JPPIPA 9(6) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Teaching Materials Based on Problem-Based Learning

Herly Janet Lesilolo[1*]

[1] Christian Religion Education Doctoral Study Program, Institut Agama Kristen Negeri Ambon, Ambon, Indonesia.

Received: April 10, 2023
Revised: April 30, 2023
Accepted: June 25, 2023
Published: June 30, 2023

Corresponding Author:
Herly Janet Lesilolo
herlylesilolo05@gmail.com

DOI: 10.29303/jppipa.v9i6.3842

Abstract: Weaknesses in student analysis and evaluation reasoning related to material faced by behavior and the level of mental life. the imprecision of students making logical arguments to solve problems with the approach. The inaccuracy of students' thinking results in students not arguing enough to provide scientific considerations. The research aims to develop problem-based learning teaching materials to improve students' critical thinking patterns. The development model uses the 4D that has four stages of the development process, namely: Define, Design, and Develop. Based on the results of the validation, the level of students' critical thinking patterns reached 0.83 with a high level of validation. Content component 3.64, linguistic component 3.71, presentation component 3.70, and practicality component 3.68. The results obtained indicate that problem-based learning-based psychoanalytic teaching materials for improving students' critical thinking patterns are valid, effective, and practical. Teaching materials based on problem-based learning can be used as one of the teaching materials for students.

Keywords: Design phase; Development stage; Teaching materials

Introduction

Nowadays, the quality of university graduates is caught hurting society because after getting a bachelor's degree, students pursue satisfaction and pleasure in the community. People complain because many graduates do not try to accumulate their knowledge essentially and effectively to benefit society independently. One of the reasons is that learning activities for students in universities are always waiting for lecturers' instructions (Schmidt et al., 2015). The lecturer also carries out teaching activities by anesthetizing students to hear the teaching material abstractly so that students forget to place themselves to divide something abstract in the dimension of reality (Nazmillah et al., 2022). Freire education without seeking and discovering the truth is an education that does not humanize (Mahur et al., 2019).

If what is desired is a quality output with work that can compete in an open world, students need to pattern critical thinking as a fundamental skill that encourages students to think evaluating a theory scientifically into reality (Sellars et al., 2018). Students' abilities are limited to mastering and knowing the analytical and evaluation assessment level. Suppose the student's reasoning power is faced with an abstract existential situation (Pregoner et al., 2020). The student must be encouraged to divide and examine the abstraction in depicting a problem that finds an interaction between parts so that the initially blurred reality begins to get meaning when the mind flows into various dimensions (Dwivedi et al., 2022). Serious learning without developing critical thinking patterns can anesthetize and skill students' creative power. Students are also less motivated to put themselves in the correct position to develop a critical understanding of social reality through reflection and action (Suzina & Tufte, 2020). The weak drive to establish a vital-mind results in broad knowledge competencies with a skilled, mature, independent, critical, and self-responsible personality not fully possessed by students.

The results of Panadero (2017) research show that learning activities should occur in a deliberately managed environment so that students participate in

How to Cite:
Lesilolo, H. J. (2023). Development of Teaching Materials Based on Problem-Based Learning. *Jurnal Penelitian Pendidikan IPA, 9*(6), 4320-4325. https://doi.org/10.29303/jppipa.v9i6.3842

community dynamics and produce critical responses to certain situations. Students are given daily life problems accompanied by questions that lead students to be able to plan and conduct trials and be able to process and analyze data to solve problems (Paul & Jefferson, 2019). Requires student activity to experience and prove for themselves the nature and development of human personality. Students are involved in conducting and following a human activity, analyzing its existence, and drawing their conclusions through a state or process that is carefully and carefully observed (Rashid et al., 2019). Students studying material tend to hear lecturers' explanations. As a result, students are less critical and less creative in asking questions and developing ideas toward studying theories and praxis in more detail. The concepts of require a higher level of critical thinking than other images. In addition, the unique characteristics of material structured with synopses and images of humanity loaded with theory and evaluation make students tend to hear and memorize.

Learning using teaching materials can train students to think critically and independently (Suryanti et al., 2018). Moreover, if student learning activities are developed based on the reality of a problem, the learning process is more effective in improving critical thinking to solve a problem. Learning through observation and experience can encourage students to observe diligently, compare theory with reality and also be able to master the material according to essential competencies. Thus the research conducted is different from previous research because this research focuses on the ability of students to solve problems by using behavioral observations related to the influence of instinct, awareness, and the unconscious. Students are given the challenge of solving problems defense mechanisms in the form of counseling services.

