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The Feasibility of Student Worksheet based on Collaborative Creativity to Improve Students Creative Thinking Skill

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Abstract

This study aims to describe the feasibility of the student worksheet based on collaborative creativity to improve creative thinking skills on static fluid material in terms of validity, practicality, and effectiveness. This type of research is a type of development research by the ADDIE model with one group pre-test post-test experimental design method. The trial subjects were 107 students from class XI-MIPA 1, XI-MIPA 3, and XI-MIPA 4 in SMAN 1 Sumberrejo. The instruments used were validation instruments, observation instruments for the practicalities of the student worksheet, test instruments, and questionnaires to measure the student worksheet's effectiveness. The results showed that the validity of the student worksheet was included in the very valid category. In terms of the implementation of learning and student activities, the student worksheet practicality criteria are in the excellent category. The student worksheet's effectiveness criteria, based on test results, are in the medium category, and students' responses are very effective. Thus, the student worksheet that has been developed can improve creative thinking skills in learning the physics of static fluid material.

Keywords: The student worksheet; collaborative creativity; creative thinking skill

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INTRODUCTION

Creative thinking is one of the skills needed to learn physics. According to Annisa, Zainuddin., & Salam (2017), creative thinking is one of the higher-level thinking stages. Creative thinking or creativity is the ability to produce new products or a combination of things that already exist (Ekasari, Gunawan, & Suhido, 2016), to solve problems with many possible answers (Fitriani, Gunawan., & Sutrio, 2017). However, the implementation of learning physics at this time still rarely directs students to think creatively. Kim (2011) states that in America, the ability to think creatively has decreased over time. Likewise in Indonesia, creative thinking skills are still very low (Dewi, Mayasari, & Handhika, 2017).

Lailiyah & Suliyanah (2018) state that students' scientific, creative thinking

skills are still relatively low. Several factors influence it. According to Restami, Suma, & Pujani (2013), teachers more often convey existing information such as concepts or formulas in the book. Next, the teacher gives examples of questions and their solutions. Such learning can be said to be teacher-center learning, whereas the current learning paradigm is the Student Learning Center (Suprapto, Suliyanah., & Admoko, 2013). Teachers are not the only source of learning, although their tasks and roles are important in the learning process (Hamidiyah & Suliyanah, 2017). The teacher center method makes students have difficulty understanding physics and causes a lack of creative thinking skills. As is the case in learning the physics of static fluid material taught by such methods, students find it difficult to understand.

Based on the results of the questionnaire given to 35 students of Class XI MIPA 3 of SMAN 1 Sumberrejo, it is known that 71% of students said they were rarely invited to find creative ideas while learning physics, 80% said it would be easy to understand physics by doing practical work or scientific work. Preliminary study results show that learning in schools rarely involves students to do scientific work. Meanwhile, students feel the need to be involved in scientific work to understand the material better and have creative thinking skills.

Doing scientific work is one way to hone creative thinking skills in learning physics (Saputra, Nurjannah., & Mansyur, 2014). Besides, physics is a branch of science that requires experimental observations (Nurlailiyah & Deta, 2015). To involve students in scientific work, teachers need supporting instruments in the form of Student Worksheets. The preparation of the student worksheet is based on specific learning models that fit the objectives to be achieved.

Collaborative creativity is a learning model that emphasizes creativity as a process (Guyotte, Sochacka, Costantino, Kellam, & Walther, 2015). From research conducted by Widia, Prihandono, & Bektiarso (2019), the student worksheet based on collaborative creativity is included in the valid category and is suitable for use. The student worksheet based on collaborative creativity can practice scientific argumentation (Puspitaningrum, Astutik, & Supeno, 2018). However, the results of the two student worksheet developments have not shown that the student worksheet based on collaborative creativity can improve creative thinking skills. Judging from other studies, namely by (Astutik & Prahani, 2018), it can be concluded that physics learning tools based on collaborative creativity learning models have proven to be effective in increasing scientific creativity. Kamilasari, Astutik, & Nuraini (2019) stated that creative thinking could be improved through SETS-based collaborative creativity learning. From several studies that have been done, there has not been any research on the development of the student worksheet based on collaborative creativity that can improve creative thinking skills.

