation of material experts with the average percentage of assessment of material expert is 4,1 with valid category ($3,4 < \bar{x} \leq 4,2$) and validation of media experts with percentage average was 3,8 with valid category ($3,4 < \bar{x} \leq 4,2$). While from and student's response questionnaire, the student's worksheet was 3,4 with practical category ($2,8 < \bar{x} \leq 3,4$), and from effectiveness with the percentage of classical learning completeness student was 72,4 with good category ($60 \leq P < 80$). Students' worksheets by instilling mathematical creative thinking ability are valid, practical, and effective in learning.

Keywords: Development, Student's Worksheet, Mathematical Creative Thinking

INTRODUCTION

In this globalization era, creative thinking needs to be developed to compete because, in the future, the competition will be tighter. Many technologies are now created are also creative from an individual. The life of creative people will be more successful because, with his creativity, he can create something new and varied with his ideas that he has. In other words, creative needed in determining one's future. Education has a decisive role in developing and realizing the individual self, especially for the nation and state development. A culture's progress depends on how the culture recognizes, respects, and utilizes human resources, which is closely related to education quality given to community members and students'. The purpose of education is to provide an enabling environment for students to develop their talents and abilities optimally to manifest themselves and function entirely and according to their personal needs and community needs.

Creativity operationally can be expressed as "the ability that reflects fluency, flexibility, and originality in thinking, and also the ability to describe (developing, enriching, detailing) an ideas" according to Munandar, S.C.U. (in Munandar, S.C.U., 1987: 50). In the education of creative thinking often used in solving the problem by developing a certain idea that is different from the others, and think flexibly or can see a problem from a different perspective, and can provide very detailed answers or fluency in conveying ideas they have. According to Maslow (in Munandar, S.C.U., 2004), creativity, besides meaningful both for self-development or community development, is also one of the basic human needs, namely the need for self-realization, one of the highest needs for all humans. According to Enco (Kenedi, 2017) explained, creativity is the ability that every student has to create all things new, even if

that was old things, or can be called things that already not new. However, creative students will surely develop new and old things, which is called innovative. Munandar, S.C.U. (2004) described that everybody has a creative talent and can express their creativity, even though they are in different fields and degrees. The most important thing for the world of education is that this talent can be developed and improved.

Creative thinking has several characteristics as described by Munandar, S.C.U., (1987) that the characteristics of creative thinking abilities (aptitude) are divided into five namely: fluent thinking skills, flexible thinking skills, original thinking skills, detailing thinking skills (elaborating), and assess skills (evaluating). According to Guilford (in Munandar, 1987: 45) define creativity or creative thinking, seeing various possible solutions to a problem. Creativity is also a form of thought which until now, has received less attention than informal education.

There are many types of teaching materials that can be used in learning mathematics. Besides textbooks and modules, teachers also often use student worksheets (LKPD) or formerly better known as student worksheets (LKS). In the learnings classroom, there are still rarely student worksheets by instilling student's creative thinking abilities. When students are given a student worksheet, then they will only solve it in the same ways like the example given. They do not want to think of a different way because, according to them, it was too difficult. Therefore, it is necessary to further develop student worksheets by instilling good creative thinking skills and making it easy for student understanding to attract student interest to be more active in learning and more creative in solving problems. According to Kaymakci (Fitri Merdianingsih, and friends. 2017), student worksheets are one of the printed teaching materials that teachers can use to help students know knowledge and skills and provide an objective assessment more active in learning inside and outside school.

Based on the researcher's observations on October 31, 2019, at SMP Muhammadiyah 2 Depok Sleman, the researcher gave 3 test questions to students to determine the level of student's creative thinking abilities. Indicators of the ability to think creatively used include fluency, flexibility, and detail. The test results are as follows: fluency by 48%, flexibility by 52%, and detail by 38%. This value indicates that the level of student creative thinking belongs to the low category.

From the test results, it is also known that students understanding of sets theory is still in the low category because the value of almost all students is below average. From the observation results, student worksheets used by teachers in learning in the school obtained results that student worksheets used by teachers still do not contain indicators of creative thinking, so that the student worksheets used still have not instilled the ability to think creatively on students.

Based on the description that has been explained above, the writer took title "Development Student's Worksheet by Instilling Mathematical Creative Thinking Ability on Sets Theory Students Grade VII at SMP Muhammadiyah 2 Depok Sleman in Academic Year 2019/2020", with this research is hoped that students become more creative in solving mathematical problems through student worksheets.

This research can be formulated as follows: 1) what is the procedure development of student worksheets by instilling student's creative thinking ability? 2) How is the validity of student worksheets developed by instilling students' creative thinking ability? 3) How is the practicality of student worksheets developed by instilling students' creative thinking ability? 4) How is the effectiveness of student worksheets developed by instilling students' creative thinking ability?

