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Application of PBL Model on Design Preparation Competencies With a Critical Thinking Approach

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Abstract
This study was conducted to analyze the application of PBL model that influences students' learning outcomes and critical thinking skills in the subject of design prerequisites. The method used is Classroom Action Research (CAR) with three cycles with a sample of 31 students of class XI KC 3 SMKN 6 Surabaya. The results of the study showed a significant increase in the cognitive aspect and critical thinking skills of students. The completion of learning the cognitive aspect using the N-Gain test analysis resulted in an increase from the percentage of cycle 1 33%, cycle 2 57% and finally cycle 3 78% effectively. Students' critical thinking skills also increased in each cycle, namely cycle 1 (88%), cycle 2 (92%) and cycle 3 (97%). Therefore, the application of the PBL model can significantly improve students' critical thinking skills in design prerequisite competencies.

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1. INTRODUCTION

Rapid developments and the entry of the digital era have brought major changes in the world of education, including in the competency of design expertise. Students are not only required to have technical skills in make-up, hair, and fashion, but must also be able to think creatively and critically in creating works that are relevant to the needs of society. The challenge that arises is how learning can equip students with analytical skills and complex decision-making in the context of design. In practice, there is still a lot of learning that is *teacher-centered* and less involving students in solving problems independently. This has an impact on the lack of critical thinking skills of students in exploring and designing design solutions.

Critical thinking skills are one of the essential competencies that students must have in the field of design. This is because the process of designing an appearance is not only related to aesthetic elements, but also involves aspects of logic, function, and suitability to user needs. Junaidi (2020) stated that critical thinking is very important for students because it allows them to optimize cognitive potential in solving various life problems. In learning Preliminary Design, students need to be accustomed to critically examining trends, assessing various design concepts, and making decisions based on rational and creative thinking. This ability is an important provision for students in facing the increasingly challenging competition in the creative industry world. Therefore, a learning model is needed that is able to develop and stimulate critical thinking skills effectively.

The PBL model is a learning method that focuses on contextual problem solving as a means to build students' understanding and skills. Through this approach, students are encouraged to be active in identifying problems, working together to find solutions,

exploring, and reflecting on the learning process they experience. Pratiwi (2020) explains that PBL requires students to be involved in teamwork to solve problems, so that it can encourage the development of critical thinking skills. With this approach, students are faced with real situations, such as designing displays based on client needs or emerging trends, which require them not only to receive information, but also to process and apply it in real life contexts.

The implementation of PBL is very relevant to the spirit of the independent curriculum which prioritizes project-based, contextual, and student-centered learning. This curriculum encourages students to learn actively, creatively, and reflectively in the learning process, as well as developing the profile of Pancasila students. Vocational high school students, especially in the design competency, have a tendency to learn practically and visually, so the experiential PBL method is very suitable to accommodate their learning style. In addition, PBL provides space for students to be creative, innovative, and learn from direct experience. Thus, the implementation of the PBL model can be a bridge to improve critical thinking skills and design competencies as a whole.

In addition to mastering design content, learning through the PBL model also supports the formation of soft skills such as collaboration, communication, responsibility, and work ethics. The process of group discussions, presentation of ideas, and evaluation of their own and others' work encourage students to be more open to criticism and self-development. Research by Chen et al. (2021) shows that PBL has a significant influence on improving students' interpersonal skills and reflective attitudes. This is important to form prospective professionals in the field of make-up who are not only technically competent but also mature in attitude. In other words, the PBL approach provides space for the holistic development of students' character and personality.

In reality, the learning process in many vocational schools still uses a conventional approach that does not provide enough space for students to think critically. Teachers play a greater role as material deliverers, while students tend to be passive listeners who receive information without being challenged to analyze or solve problems independently. As a result, many students have difficulty when asked to create original, solution-oriented, and contextual designs. This learning model does not support the development of high-level thinking skills that are needed in today's workplace. Therefore, it is important to change the learning approach to be more participatory and intellectually challenging.