The results of preliminary studies that have been carried out state that students are interested in conducting scientific work activities using the student worksheet based on collaborative creativity. Based on several studies and preliminary studies that have also been conducted, it can be concluded that one of the student worksheets that can be developed to improve creative thinking skills is the student worksheet based on collaborative creativity.

METHODS

This research is development research. This study's development

model is the ADDIE model (*Analyze, Design, Develop, Implement, and Evaluation*). The research method using the one group pre-test post-test design experimental method. In this method, the research was conducted twice, namely before and after the implementation of learning using the developed student worksheet. Students work on the pre-test before learning takes place, and after learning takes place, students work on the post-test. The test is conducted to measure the achievement of creative thinking skills before and after learning, consists of five essay questions about static fluid material.

The trial subjects were 107 students from class XI-MIPA 1, XI-MIPA 3, and XI-MIPA 4 in SMAN 1 Sumberrejo. The selected of this class based on the class that is taught by one of the physics teachers at SMAN 1 Sumberrejo. The object of this research was the development of the student worksheet based on collaborative creativity in the static fluid material of the Archimedes legal section.

The research instruments used included validation sheets, observation sheets, test sheets, and response questionnaire sheets. The validation sheet is the student worksheet validation sheet, which includes assessing the validity of the content, language, and presentation of the developed the student worksheet. Observation sheets used are of two types, namely observations of the implementation of learning to measure the suitability of the lesson plan with the learning process that is carried out and the observation sheet of students' activity to find out the activities of students during learning. The observer makes observations during the learning process. The test sheet consists of *pre-test* and *post-test* questions to measure the achievement of students' creative thinking skills before and after being given the application of the developed student worksheet. The student response questionnaire sheet contains questions related to the student worksheet that was developed.

The resulting data is used to determine the feasibility of the student worksheet based on the validity of the student worksheet, the practicality of the student worksheet, and the effectiveness of the student worksheet. The validity of the student worksheet was analyzed based on a Likert scale. The practicality of the student worksheet was reviewed from two aspects: the implementation of learning and students' activities. Both aspects were analyzed based on a Likert scale. Category assessments are based on a Likert scale score, as shown in Table 1.

Table 1 Likert scale score

Rating Indicator	Scale Value
Very good	4
Good	3
Enough	2
Not good	1

(Adaptation from Sugiyono, 2017:135)

To determine the feasibility of the student worksheet developed based on the validity and practicality of the student worksheet from the Likert scale score, use the following equation:

$$Percentage(\%) = \frac{Total\ score\ from\ validator}{Maximum\ score} \times 100\%$$

From the results of calculations, the feasibility of student worksheets based on validity and tactical student worksheets developed following the criteria for interpreting scores can be determined from table 2.

Table 2 Criteria for interpretation of the student worksheet feasibility score

Percentage	Criteria
$0\% \leq p \leq 20\%$	Very less
$22\% < p \leq 40\%$	Less
$41\% < p \leq 60\%$	Enough
$61\% < p \leq 80\%$	Good
$81\% < p \leq 100\%$	Very good

(Adaptation from Riduwan, 2015)

The student worksheet's effectiveness was also viewed from two aspects, namely the test results and student response results. The data generated were classified as normal and homogeneous. Therefore, the test results were analyzed based on paired t-test analysis and N-gain (Hake, 1998). The n-gain analysis conducted to determine the effect of using student worksheets based on collaborative creativity to improve students' creative thinking skills.

Student responses were analyzed based on the Guttman scale. The Guttman scale table is listed in Table 3.

Table 3 Guttman scale score of students' responses

Answer	Scale of Scores
Yes	1
No	0

(Adaptation from Sugiyono, 2017)

To find out the percentage of students' responses from a given questionnaire,use the following equation:

$$P = \frac{\Sigma\text{"Yes"}answer\ from\ students}{\Sigma students} \times 100\%$$

(Adaptation from Riduwan, 2015)

Based on the percentage of student responses, the eligibility of student worksheets following the criteria for interpretation of scores can be determined from table 4.

