

Pengembangan Modul Berbasis Masalah Pada Mata Kuliah Logika Dasar

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Abstract. Problem based learning approach is a learning approach that use problems as a first step to get new knowledge. Student can solve group learning problems in problem based learning. The purpose of this study is to explain the development of problem based modules in basic logic course. This research is expected to provide a result of the development of modules that can be applied in learning. The research that will be used is to follow a series of developmental research. Broadly speaking, this research will be carried out in four stages, namely: define, design, develop, and disseminate. The define phase includes the analysis of logical material and analysis of problem-based approaches; the design phase includes the preparation of modules and instruments; develops include the testing phase of problem-based modules in basic logic courses and the evaluation and improvement of the modules; as well as the disseminate stage of distributing problem-based modules on basic logic courses used by students in learning basic logic courses. This research will be conducted at IKIP Budi Utomo Malang Semester I Class 2019 B. The result of the study show the validation result of the expert valisator as follows: module development with a value of 3.60 with a very valid category. While the result of the student questionnaire with a value of 3.55 in the excellent category. The final product us a problem based module in basic logic courses.

Keywords. *Development, problem based modules, and basic logic*

Abstrak. Pendekatan pembelajaran berbasis masalah merupakan pendekatan pembelajaran yang menggunakan masalah sebagai langkah awal untuk mendapatkan pengetahuan baru. Mahasiswa dapat memecahkan masalah pembelajaran secara berkelompok dalam pembelajaran berbasis masalah. Tujuan penelitian ini adalah memaparkan pengembangan modul berbasis masalah pada mata kuliah logika dasar. Penelitian ini diharapkan akan memberikan suatu hasil pengembangan modul yang dapat diterapkan dalam pembelajaran. Penelitian yang akan digunakan adalah mengikuti rangkaian penelitian pengembangan (developmental research). Secara garis besar penelitian ini akan dilaksanakan dalam empat tahap, yaitu: define, design, develop, dan disseminate. Tahap define meliputi analisis materi logika dan analisis pendekatan berbasis masalah; tahap design meliputi penyusunan draf modul dan instrumen; develop meliputi tahap ujicoba modul berbasis masalah pada mata kuliah logika dasar dan adanya evaluasi serta penyempurnaan modul tersebut; serta tahap disseminate melakukan penyebaran modul berbasis masalah pada mata kuliah logika dasar yang digunakan mahasiswa dalam pembelajaran mata kuliah logika dasar. Penelitian ini akan dilaksanakan di IKIP Budi Utomo Malang Semester I Kelas 2019 B. Hasil penelitian menunjukkan hasil validasi dari validator ahli sebagai berikut: pengembangan modul dengan nilai 3.60 dengan kategori sangat valid. Sedangkan hasil dari angket mahasiswa dengan nilai 3.55 dengan kategori sangat baik. Produk akhir berupa bahan modul berbasis masalah pada mata kuliah logika dasar.

Kata Kunci *Pengembangan, modul berbasis masalah, logika dasar*

1. INTRODUCTION

The education system has changed a lot with the times. The Indonesian government has made many changes to the education system, especially in the curriculum structure and learning patterns to improve the quality of education (Martiningsih, Lisdiana, & Susilowati, 2018). The results of the Program for International Student Assessment (PISA) survey which was attended by 72 countries in 2015 showed a significant increase in education achievement in Indonesia, amounting to 22.1 points. These results put Indonesia in fourth place in terms of increasing student achievement compared to the results of the previous survey in 2012, from 72 countries that took the PISA test (Tohir, 2018).

Improving the quality of education is closely related to the learning process in the classroom. Learning in the classroom must have innovation so that learning further improves science and technology. The learning process must be innovated with existing models, methods and approaches. The learning process is a process of communication between teacher and student, students and students to be able to build good and smooth interactions (Arpan, Anurrahman, & Fadillah, 2018). In addition, the development of books and learning modules integrated models, methods, and approaches is something that creative.

Learning strategies must also be applied in the learning process, especially mathematics material. This is because with the right learning strategy, it can achieve the expected curriculum. Learning strategy is not only chosen based on which skill/ability assessed, but also by considering learning material, students' prior knowledge, time allocation and facilities, teachers' personality and experience (Kusumawati, Ratih; Nayazik, 2018). Thus, the learning strategy must be designed before the learning process.

One strategy to improve the quality of learning is to create modules that are designed for the learning process. Learning by using modules makes learning materials more detailed. The module is teaching materials that are arranged systematically to achieve the competencies and specific objectives expected (Zulfah & Aznam, 2018). Teaching material in this case in the form of learning modules is an independent learning package which includes a series of learning experiences that are planned and systematically designed to help students achieve learning goals and can be studied independently.

other than that, one learning model that can be integrated with a learning module is the problem based learning (PBL) type of cooperative learning model. Problem-based learning (PBL) is an instructional approach that has been used successfully for over 30 years and continues to gain acceptance in multiple disciplines. It is an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem (Savery, 2006).

