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DEVELOPMENT OF LKPD BASED ON SETS-PJBL TO TRAIN CRITICAL THINKING SKILLS OF STUDENTS

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ABSTRACT

This study aims to produce SETS-PjBL-based Learner Worksheets (LKPD) and train students' critical thinking skills. The Research and Development (RnD) method was used in this study through the RnD stage of the ADDIE Model with 34 participants of class XI 4 SMAN 4 Banjarmasin and the subject of SETS-PjBL-based LKPD. The results of this study showed: 1) The experts' validity of the SETS-PjBL-based LKPD is categorised as very good with a percentage of 94%. 2) The developed LKPD received a good response from students with a percentage of 74.90%. 3) The critical thinking skills of students obtained from the overall observation results are good with a percentage of 79.46%.

Keywords: *LKPD, SETS-PjBL,* c*ritical thinking skills.*

INTRODUCTION

High-level numeracy skills are needed in physics, so many students are not interested in learning physics (H. Pratama and Prastyaningrum 2016). Real studies in scientific investigations are needed in all domains of physics to reveal the truth of natural phenomena (Adha and Mufit 2022). So that the involvement of students with nature makes the concepts and materials of physics can be more easily understood.

Three concepts of 21st century education adapted by the Ministry of Education and Culture of the Republic of Indonesia that aim to improve the quality of education in Indonesia include: 21st century skills, scientific approach, and authentic assessment (Junedi, Mahuda, and Kusuma 2020). The results of research and assessment by the Organisation for Economic Co-operation & Development (OECD) with the Unesco Institute for Statistics in

2022 on the Programme for International Student Assessment (PISA) show that according to the score of students' skills from 379 points to 366 points (OECD 2023) which proves the declining quality of education in Indonesia. So that critical thinking skills need to be instilled in students to solve problems in the demands of 21st century learning.

Ennis revealed in (Akhmad Romadhon 2019) the concept of critical thinking is based on certain skills, such as observing, inferring, generalising, reasoning, evaluating reasoning, and the like. For him, critical thinking is assessing true statements, but he also defines it more generally as reasonable reflective thinking. Critical thinking skills can be improved with the use of supportive learning models. (Kalsum, Hamzah, and M 2019) revealed that in addition to supportive learning, critical thinking skills can be improved through learning experiences that are direct, meaningful, and relevant to real life.

The science, environment, technology, and society (SETS) approach provides students with the skills to change their thinking process based on science and technology knowledge and its impact on the environment and society. SETS is an integrated learning approach, involving elements of science, environment, technology, and society. The SETS approach is a learning approach that links learning with aspects of science, environment, technology, and society that are reciprocally appropriate as a form of integrated activities (Riwu, Budiyasa, and Rai 2018). Anwar argued in (Umami and Jatmiko 2013) that the SETS approach is considered to have an implementation so that students have higher order thinking skills, including critical thinking skills.

The project-based learning (PjBL) model is a learning model that is applied by forming small groups to produce a project (Puspitasari, Astuti, and Masturi 2020). The PjBL model requires teachers and students to develop aguiding question in solving a given problem so as to train students to think critically (Daniel 2017). So that with PjBL through a long process of investigation, responding to questions from complex problems, or challenges, training the skills required in the 21st century. The use of effective learning models and approaches and also accompanied by teaching materials in the form of books, LKPD (student worksheets), and attractive learning modules can help and facilitate the learning process in the classroom. From several existing teaching materials, the researcher chose to develop a teaching material in the form of LKPD that uses the SETS approach and also project-based learning to improve students' critical thinking skills.

Changes in the paradigm or view of education about students and learners have led to a change in the name from LKS to LKPD. LKPD are sheets that contain tasks that must be done by students, LKPD is usually in the form of instructions or steps to complete a task. LKPD is packaged in such a way that students can learn concepts independently based on theory or observation, in which students can also be assigned tasks related to the material being studied

(Prastowo 2016). The problem underlies researchers to conduct research by developing SETS-PjBL-based LKPD to train students' critical thinking skills.

METHODS

This type of research is research and development (R&D) with the ADDIE model which stands for analyze stage, design stage, development stage, implementation stage, and evaluation stage (Nalarita and Listiawan 2018). The subject of this research is SETS-PjBL based LKPD on thermodynamic material with the topic of heat engines, while the object of this research is 34 students of SMA Negeri 4 Banjarmasin.