METHODS

This research used development research that produces products in learning media with ADDIE development models. The product produced is the student's worksheet by instilling mathematical creative thinking ability.

This research was conducted at SMP Muhammadiyah 2 Depok Sleman, located at Jalan Turi 1 Jalan Gempol Raya Number 6, Dero, Condongcatur, Depok, Sleman, Special Region of Yogyakarta with research subject were students grade VII in the academic year 2019/2020. The research was conducted from June 5, 2020, until June 10, 2020. The students' worksheet product's test subjects with the sets theory

were grade VII students SMP Muhammadiyah 2 Depok Sleman. With information, some grade VII students are subject to small-scale field trials, while students of grade VII are the subjects of large-scale field trials. Based on the development model used, the following are the stages of developing the ADDIE model that researchers do.

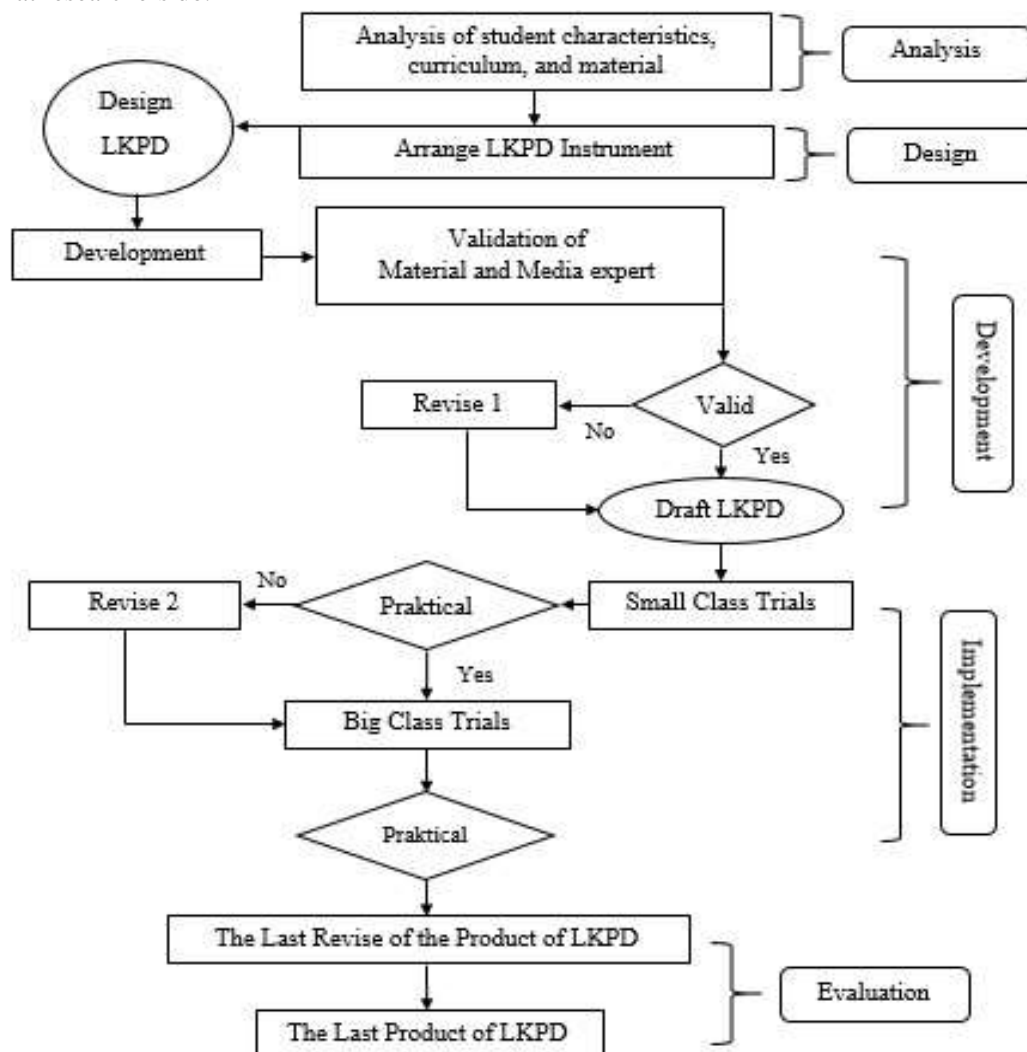


Figure I. ADDIE Model Development

Data analysis techniques were conducted to obtain suitable student worksheets and quality that met valid, practical, and effective criteria. Data analysis techniques in this research are divided into three, namely;

- Data Analysis Validity Student Worksheets. Student worksheet assessment data were obtained from a product assessment questionnaire that has been filled out by the validator lecturer. Determined the validity of student worksheets by calculating the average total score given by each evaluator, then compared with the average total score with the assessment criteria of student worksheet quality.
- Data Analysis Practicality Student Worksheets. Practicality data analysis techniques were obtained from the results of student response questionnaires. Determined the practicality of student worksheets by calculating each aspect's average score and an average overall score, then converted became a qualitative value by the criteria.
- Data Analysis Effectiveness Student Worksheets. Effectiveness data analysis techniques were obtained from the test results of the student's creative thinking question. The effectiveness criteria are used based on the minimum completeness criteria in the class that is 70 and achieve completeness percentage of minimum learning outcomes with good categories.