Table 4 Criteria for interpretation of the student worksheet feasibility score

Percentage	Criteria
0% ≤ p ≤ 20%	Very less
22% < p ≤ 40%	Less
41%< p ≤ 60%	Enough
61%< p ≤ 80%	Good
81%< p ≤ 100%	Very good

(Adaptation from Riduwan, 2015)

RESULTS AND DISCUSSION

The Validity of The Student Worksheet

The validity of student worksheets was analyzed based on three criteria, namely content, presentation, and linguistic criteria. The following are the results of the validation of the student worksheets by the validator can be seen in Figure 1.

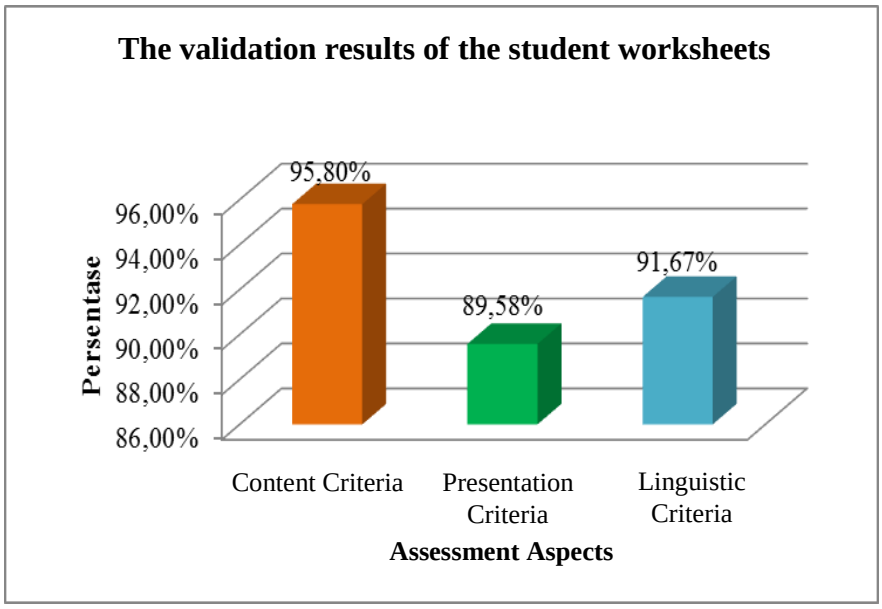

Figure 1 The validtion of the student worksheet

Figure 1 shows that the average percentage obtained from the validation of the student worksheet based on collaborative creativity was 92.35%, in the very valid category. The developed student worksheet was suitable for use in the learning process. These results are in line with the results of research conducted by Widia et al. (2019), which concluded that the Student Worksheet based on collaborative creativity is in the valid category. Other research supporting this finding is Puspitaningrum et al. (2018)'s research, which states that the Collaborative Creativity Student Worksheet is appropriate.

Of the three assessment criteria at validation, the presentation criteria get the lowest percentage. That is because the appearance of developed the student worksheet is not yet perfect and references to making the student worksheet based on collaborative creativity are still not enough.

The following are the validation content of the student worksheet listed in Table 5.

Table 5 The validation content of the student worksheet

Aspects	Average
The suitability of the material with the 2013 curriculum	4.0
Material compatibility with Core Competencies	4.0
Material compatibility with Basic competence	4.0
Material compatibility with indicators	4.0
Evaluation questions in the student worksheet are easy to understand and in accordance with existing indicators	3.5
Experimental activities according to the material and basic competencies developed	3.5

In the content criteria, there are six aspects assessed. Four aspects get an average score of 4, and two aspects get an average score of 3.5. Two content expert validators assessed both. Table 5 shows that the aspect that gets an average score of 4 is material suitability. That is because of the preparation of the material based on new books that refer to the curriculum, Core Competencies, and new Basic Competencies. It is in line with Jannah, Putra, Hifri., S., & Sari (2019)'s research results that the student worksheet considered feasible because aspects of the student worksheet, including content, are following curriculum demands in the development of the student worksheet as teaching material. Meanwhile, compiling questions and experimental activities get an average score of 3.5 because it is the result of researchers' development, so some things are less appropriate.

The following are the validation presentation of the student worksheet listed in Table 6.