Material with an informal, clear, and sharp language style is also comprehensive, resulting in students being less motivated to learn one subject. Worse, students have not carefully carried out logical arguments to avoid losing meaning or undermining the original theory. The invasiveness of student thinking also results in students being incomplete in solving human personality problems. Observing the problems above, developing teaching materials based on problem-based learning is necessary to improve student thinking patterns. The development of this teaching material can motivate students to practice applicable theories in the field of related to the structure of human personality. In addition, it leads students to study problems of the unconscious and human consciousness in reality and provides stimulus as a form of critical thinking ability to motivate students to obtain answers to the problems encountered (Paradita, 2018).

Teaching materials are written or unwritten materials that help teachers during teaching and learning activities. The content of teaching materials consists of information that guides the actions of teachers and students so that learning objectives can be achieved-arranged systematically to allow students to read and understand the content of the teaching material easily (Al-Khasawneh, 2022). The information in the teaching materials helps students learn competence entirely and systematically. Learning using teaching materials can support scientific activities and familiarize learning activities by analyzing the activities carried out. Even learners can think critically and pay close attention to each process that is carried out.

Meanwhile, problem-based learning teaching materials aim to motivate students to develop intellectual abilities and skills, critical thinking, problem-solving skills, and group participation learners can compose their thoughts, create higher skills and inquiry, bathe students, and increase learner confidence. The issue curriculum train and improve critical thinking skills, solve problems, and gain knowledge through scientific activities based on reality (Narmaditya et al., 2018). Critical thinking is a student's ability that must be developed and taught in every subject because critical thinking is an intellectual potential that can be carried out through teaching and learning activities (Shamboul, 2022).

Students' critical thinking potential can be measured if there are learning activities with an approach to solving a problem. The series of necessary thinking work comes from finding facts to prove facts ahead of time or finding facts to verify discovered facts and making decisions. That is to say, the ability to think critically focuses on reasonable and reflective elements until the conclusion stage. Students' critical thinking skills are expected to improve with problem-based learning models. Students are actively involved in investigating and independently analyzing problems that occur in reality. The attitude of student independence in solving problems means that students play a role as professional problem solvers in discussing one problem topic. Thus, the problem-based learning model is one of the alternatives to improve students' critical thinking in learning. Problem-based learning activities are actual activities where students can explore, interpret, synthesize, assess, and process information. The research objective was to produce problem-based learning-based teaching materials to improve students' critical thinking patterns.

Method

Research on the development teaching materials based on Problem-based Learning to improve critical thinking patterns of students using the development model used is the 4D development model. The 4D model has four stages of the development process Define, Design, and Develop. This research only uses three stages because the results of the development of this teaching material are not disseminated to other higher education institutions. The define stage of the researcher determines and defines the needs, consisting of analysis at an end, student analysis, task analysis, concept analysis, and specification of learning objectives.

In the design stage, the researcher designs the prototype of teaching materials by compiling a benchmark reference test, media selection, format selection, and initial design. The draft teaching materials are formed, followed by the development stage, which produces teaching material products. The expert appraiser tests the teaching material product to get comments, suggestions, and criticisms that are remedial for improvement. The experts who perform the validation are material experts, linguists, and design experts (Table 1). The results of the assessment are used as guidelines for revising teaching products.

Product trials are carried out in small groups and field tests. The small group test was carried out after I completed the revision process. In small group trials, it is expected that there will be responses and suggestions from students. In addition, if you find incompatibilities, it is necessary to make improvements before the field trial stage. Trial data using response questionnaires. The results of small group trials were analyzed and used as guidelines for making improvements (revision II) before field trial products.

Table 1. Validity Criteria

Range of Values	Category
V ≤ 0.4	Weak validity
0.4>V<0.8	Medium validity
V≥0.8	High validity

Result and Discussion

The results of this research and development are the product of teaching materials based on Problem-based learning to improve the critical thinking patterns of students by using the 4D development model. The 4D model has four stages of the development process define, design, and develop. The defining stage was carried out by analyzing the objectives and limitations of lecture material for with material on mental life. In detail, five stages are carried out at the definition stage.

Front-end analysis students also find it challenging to find material in textbooks because some textbooks are foreign languages. Students only owned by lecturers do not hold analysis textbooks. Students have difficulty mastering the material, especially if they have to face exams or do assignments because they often take information only from the internet. The lack of lecturers motivates students' enthusiasm and desire to like and diligently like and want to master well and precisely the content of material. Patterned from the teaching and learning process that only hears and notes, students tend to experience a decreased enthusiasm to think critically.