Vocational schools as vocational education institutions aim to produce graduates who are ready to work, creative, and able to adapt to the times. To achieve this goal, learning in vocational schools needs to focus on developing technical and non-technical skills in a balanced manner. The implementation of PBL in design prerequisite competencies contributes to improving the quality of graduates, especially in terms of problem-solving skills, critical thinking, and creating functional and innovative designs. This approach also fosters students' self-confidence in expressing ideas and defending them rationally. Thus, the implementation of PBL not only improves learning outcomes, but also forms a professional mentality in students.

Based on the description above, it can be concluded that the application of the PBL model is very suitable for improving design prerequisite competencies with a critical thinking approach. PBL provides space for students to be active, reflective, and collaborative in facing real challenges in the world of design. This approach not only improves conceptual understanding, but also forms a professional attitude needed in the world of work. In addition, critical thinking skills developed through PBL will help students become designers who are not only creative, but also solution-oriented and responsible. Therefore, the integration of PBL in design prerequisite learning is a strategic step in realizing meaningful and transformative learning in vocational schools.

2. RESEARCH METHOD

This study uses the type of Classroom Action Research (CAR). Classroom Action Research is classified as quantitative and qualitative research. Classroom Action Research is different from descriptive research or experimental research. In descriptive research, what is described is the object at the time of the research, while experimental research is described regarding the cause and effect after a treatment. The research was carried out in two learning cycles, if the action is still not good, an evaluation will be carried out and carried out in the next cycle. Therefore, the research can be continued to cycle II or later by planning appropriate improvements, so that the research results obtained are better, as described as follows (Arikunto, 2019)

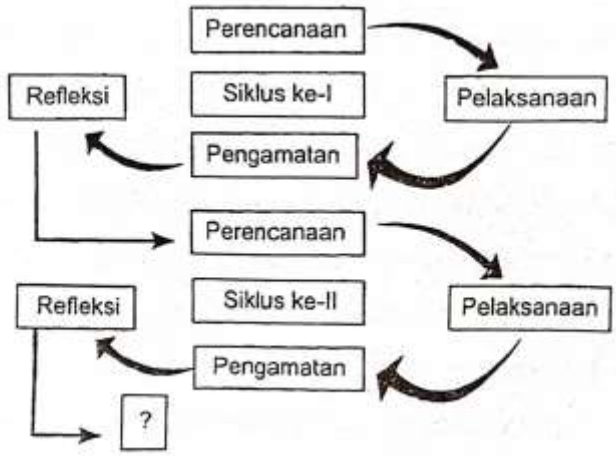

Figure 1. Classroom Action Research Design
(Source: Arikunto, 2019)

The explanation of the process above is:

a. Planning
   Before starting the research, researchers need to design the problem formulation, set objectives, and prepare an action plan to be implemented. This step includes the preparation of research instruments such as observation sheets, questionnaires, and interview guides. In addition, researchers must also prepare learning tools, including teaching modules, participant worksheets, and assessment instruments.
b. Implementation of Actions and Observations
   This stage involves the implementation of actions in the form of applying problem-based learning (PBL) models to help build students' conceptual understanding and improve students' critical thinking skills. Along with the implementation, observation activities are carried out to directly observe the process and results of PBL implementation in the classroom.
c. Reflection
   The reflection stage is carried out by reviewing and evaluating data obtained from the results of observations of the implementation of the action. This process aims to examine the extent to which the actions implemented have an impact on learning and achieving goals. Reflection is an important part of research because it functions as a basis for determining the sustainability of the action, whether it is necessary to carry out a further cycle or simply stop if the success indicators have been achieved.

The population of the study included all students of grade XI Beauty School of SMKN 6 Surabaya consisting of 3 classes with a total of 105 students, with samples taken by purposive sampling of 31 students of grade XI KC 3. Data collection instruments included test questions and questionnaires. The data collected included information on cognitive, psychomotor and critical thinking learning outcomes of students in design prerequisite learning. Data were collected through test questions consisting of pretest and posttest, surveys including questionnaires distributed to students to obtain data on their critical thinking in design prerequisite learning.