Table 6 The validation presentation of the student worksheets

Aspects	Average
Clarity of learning indicators to be achieved	3.5
The presentation of the student worksheet arouses motivation and curiosity	4.0
The suitability of illustrations or drawings with the subject matter	3.5
Illustrations or drawings can help understanding concepts	3.5
Presentation of the image is accompanied by a reference	3.5
Presentation of material is centred on students or students involved	3.5

The validation presentation of the student worksheets is carried out by two validator experts. Table 6 shows that aspect 2 gets the highest average score. It is because the student worksheet's appearance is accompanied by animated pictures and presentation of problems that foster students' curiosity. As Prastiwi & Suliyanah (2018) said, the student worksheet presented exciting, fun, and not boring will motivate participants.

The following are the the validation language of the student worksheet listed in Table 7.

Table 7 The validation language of the student worksheet

Validated Aspects	Average
Writing the student worksheet in a language that is in accordance with the level of development of students' thinking	4.0
The material is presented in communicative language	3.0
The illustrations used to explain the material in the the student worksheet are relevant to the message delivered	4.0
Writing the student worksheet with good and correct Indonesian grammar	4.0
Writing the student worksheet with the right terms in accordance with Indonesian and easy to understand	3.0
Language clutters or linkages between chapters, sub-chapters, paragraphs and sentences in the student worksheet.	4.0

Table 7 shows that what gets a score of 3 is the writing of the language less communicative and less easily understood. That is because the choice of words used in the student worksheet is less communicative; therefore, it is difficult to understand. To be easily understood, sentences in the student worksheet can be arranged concisely and clearly. Good teaching materials are teaching materials arranged in simple sentences and not convoluted so that the information conveyed is clear (Depdiknas, 2008).

The Practicality of The Student Worksheet

Learning implementation

In this study, learning is done in three classes, and all of them are experimental classes. The following is a visual observation of learning implementation in each class, as shown in Figure 2.

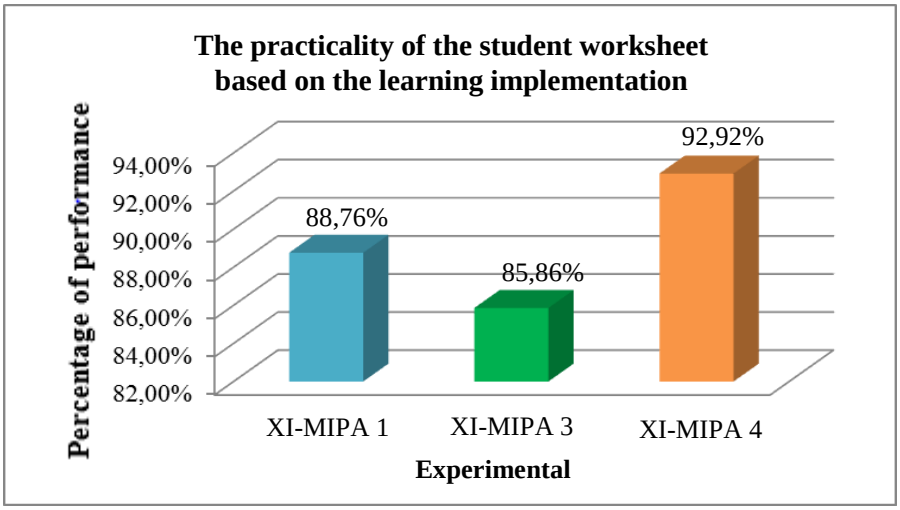

Figure 2 The practicality of the student worksheet based on the learning implementation

Figure 2 shows that the average score of learning achievement of the three classes is above 80%. According to the criteria for interpretation of the feasibility score, learning using the developed the student worksheet can be practical. The percentage obtained is more than or the same as 61%, so the results of the learning outcomes obtained according to the Likert scale are included in the excellent category.

Following the results of research conducted by Puspitaningrum et al. 2018), the student worksheet oriented collaborative creativity that developed can be carried out properly following the planned learning activities, so the student worksheet included in the practical category as teaching material. Other supporting research is by Astutik & Prahani (2018), which states that teachers can carry out tasks as good facilitators, mentors, and mediators during the implementation of collaborative creativity learning.s

Based on observational data on the implementation of learning from the three classes, the results show that the problem identification phase has the lowest average percentage.