RESULTS AND DISCUSSION

This research conducted was development research. The product developed in this research is a student's worksheet by instilling mathematical creative thinking ability on sets theory for junior high school students. This research used the ADDIE (Analysis, design, development, implementation, evaluation) development model. The quality of these student worksheets was reviewed from validity, practicality, and effectiveness aspect.

The validity data of student worksheets were obtained and analyzed by calculating the total score from each instrument by changing the average score into qualitative data by the assessment criteria adopted from Widoyoko (2009). The table of the result of the assessment of student worksheets validity analysis is presented at the following Likert Scale table.

Table 1. Validity Criteria of Student Worksheets

Average Interval Score	Classification
$\bar{x} > 4,2$	Very Valid
$3,4 < \bar{x} \leq 4,2$	Valid
$2,6 < \bar{x} \leq 3,4$	Quite Valid
$1,8 < \bar{x} \leq 2,6$	Less Valid
$\bar{x} \leq 1,8$	Very Less Valid

(Widoyoko, 2009)

Material expert validation was obtained by filling in an assessment questionnaire on each aspect of the assessment consisting of 4 aspects and 25 questions. The result data of the validity of the material expert is presented in the following table.

Table 2. Material Expert Validation Data

Validator	Student Worksheets Assessment Score Of Material Expert			
	Content Feasibility Aspect	Language Feasibility Aspect	Presentment Feasibility Aspect	Aspect Of Conformity With Creative Thinking
Validator 1	52	16	19	12
Validator 2	55	17	21	13
Average	4,1	4,1	4	4,2
Criteria	Valid	Valid	Valid	Valid

Media expert validation was obtained by filling in an assessment questionnaire on each aspect of the assessment consisting of 3 aspects and 20 questions. The result data of the validity of the media expert is presented in the following table.

Table 3. Media Expert Validation Data

Validator	Student Worksheets Assessment Score Of Media Expert		
	Content Feasibility Aspect	Presentment Feasibility Aspect	Graphics Feasibility Aspect
Validator 1	16	16	44
Average	4	4	3,6
Criteria	Valid	Valid	Valid

Practicality data were obtained based on student response questionnaire of grade VII towards the use of student worksheets. Guidelines for changing the average score of each aspect into qualitative data are shown in the following table:

Table 4. Classification Guidelines Assessment of the Practicality of Student Worksheets

Average Interval Score	Classification
$\bar{x} > 3,4$	Very Practical
$2,8 < \bar{x} \leq 3,4$	Practical
$2,2 < \bar{x} \leq 2,8$	Quite Practical
$1,6 < \bar{x} \leq 2,2$	Less Practical
$\bar{x} \leq 1,6$	Very Less Practical

(Widoyoko, 2009)

Students' response questionnaire in small class trials against student worksheets developed can be seen in the following table.

Table 5. The Result Score of the Response Questionnaire of Students in Small Class Trials

Respondents	Total Score
Result response questionnaire student to student worksheets	205
Average	2,7
Category	Quite Practical

The students' response questionnaire in significant class trials against student worksheets developed can be seen in the following table.

Table 6. The Result Score of the Response Questionnaire of Students in Big Class Trials

Respondents	Total Score
Result response questionnaire student to student worksheets	1268
Average	3,4
Category	Practical

The effectiveness data were obtained based on the questionable practice of students' creative thinking abilities of grade VII students against student worksheets. The effectiveness criteria used are based on the minimum completeness criteria in the class that is 70 and achieve completeness percentage of minimum learning outcomes with good categories. Categorize the percentage of students' completeness based on the table of classical learning completeness criteria shown in the following table.

Table 7. Classical Learning Completeness Criteria

Percentage of Completeness (%)	Criteria
$P > 80$	Very Good
$60 < P \leq 80$	Good
$40 < P \leq 60$	Pretty Good
$20 < P \leq 40$	Less Good
$P \leq 20$	Very Less Good

(Widoyoko, 2009)

Information:

P = the percentage of completeness learning classical

The recapitulation of the result of the question practice students' creative thinking ability class VII produces the following percentage of students' learning completeness. Calculating the percentage of students' completeness learning with formulas:

$$P = \frac{\text{Many students complete}}{\text{many students take the test}} \times 100$$

$$P = \frac{21}{29} \times 100$$

$$P = 72,4$$

Based on the research result that already described earlier, the development of the learning device of student worksheets using ADDIE development models consisted of stages that are: Analysis, Design, Development, Implementation, and Evaluation. Producing a learning device in the form of student worksheets by instilling mathematical creative thinking ability for junior high school grade VII students with valid, practical, and effective criteria.