Some student weaknesses related to the decline in students' critical thinking spirit are weaknesses in student analysis and evaluation reasoning related material faced with the client's behavior and level of mental life, students' inaccuracy in making logical arguments to convince clients to solve problems with the ego defense mechanism approach, and students' incompetence in thinking results in students not arguing enough to give scientific considerations in solving problems. Based on this analysis, researchers develop teaching materials that help overcome existing problems, namely, teaching materials based on problem-based learning in improving students' critical thinking patterns.

Task Analysis maps the main tasks performed by students. Task analysis consists of Core Competencies and Basic Competencies and is developed through teaching materials. Concept Analysis is analyzed by determining the material level of mental life by identifying, detailing, and compiling the main concepts. In the specification of objectives, learning indicators are produced as a basis for designing problem-based learning-based teaching materials to improve students' thinking skills.

Design Phase

The presentation of the material relates to the client's problems and describes the teaching material. The description of the material begins with the determination of the issues. It directs students to read situations and questions, followed by the presentation of the material, where each material has problems that motivate students to raise questions from students. Students are given a tutorial room, where there are students who play the role of providing information. In addition, students benefit explicitly or implicitly from some events with an easily visible eye.

The tutorial has a measure of knowledge and data related to the discussion because, conceptually, it has been stated in the teaching materials (Hartikainen et al., 2019). Teaching materials based on Problem Based-Learning in improving critical thinking patterns in this

development include the introduction, content, and evaluation sections. The introductory paragraph consists of a *cover*, a preface, a competency formulation, and a table of contents. The content section consists of essential competencies and learning indicators (Medriati et al., 2018). In each part of the learning, there are lecture sessions and tutorials on various tasks such as discussion, problem, or study tasks.

Development Stage (Develop)

The development stage material based on Problem Based-Learning in improving critical thinking patterns by validators. The revised result is the second draft. The purpose of expert validation is to determine the level of validity of teaching materials (Table 2).

Table 2. Validation Results Teaching Materials

Evaluation	Lesson Plan	Student Worksheets	Critical Thinking Instruments
Validator 1	3.57	3.62	3.47
Validator 2	3.86	3.73	3.60
Validator 3	3.57	3.58	3.40
Average	3.67	3.61	3.49
Index Aiken	0.89	0.87	0.83

Table 2 shows that the assessment of the three validators for each component of the teaching material has an index of ≥ 80. Thus, the teaching materials developed conclude that teaching materials have high validity. Suggestions for lesson plan improvement are the approach used is adjusted to the problem-based learning model, the material is more specific so that there is a connection between the sub-materials, the lesson plan is made to be in sync with learning activities, the rubric assessment needs to be described in detail so that it is assessed. Inputs for student worksheets, activities in student worksheets are adapted to the lesson plan, drawings and tables on student worksheets should be clear.

The validity of teaching materials and lesson plans is declared valid if the resulting product has a character that reflects the soul of knowledge (Muslim et al., 2021). Product components have consistency with each other. This statement is in line with the development of a lesson plan with a problem-based learning model by emphasizing the validity of content (Phungsuk et al., 2017). The validation results of the critical thinking ability test instrument include content, presentation, and language. Inputs for the improvement of the test instrument include writing marks are placed appropriately, the use of terms and naming must be by the reference for the meaning to be clear, adding critical thinking skills at the C6 level, and the instructions for doing the questions are more simplified. Similar research shows that teaching materials developed have very valid criteria based on the validator's assessment.

According to Zur et al. (2022), teaching materials can be mastered well by students if they foster interest in reading, they can use it anytime if needed, describe the goals to be achieved, implement flexible learning patterns, structure teaching materials based on the final competencies to be achieved, provide opportunities to do exercises, accommodate learning difficulties, provide conclusions, communicative and semi-formal language, instructing through instructional processes, feedback occurs and, instructing learning. Furthermore, the results of the teaching material trial can be seen in Table 3.

Table 3. Effects of Teaching Material Trials

Information	Average Eligibility	Assessment Criteria	Average Eligibility Percentage	Percentage Criteria
Components of the contents	3.64	Valid	91.67	Valid
Linguistic component	3.71	Valid	92.22	Valid
Serving components	3.70	Valid	92.54	Valid
Practicality component	3.68	Valid	90.23	Valid

Problem-based teaching materials further address the problem as a context that motivates students to be diligent in learning, understanding, and mastering (Triyanto et al., 2017). Students have high learning motivation, form in-depth mastery of the material and improve aspects of critical thinking, problem-solving, and cooperation in groups. Validity criteria are fulfilled based on the practicality of using teaching materials. The suitability of teaching materials is related to the ease with which teachers and students use teaching materials (Widya et al., 2020). To test the usefulness of teaching materials, trials are carried out for students by facing problems, making observations, collecting data, and working on overcoming problems. The practicality test of teaching materials is carried out by observing the implementation of learning and providing questionnaires to students and lecturers as users of teaching materials (Aprijon et al., 2019).