It shows that the teacher (researcher) does not guide students to form small groups and large groups, identify problems, and formulate problems. In the evaluation phase of the results and process, the highest score obtained is 95.8%, because, at that stage, the researcher gives direction to students.

The results showed that the highest percentage of learning performance in class XI-MIPA 4 because the implementation of learning in the class is more maximal than in the previous classes. If there were deficiencies in the previous class, the last test class, XI-MIPA 4, was improved.

Student Activity

The results of observing student activities can be seen in Figure 3.

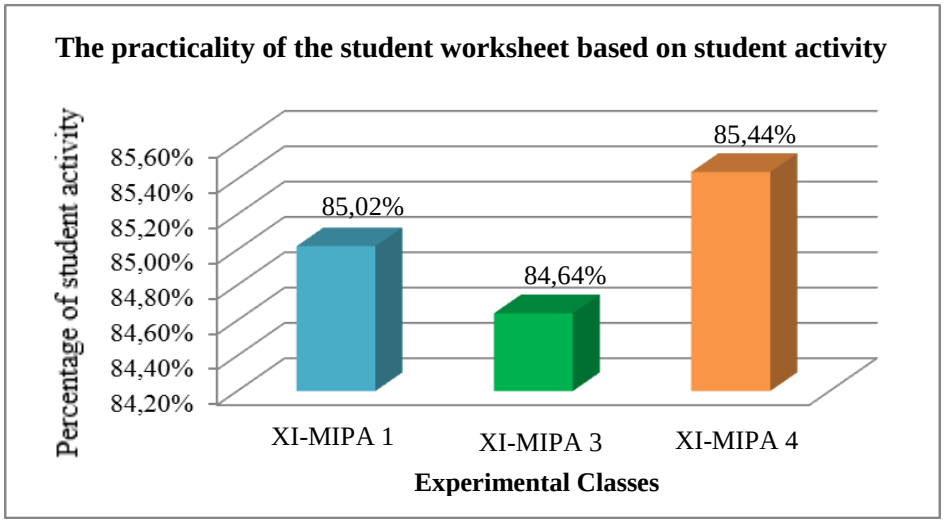

Figure 3 The practicality of the student worksheet based on student activity

Figure 3 shows the results that the average score of student activity when working on the student worksheet based on collaborative creativity is above 80%. According to the interpretation criteria, the student's activity score can be said to be practical because the percentage obtained is more than equal to 61%, so that the student activity data results obtained according to the Likert scale are

included in the excellent category. Based on this explanation, it can be stated that students actively participate in learning by using the student worksheet based on collaborative creativity.

The study results are appropriate when seen from the statement of Kamilasari et al. (2019) that the main characteristic of collaborative creativity is student participation, so students are required to be active in learning. It is also supported by Ni'mah, Astutik, & Maryani (2018), who state that learning using the collaborative creativity model makes students more active in learning. Other supporting research is by Pratiwi, Astutik, & Maryani (2018), which states that the collaborative creativity (CC) learning model can make students actively involved in learning.

In the elaboration phase, creative ideas get the lowest average percentage. It is because only a few groups make presentations, so the value of the activity of doing presentations is low and results in value at the elaboration stage of creative ideas.

The highest activity of students is in class XI-MIPA 4 because students in that class are very enthusiastic about participating in the learning process. The class that gets the lowest percentage is class XI-MIPA 3 because students in that class are more difficult to give directions, so some phases do not run well.

The Effectiveness of The Student Worksheet

Student test results

A paired t-tests was performed to test the difference between pre-test and post-test scores. Table 8 presents the results of the paired t-test analysis.

Table 8 Paired t-test analysis results

Class	T_{count}	t_{table}	Conclusion
Eks 1	5.78	1.69	H_0 rejected
Eks 2	3.10	1.69	H_0 rejected
Eks 3	7.03	1.69	H_0 rejected

Based on Table 8, the t> t table is valued for each class; consequently, H0 is rejected for all classes. In conclusion, there are significant differences between pre-test and post-test scores in all classes. After finding the difference between pre-test and post-test scores, the next step is to analyze these values, as shown in Table 9.