At the stages of Analysis, do Analysis of student characteristics, curriculum analysis, and material Analysis. At the curriculum stage, an Analysis was obtained learning implementation plan that already includes basic competencies, core competencies, indicators, and learning objectives and the rules of the learning implementation plan in the curriculum used. The available student worksheets have no helped students in instilling mathematical creative thinking ability. This thing can be seen from the question practice results that students' creative thinking ability was low. At the student analysis stage, based on the result of the interview against the teacher's known that students' ability in learnings mathematics can be said to be moderate. Learners also still depend on the teacher's explanation, so the students still find it difficult if given more complex questions. The researcher adjusted the material to the 2013 curriculum appropriate to its existing curriculum material analysis stage. The results of this material analysis produce information related to the material that will be presented in the student worksheets.

At the design stage, the authors do compile student worksheet instruments, then design student worksheets. At this stage, the author has begun designing student worksheets by instilling students' mathematical creative thinking ability. Researchers' material in this research is sets theory that meets the valid category by material expert and the media expert. In this study, the assessment instruments were student worksheets, assessment sheets, student responses, and question practice instruments.

At the development stage, the researcher develops to develop the learning device and validation the learning device. At this stage, the student worksheets approved by the advisor lecturer are validated by the validator, namely the material expert and the media expert. The result of this validation determines the validity of the student worksheets that have been developed. Before the product was trialed to the research subject, the researcher makes revisions according to the validators' comments and suggestions.

At the implementation stage, student worksheets products were declared valid by experts, and then the product was trialed to the respondents. Namely, students grade VII at SMP Muhammadiyah 2 Depok Sleman. The learning device trials were conducted two times, namely for trials in small classes and large classes. Students on this small class trials are randomly selected. The number of trial participants is five students. Large class trials are conducted by providing that already revised student worksheets according to students' response during small class trials. Participants in this large class trial totaled 29 students.

The researchers begin to analyze the research result data at the evaluation stage, namely the validity analysis of student worksheets from the material expert lecturer and media experts and student worksheets practicality analysis from student response questionnaires. Then, revise the learning device that area developed by unmet needs.

Based on the results of data analysis obtained from the material expert, on the aspect of content feasibility obtain an average value of 4,1 with good category ($3,4 < \bar{x} \leq 4,2$), on the aspect of language feasibility, obtain an average value of 4,1 with good category ($3,4 < \bar{x} \leq 4,2$), on the aspect of presentment feasibility, obtain an average value of 4 with good category ($3,4 < \bar{x} \leq 4,2$), and on the aspect of conformity with creative thinking obtain an average value of 4,2 with good category ($3,4 < \bar{x} \leq 4,2$). Based on the Analysis of the data obtained, it can be concluded that the development of the student's worksheet by instilling mathematical creative thinking ability valid and feasible to use in terms of material. Based on the results of data analysis obtained from the media expert, on the aspect of content feasibility obtain an average value of 4 with good category ($3,4 < \bar{x} \leq 4,2$), on the aspect of presentment feasibility, obtain an average value of 4 with good category ($3,4 < \bar{x} \leq 4,2$), and on the aspect of graphics feasibility obtain an average value of 3, 6 with good category ($3,4 < \bar{x} \leq 4,2$). Based on the Analysis of the data obtained, it can be concluded that the development of the student's worksheet by instilling mathematical creative thinking ability valid and feasible to use in terms of media.

Based on the response questionnaire student, the score average result the assessment of student response questionnaire at the average number of statement score of student worksheet by instilling mathematical creative thinking ability was 3,4 with practical category ($2,8 < \bar{x} \leq 3,4$), based on that category, it can be seen that student worksheet by instilling mathematical creative thinking ability is practically used as teaching material.

The percentage of completeness learning classical of students was 72,4 with good categories ($60 \leq P < 80$). From the value result of the question practice, it can be concluded that student worksheets effectively instill students' creative thinking ability.

CONCLUSION

Based on the achievement valid, practical, and effective criteria from student worksheets in chapter IV, so it can be concluded that the development of obtaining a final product in the form of student worksheets by instilling mathematical creative thinking ability on sets theory for grade VII junior high school which meets the quality of good learning device based on validity assessments by experts, practically based on the results of students response questionnaire and effective based on the results of the questionable practice of students creative thinking, so it is feasible to use in learning.

During the study, several obstacles or limitations were found in conducting the research, namely: 1) Student worksheets can only include one material, 2) The step in this research development is only up to field trials, 3) Indicators of creative thinking variables only cover three variables used in research.

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