The validity instrument of the SETS-PjBL-based LKPD was filled in by 3 academic validators. LKPD is measured using the test using the Aiken's V equation with a range of 0-1, the closer to 1, the higher the interpretation of the Aiken's V index (Raniah, Efendi, and Liliawati 2019). Guilford suggested in (Tomoliyus and Sunardianta 2020) Aiken's V criteria as follows.

Tabel 1. Aiken's V Criteria

No	Validity Criteria	Aiken's V
1	Very High	0,80 – 1,00
2	High	0,60 – 0,80
3	Medium	0,40 – 0,60
4	Low	0,20 – 0,40
5	Very Low	0,00 – 0,20
6	Invalid	V – 0,00

In instrument validation, the validation analysis uses the Aiken's V equation as follows (Raniah, Efendi, and Liliawati 2019).

$$V = \frac{\Sigma s}{n(c-1)}$$

Description:

V = rater agreement indeks

s = the score selected by the rater minus the lowest score in the category

n = number of raters

c = number of categories

After the validity test is carried out, the instrument reliability test is then carried out. Reliability test is the process of measuring the consistency of an instrument (Al Hakim, Mustika, and Yuliani 2021). The reliability test uses reliability analysis based on Cronbach Alfa formulated (Tanjung and Faiza 2019). $r_i = \left[\frac{k}{k-1}\right]\left[1 - \frac{\Sigma a_b^2}{a_t^2}\right]$

Description:

r_i = Cronbach Alpha reliability coefficient

k = number of question items

Σa_b^2 = number of variant items

a_t^2 = total variance

The Cronbach Alfa coefficient value obtained is then categorised according to (Tomoliyus and Sunardianta 2020).

Tabel 2. Cronbach's Alpha Criteria

No	Reliability Criteria	Cronbach's Alpha Coefficient (*a*)
1	Special	$a > 0{,}75$
2	Satisfactory	0,60 – 0,75
3	Simply	0,40 – 0,60
4	Bad	$a < 0{,}40$

The students‘ response questionnaire is used to measure the practicality of using the LKPD, the average score obtained from the students’ answers to the response questionnaire is said to be feasible if it meets at least good criteria. The instrument for the achievement of critical thinking skills is reviewed through an observation sheet conducted by two observers during the learning process, the LKPD will be declared feasible if it meets the good criteria.

RESULTS AND DISCUSSION

Validity of SETS-PjBL based LKPD

After the validity of the LKPD by three validators, the validity results were 95% in the media aspect, 96% in the language aspect, and 89% in the material aspect so that the LKPD was declared very good from the media, language, and material aspects so that it was feasible to use in physics learning with some improvements. Improvements to the LKPD are obtained from the validator's suggestions and comments on the cover whose identity of the LKPD to be more clarified.

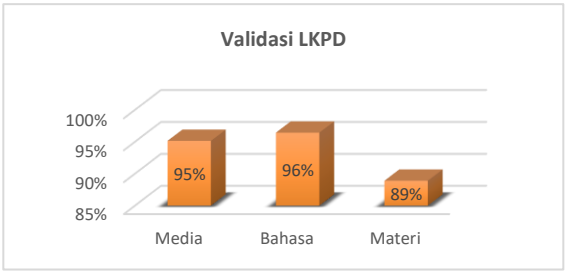

Figure 1. Diagram of LKPD Validation Results

In Figure 1, it can be seen that the media aspect gets a percentage of 95% with very good criteria. The validation of LKPD in the media aspect is related to the presentation of thermodynamic material with the topic of heat engines and SETS-PjBL in LKPD. The selection of appropriate media can develop the skills and interests of students in the learning process (A. P. Wulandari et al. 2023). The language aspect of the LKPD also received a high score of 96% with very good criteria. The material aspect is the last aspect of the LKPD presentation which scored 89% with very good criteria.

The topic of heat engines contained in the LKPD is related to environmental issues and their development. Presentation of SETS-PjBL-based LKPD that are in accordance with the topic of heat engines and learning outcomes in the independent curriculum. In the aspect of material getting high validation shows that the presentation of material and learning models in LKPD is relevant to the learning objectives and achievements in the classroom. So that the SETS-PjBL-based LKPD on thermodynamic material with the topic of heat engines can improve students' critical thinking skills (Yevira 2023).

Practicality of SETS-PjBLbased LKPD

The results of students' responses to the SETS-PjBL-based LKPD can be seen in Figure 2. The percentage results of each aspect are presented in Figure 2. The LKDP that has been validated, then tested on the research sample in the form of 34 respondents consisting of 18 women and 16 men. The response to the use of LKPD was taken after being tested for 2 meetings taken from students. Judging from the percentage of values given by students in the presentation aspect, it got a score of 74.88% with good criteria.