The quality of the results of the development of teaching materials according to the word is also characterized by characteristics, among others, guiding students to achieve learning goals, providing attractive experiences and interactions, involving students to support the achievement of learning goals actively, there

are learning facilities and resources that develop aspects of student learning success from elements of attitudes, knowledge, and skills. They are developing problem-based learning-based teaching materials improve the critical thinking patterns of students (Akhdinirwanto et al., 2020) using problem-based teaching materials. The nature of the problem trains students to think critically to solve problems. Students diligently criticize a phenomenon in a pleasant learning atmosphere to improve critical thinking skills. Problem-Based Learning-based learning activities to enchance essential thinking patterns of students have positively impacted students' critical thinking.

Conclusion

Teaching materials based on problem based learning can be used as one of the teaching materials for enchance essential thinking patterns of students have positively impacted students' critical thinking.

Acknowledgments
Thanks to all parties who have supported the implementation of this research. I hope this research can be useful.

Author Contributions
Conceptualization, data curation, funding acquisition, methodology, visualization, writing–original draft, writing–review & editing: Herly Janet Lesilolo.

Funding
This research was independently funded by researchers.

Conflicts of Interest
No Conflicts of interest.

References

Akhdinirwanto, R. W., Agustini, R., & Jatmiko, B. (2020). Problem-Based Learning with Argumentation as a Hypothetical Model to Increase the Critical Thinking Skills for Junior High School Students. *Jurnal Pendidikan IPA Indonesia*, *9*(3), 340–350. https://doi.org/10.15294/jpii.v9i3.19282

Al-Khasawneh, F. (2022). A systematic review of the eclectic approach application in language teaching. *Saudi Journal of Language Studies*, *2*(1), 17–27. https://doi.org/10.1108/SJLS-11-2021-0022

Aprijon, A., Atmazaki, A., & Asri, Y. (2019). Development of Writing Text Description Learning Modules Based on Scientific Approach Class VII Junior High School. *Proceedings of the Proceedings of the 2nd International Conference on Language, Literature and Education, ICLLE 2019, 22-23 August, Padang, West Sumatra, Indonesia*. https://doi.org/10.4108/eai.19-7-2019.2289483

Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., Dennehy, D., Metri, B., Buhalis, D., Cheung, C. M. K., Conboy, K., Doyle, R., Dubey, R., Dutot, V., Felix, R., Goyal, D. P., Gustafsson, A., Hinsch, C., Jebabli, I., … Wamba, S. F. (2022). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, *66*, 102542. https://doi.org/10.1016/j.ijinfomgt.2022.102542

Hartikainen, S., Rintala, H., Pylväs, L., & Nokelainen, P. (2019). The Concept of Active Learning and the Measurement of Learning Outcomes: A Review of Research in Engineering Higher Education. *Education Sciences*, *9*(4), 276. https://doi.org/10.3390/educsci9040276

Mahur, Y., Riyanto, Y., & Roesminingsih, E. (2019). Paulo Freire: Critical, Humanist and Liberating Education (Critical Reflections on Indonesian Education). *International Journal for Educational and Vocational Studies*, *1*(8), 873. https://doi.org/10.29103/ijevs.v1i8.2242

Medriati, R., Irawati, S., & Ekaputri, R. Z. (2018). Mapping the standard competencies, basic competencies, and the indicators (SKKDI) of natural science course of middle school students in curriculum 2013. *Journal of Physics: Conference Series*, *1116*, 032019. https://doi.org/10.1088/1742-6596/1116/3/032019

Muslim, L. L., Verawati, N. N. S. P., & Makhrus, M. (2021). Validity and Reliability of Learning Tools Based on Discovery Learning Model to Improve Creative Thinking Ability and Concept Understanding. *Lensa: Jurnal Kependidikan Fisika*, *9*(1), 10. https://doi.org/10.33394/j-lkf.v9i1.3507