The data to be obtained from this test question is presented in the form of a final score and then the N-gain and mean tests are carried out. This is done in cycles 1, 2 and 3. The values obtained on the test question instrument are presented in the form of N-Gain values. The following is a reference table to find out the N-Gain Score test criteria:

Table 1.N-Gain Value Criteria

Nilai N-Gain	Kateogori
$g > 0.7$	Tinggi
$0.3 \leq g \leq 0.7$	Sedang
$g < 0.3$	Rendah

Source: Melzer, 2008: 33

Table 2.N-Gain Effectiveness Interpretation Category

Persentase (%)	Tafsiran
< 40	Tidak Efektif
40 – 55	Kurang Efektif
56 – 75	Cukup Efektif
>76	Efektif

Source: Hake, R.R, 1999

Next, it is done to obtain data on critical thinking of students in the learning of pre-design. The instrument is compiled based on the theory that has been obtained and compiled using a Likert scale using an assessment of 1 to 5. The scores obtained on the rubric-based performance assessment instrument (*Performance Assessment Rubric*) then presented in percentage form. The following is a reference table to find out the percentage:

Table 3. Assessment Criteria for the Percentage of Student Questionnaires

No	Tingkat Ketercapaian	Kategori
1	0% - 20%	Sangat kurang baik
2	21% - 40%	Kurang baik
3	41% - 60%	Cukup
4	61% - 80%	Baik
5	81% - 100%	Sangat baik

(Source: Riduwan, 2018, p.15)

3. RESEARCH RESULTS AND DISCUSSION

The learning outcomes of students in the cognitive domain are measured through the implementation of pre-tests and post-tests. Learning completeness is determined based on the Learning Objective Achievement Criteria (KKTP), namely with a minimum value of

75. The success of improving learning outcomes is analyzed using the N-Gain calculation with an effective category if the N-Gain Score (%) exceeds 70. The increase in test results that were carried out further strengthens that the implementation of the PBL model is effective in continuously improving students' cognitive learning outcomes. Further analysis of this increase is carried out through the N-Gain calculation with the success criteria in the study, namely g> 0.7.

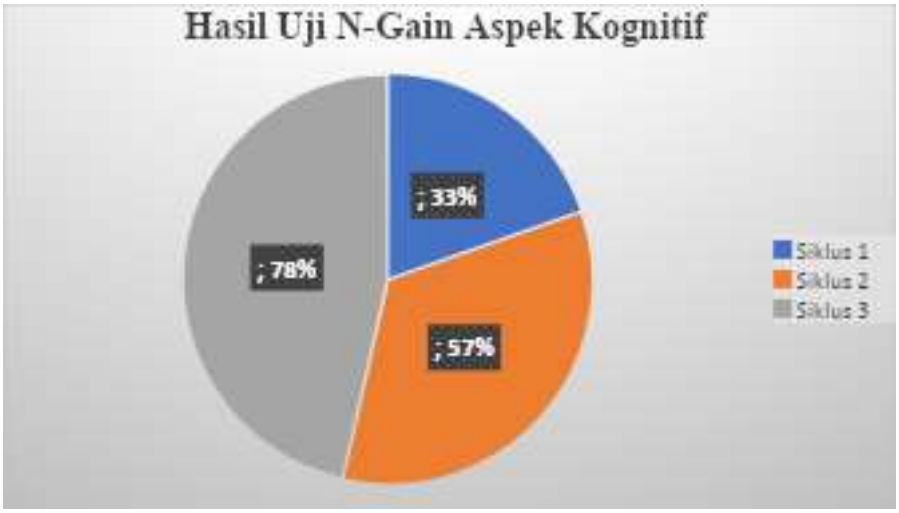

Figure 1. Results of the N-Gain Test of Cognitive Learning Outcomes

Based on Figure 1, the results of the N-Gain score analysis in cycle 1 were 0.33 in the moderate category with the n-gain test (%) of 33% categorized as less effective. In cycle II, the n-gain score was 0.57 in the moderate category and the n-gain test (%) of 57% was categorized as quite effective. In cycle III, it was the last cycle to be carried out, because the results obtained were in accordance with the research target, namely the results of the N-Gain test score of 0.78 included in the high category and N-Gain (%) of 78% in the effective category.