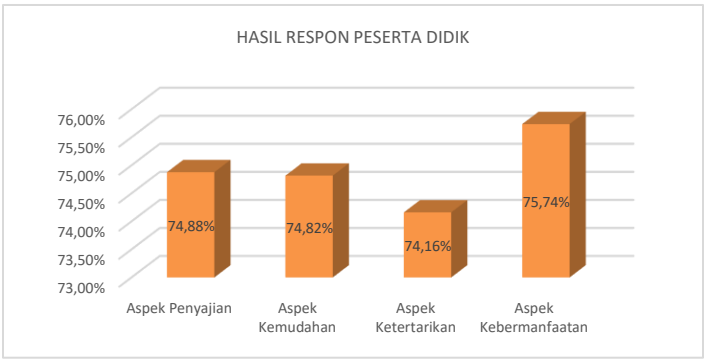

Figure 2. Diagram of Learner Response Questionnaire Results

The response to the use of LKPD was taken after being tested for 2 meetings taken from students. Judging from the percentage of values given by

students in the presentation aspect, it got a score of 74.88% with good criteria. In the first aspect, namely the presentation aspect, it shows good criteria with a percentage of 74.88%. The convenience aspect contains instructions for use, commands, content and writing language in LKPD, the convenience aspect gets good criteria with a score of 74.82%. The percentage score obtained in the aspect of interest obtained a score of 74.16% with good criteria. In the aspect of usefulness, the percentage gets the highest score of each aspect which is 75.74% with good criteria.

Critical thinking skills of students during the use of SETS-PjBL based LKPD.

The results of observations of critical thinking skills of 34 students at SMA Negeri 4 Banjarmasin after using SETS-PjBL-based LKPD on the topic of Heat Engine obtained an average of 78.92% with good criteria presented in Figure 3.

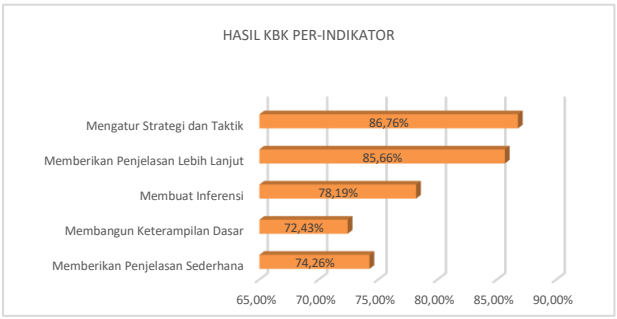

Figure 3. Critical Thinking Skills Observation Results

The first indicator provides a simple explanation, the average percentage of the aspect of providing a simple explanation is 74.26% with good criteria. The second indicator, namely building basic skills, scored 72.43% with good criteria and it can be seen that students' skills in considering the authenticity of the source and the results of their observations in building basic skills are quite good.

The third indicator, namely making inferences related to actions in concluding something with logical reasons (Permata, Muslim, and Suyana 2019) received a percentage score of 78.19% with good criteria. The fourth indicator, namely providing further explanation, received a score of 85.66% with very good criteria, which proves that students are very good at identifying assumptions and connecting the relationship between the assumptions obtained (Sundari and Sarkity 2022). The fifth indicator, namely regulating strategies and tactics, received the highest score of other indicators, namely 86.76% with very good criteria, so that students are very good at regulating strategies and tactics in solving the problems given.

Based on the results of the development of SETS-PjBL-based LKPDs, it explains that SETS-PjBL-based LKPDs get valid criteria based on a team of experts, get good responses from students so that it can be said that SETS-PjBL-based LKPDs are practical to use, and are able to help in practicing skills.

CONCLUSION

Based on the explanation above, it can be concluded that: 1) SETS-PjBL-based LKPD on thermodynamic material with the topic of heat engines is declared 'very valid'. 2) Students' responses to the use of SETS-PjBL-based LKPD on thermodynamic material received a good response so that it was declared "practical". 3) Critical thinking skills of students after using SETS-PjBL-based LKPD on thermodynamic material are included in the 'good' category.

ACKNOWLEDGEMENT

Based on the results of the study, several suggestions for further research and development are given as considerations including: 1) There is a need for the development of SETS-PjBL LKPD to improve students' skills in other 21st century skills. 2) There needs to be development on other teaching media besides LKPD using the SETS-PjBL model.

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