Table 9 Results Average of the pre-test and post-test scores

Class	*Pre-test*	*Post-test*
XI MIPA 1	42.25	81.86
XI MIPA 3	42.97	81.25
XI MIPA 4	39.23	79.91

Based on Table 9, the results show that the average post-test> pre-test. This indicates that there is an increase in student grades.

After the test results are calculated, the next step is to analyze the test results' improvement by analyzing the n-gain score, as shown in Table 10.

Tabel 10 Category Result of N-gain

Class	*N-gain*	Category
XI MIPA 1	0.70	high
XI MIPA 3	0.67	moderate
XI MIPA 4	0.68	moderate

Table 10 indicates the results of the N-gain score analysis of the three classes increased. The increase in students 'creative thinking skills shows that the student worksheet that was developed effectively improved students' creative thinking skills. It is following the results of research conducted by Astutik & Prahani (2018) that the collaborative creativity model can increase students' creativity. Other research that supports this theory is the research conducted by Kamilasari et al. (2019), which concluded that students' ability to think creatively primarily in learning physics could be improved through collaborative creativity (CC) learning.

The increase in creative thinking skills after being implemented by the

student worksheet based on collaborative creativity is because the problems presented in the student worksheet require students to think creatively. Besides, the questions used for pre-test and post-test are adjusted to the developed student worksheet. Thus, students can answer questions well after the implementation of the student worksheet based on collaborative creativity.

The advantage of the developed student worksheet is that it was developed based on the Collaborative Creativity learning model to improve creative thinking skills. Students are divided into small groups and large groups. Students are directed to find their problems to be solved in their way. To be able to solve a problem, students will express their creative ideas. So, each participant will have creative thinking skills.

Student Response

The following results of students' responses to the worksheets developed, can be seen in Table 11.

Table 11. Student response results

Statement	Average (%)
I think this the student worksheet design is interesting.	96.3
I think the language used in the student worksheet is easy to understand.	84.1
In my opinion, the questions in the the student worksheet are clearly formulated.	86.9
The the student worksheet that has been developed helps me to better understand the concept of static fluid in the legal sub-chapter of Archimedes.	92.6
The the student worksheet that has been developed helps me in practicing the thought process.	89.7
I was motivated to go back to doing the experiments.	88.8
I am interested in learning with this the student worksheet.	89.8
The developed the student worksheet was able to make me connect physics material with everyday life.	89.7
This the student worksheet can train my ability to identify scientific questions in experiments.	89.7
The developed the student worksheet can train my ability to formulate problems in experiments.	93.5
The developed the student worksheet can train my ability to formulate hypotheses in experiments.	82.2
The developed the student worksheet can train my ability to identify variables in the experiment.	92.5
The developed the student worksheet can train my ability to conduct experiments.	97.2
The developed the student worksheet can train my ability to analyze experimental data.	91.6
The developed the student worksheet can train my ability to formulate problems in experiments.	93.5
The developed the student worksheet can train my ability to conclude an experiment.	91.6
The developed the student worksheet can help me improve my creative thinking skills.	94.4

The average results of the percentage of students' responses to the developed student worksheet were 90.7%. Table 11 shows that the student

worksheets developed can be said to be effective if the percentage obtained is more than equal to 61%. The student response data obtained according to the Likert scale is included in the very good category. These results are supported by Astutik & Prahani (2018) research, which states that students' responses to learning using collaborative creativity learning are very positive.

When compared with research conducted by Wahyu & Madlazim (2018), the student worksheet developed received a response of 87%, and with research conducted by Abdurrahman. et al. (2020), the student worksheet developed received a response of 88%, so it appears that the student worksheet based on collaborative creativity gets a higher response.

Based on the results of the students' questionnaire responses, aspects that the application of the developed the student worksheet can train students to conduct experiments to get the highest presentation. That is because previously, students rarely conducted experiments to apply the student worksheet that could involve students to conduct experiments.

CONCLUSION

The student worksheet based on collaborative creativity developed has a validity of 92.35% (very valid), practicality above 80% (very good), the effectiveness of test result with an n-gain score above 0.30 (effective), and from the response of students 90.7% (very good). So that the developed the student worksheet is appropriate to be used to improve students' creative thinking skills on static fluid material.

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