Figure 2. Critical Thinking Skills Results

Based on the pie chart of critical thinking ability results, there is a significant increase in each learning cycle. In cycle I, the percentage of students' critical thinking ability reached 88%, indicating that most students have begun to show the ability to interpret problems,

although there are still shortcomings in terms of analysis and drawing conclusions. In cycle II, there was an increase to 92%, reflecting improvements in students' ability to evaluate alternative solutions and link design needs with appropriate work techniques. Meanwhile, in cycle III, the percentage reached 97%, indicating that almost all students have been able to think critically optimally. They are able to interpret client needs, analyze situations, evaluate design choices, and convey the reasons for choosing curling techniques logically and systematically. This increase proves that the application of the PBL model contributes positively to the development of students' critical thinking skills, especially in the context of Preliminary Design learning which requires creative and appropriate decision making based on real problems.

4.1 Discussion

The results of the study indicate that the application of the PBL model in learning the competency of Primary Design, especially on the topic of hair curling techniques, is effective in improving students' critical thinking skills. The problem-based learning process requires students to understand the context, analyze needs, choose relevant techniques and tools, and explain the logic of their design decisions. This provides a great opportunity for students to practice high-level thinking skills, such as analysis, evaluation, and synthesis.

This study is supported by Masrina's (2019) findings which state that the PBL approach is able to stimulate students' critical thinking skills through authentic and collaborative problem solving. Wayudi (2020) also emphasized that students' low critical thinking skills are often caused by learning methods that do not involve high-level cognitive activities. In this study, the use of PBL successfully answered these challenges by encouraging students to actively analyze cases and make decisions based on logical reasoning.

Furthermore, Ariadilla (2023) stated that critical thinking skills can be developed through the habit of asking questions, assessing information objectively, and making rational decisions, all of which appear in the problem-based hair design learning process. This is also in accordance with the findings of Aini (2022) who stated that critical thinking can be measured through six indicators which in this study were used as the basis for student assessment rubrics. Junaidi (2020) stated that PBL contributes to the formation of active interactions between teachers and students and facilitates the formation of constructive knowledge. This is also reflected in the improvement in the quality of student discussions and reflections during design learning.

Furthermore, Supriatna (2020) reported that PBL not only improves learning outcomes but also improves teacher and student activities and classroom management. In this study, student engagement increased significantly because they felt involved in the process of finding real design solutions. The improvement in learning outcomes is also reflected in Widyasari's (2024) research which statistically proves (t-test) that the PBL model significantly improves learning outcomes. A similar thing was shown by Harwati (2021) who noted an increase in student activity from 43% to 100% after implementing PBL.

Istiningsih (2023) supports these results by stating that there is a significant difference in critical thinking skills between classes that use PBL and those that do not. This means that the implementation of PBL has a direct impact on the development of critical thinking skills, including in vocational contexts such as Pre-Design. Finally, Efendi (2021) concluded that compared to the Inquiry Learning model, PBL is more effective in improving students' critical thinking skills, especially in project-based learning or real contexts such as science. This is also relevant in vocational learning,

where students are required to solve real problems in the realm of practical and creative skills.

4. CONCLUSION

Based on the results of the research and discussion that has been done, it can be concluded that the application of the PBL model has proven effective in improving students' critical thinking skills in the Design Preliminary subject. The application of PBL encourages students to actively identify real problems, analyze design needs, evaluate alternative solutions, and convey logical reasons for the design decisions taken. This can be seen from the increase in the percentage of students' critical thinking skills from 88% in cycle I, to 92% in cycle II, and reaching 97% in cycle III.

In addition, the learning outcomes of the cognitive domain also showed a significant increase, with the N-Gain value increasing from the less effective category (33%) in cycle I to quite effective (57%) in cycle II, and finally reaching the effective category (78%) in cycle III. PBL provides space for students to develop analytical, evaluation, and inference skills, which are the core of critical thinking skills, while fostering self-confidence and collaborative work skills.

Thus, it can be concluded that the PBL learning model is very relevant and applicable to be applied in the competency of Pratata Design expertise because it is able to improve the quality of the learning process, cognitive learning outcomes, and critical thinking skills of students. The application of PBL is also in line with the spirit of the Merdeka Curriculum, which emphasizes active, contextual, and project-based learning, so that it can prepare students to become creative and solution-oriented workers in the beauty and design industry.

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