Narmaditya, B. S., Wulandari, D., & Sakarji, S. R. B. (2018). Does Problem-Based Learning Improve Critical Thinking Skill? *Jurnal Cakrawala Pendidikan*, *37*(3). https://doi.org/10.21831/cp.v38i3.21548

Nazmillah, N., Hidayat, D. N., Defianty, M., Anita, A., & Muin, A. (2022). A Study of Teachers' Strategies in Providing Feedback in English Writing Class. *Acitya: Journal of Teaching and Education*, *4*(2), 339–356. https://doi.org/10.30650/ajte.v4i2.3258

Panadero, E. (2017). A Review of Self-regulated Learning: Six Models and Four Directions for Research. *Frontiers in Psychology*, *8*, 422. https://doi.org/10.3389/fpsyg.2017.00422

Paradita, L. I. (2018). Motivating Students in L2 Reading through Dialogue Journal: An Investigation on Students' Perception. *Journal of Foreign Languange*

Teaching and Learning, *3*(2). https://doi.org/10.18196/ftl.3233

Paul, J., & Jefferson, F. (2019). A Comparative Analysis of Student Performance in an Online vs. Face-to-Face Environmental Science Course From 2009 to 2016. *Frontiers in Computer Science*, *1*, 7. https://doi.org/10.3389/fcomp.2019.00007

Phungsuk, R., Viriyavejakul, C., & Ratanaolarn, T. (2017). Development of a problem-based learning model via a virtual learning environment. *Kasetsart Journal of Social Sciences*, *38*(3), 297–306. https://doi.org/10.1016/j.kjss.2017.01.001

Pregoner, J. D. M., Accion, N., Buraquit, D., & Amoguis, A. (2020). *The Experiences of Working While Studying: A Phenomenological Study of Senior High School Students* [Preprint]. EdArXiv. https://doi.org/10.35542/osf.io/w5t7a

Rashid, Y., Rashid, A., Warraich, M. A., Sabir, S. S., & Waseem, A. (2019). Case Study Method: A Step-by-Step Guide for Business Researchers. *International Journal of Qualitative Methods*, *18*, 160940691986242. https://doi.org/10.1177/1609406919862424

Schmidt, H. G., Wagener, S. L., Smeets, G. A. C. M., Keemink, L. M., & van der Molen, H. T. (2015). On the Use and Misuse of Lectures in Higher Education. *Health Professions Education*, *1*(1), 12–18. https://doi.org/10.1016/j.hpe.2015.11.010

Sellars, M., Fakirmohammad, R., Bui, L., Fishetti, J., Niyozov, S., Reynolds, R., Thapliyal, N., Smith, Y., & Ali, N. (2018). Conversations on Critical Thinking: Can Critical Thinking Find Its Way Forward as the Skill Set and Mindset of the Century? *Education Sciences*, *8*(4), 205. https://doi.org/10.3390/educsci8040205

Shamboul, H. A. E. (2022). The Importance of Critical Thinking on Teaching Learning Process. *Open Journal of Social Sciences*, *10*(01), 29–35. https://doi.org/10.4236/jss.2022.101003

Silvia, R., & Rohaeti, E. E. (2022). Analysis of Teaching Materials Editorial Text to Improve Student's Writing Ability. *JLER*, *5*(1). https://doi.org/10.22460/jler.v5i1.7598

Suryanti, Arifin, I. S. Z., & Baginda, U. (2018). The Application of Inquiry Learning to Train Critical Thinking Skills on Light Material of Primary School Students. *Journal of Physics: Conference Series*, *1108*, 012128. https://doi.org/10.1088/1742-6596/1108/1/012128

Suzina, A. C., & Tufte, T. (2020). Freire's vision of development and social change: Past experiences, present challenges and perspectives for the future. *International Communication Gazette*, *82*(5), 411–424. https://doi.org/10.1177/1748048520943692

Triyanto, T., Suharno, S., Khodijah, S., & Wulandari, T. (2017). Learning Motivation Strategy Through Problem-Based Learning: *2nd International Conference on Sociology Education*, 1036–1040. https://doi.org/10.5220/0007110410361040

Widya, Indrawati, E. S., & Muliani, D. E. (2020). Validity and practicality of integrated science teaching materials based on Creative problem Solving model as an efforts for the establishment of anticorruption characters. *Journal of Physics: Conference Series*, *1481*(1), 012079. https://doi.org/10.1088/1742-6596/1481/1/012079

Zur, S., Zur, S., Hestiana, H., & M, Z. (2022). Students' Interest in Reading English Texts. *KnE Social Sciences*, 148–157. https://doi.org/10.18502/kss.v7i8.10733