Learning essentially aims to produce students who have extensive knowledge, good attitude, strong skills and can apply it in life to solve the problems they encountered (N, Issufiah D; Sunardi; W, 2018). Problem based learning (PBL) emphasizes learning as a process that involves solving problems and thinking critically in actual contexts. Problem solving is a troubleshooting method or a way of presenting the lesson by encouraging the students to find and solve the problems or issues in order to achieve learning objective (Yuni & Thohiri, 2018). PBL model is also in accordance with the purpose of learning mathematics that focuses on ways of thinking or reasoning, developing creative activity, developing the ability to solve problems and communicate ideas (Ikam, Hasnawati, & Rezky, 2016).

The PBL method requires students to become responsible for their own learning. The PBL teacher is a facilitator of student learning, and his/her interventions diminish as students progressively take on responsibility for their own learning processes (Hmelo-Silver & Barrows, 2006). Other than that, some definitions of PBL in the studies reviewed are closely related to classroom practice; we call these functional or curriculum design definitions (Merritt, Lee, Rillero, & Kinach, 2017). PBL in the form of an institutionalised pedagogical paradigm, a learning structure for cultivating students' skills to integrate espoused theory and practical problem-solving in a scholarly fashion (Camacho & Christiansen, 2018). Student's engagement in the learning process may assess students during a lesson on how they follow the lesson, therefore, it is not only seen from the output (Riswari, L.A; Yanto, H; Sunarso, 2018).

The reality of students' understanding of logic courses has not been maximized. To make learning more effective, a module will be developed. Modules developed in this study, namely the basic logic material. The module will be designed using the PBL model.

2. METHOD

This study uses the Four-D model of Research and Development with the reduction of one final stage, which includes define, design, develop, and disseminate. The Four-Door (4D) is a simple instructional design model that helps the researcher to design the product that will help the learner to improve their ability in learning process (Gorbi Irawan, nyoman Padmadewi, & Putu Artini, 2018).

a. Define phase

The define phase in this study includes analysis and potential problems that exist in the logic courses at IKIP Budi Utomo Malang. How gather information by doing direct observation during the learning process. To find this out, it is defined as an analysis of teacher needs for basic logic modules develop on problems and basic logic curriculum analysis.

b. Design phase

The design phase is a process after the preliminary phase, based on the findings in the preliminary stage, problem based modules will be developed on the basic logic material which is expected to overcome existing problems, the design phase includes: 1) designing a problem based module framework on basic logic material, 2) establishing module display design, 3) collecting references, and 4) developing problem based module assessment instruments on basic logic material.

c. Develop Phase

The development phase is a process after the design phase, based on the findings at the design phase, a problem based module will be developed on based logic material which is expected to overcome the existing problems, the development stage includes: 1) product design 2) Design validation 3) design revision.

d. Disseminate Phase

The disseminate phase is a process after the development phase. At this stage the product is distributed to class 2019 B for the learning process.

3. RESULT & DISCUSSION

Early identification is know that there is no basic logic module developed at IKIP Budi Utomo Malang. In order to make learning more interesting and to solve problems, a problem based module is needed on basic logic material.

Based on the teaching needs of the learning process, a problem based module is developed on basic logic material, the development used is Research and Development with the 4D model. The problem-based module on basic logic material has been validated by three validators, who are mathematics education lecturers at IKIP Budi Utomo Malang. The validation results from the validator show that the quality of the module based on the basic logic material developed was reviewed in terms of the validity of the material, the validity of the media, and the validity of the language, as a whole having very valid criteria.

The development of problem based modules on basic logic material consists of 5 chapters. Chapter 1 explains the basics of logic, chapter 2 explains the truth table, chapter 3 explains compound propositions, chapter 4 explains tautology and contradictions, and chapter 5 logical equivalence. The steps for developing a problem-based module on the basic logic material are as follows.

Table 1: Steps for developing a problem-based module on basic logic material

Stages	Indicators in module development
Orientation to the problem	<ul style="list-style-type: none"> • Learning objectives are in accordance with learning achievements in the semester learning plan. • A detailed explanation of the basic concepts in each material.

	<ul style="list-style-type: none"> • Logical and sequential explanation of material. • There is an evaluation of the learning process on each material. • Provision of problem based exercises that refer to the process of critical thinking. • There is motivation in every learning so students are more enthusiastic and active. • Explain the material logically and sequentially.
Organizing problems for learning	<ul style="list-style-type: none"> • Form groups to solve problems together. • There is a process in understanding the problem.
Guide the investigation	<ul style="list-style-type: none"> • Gather the information needed to solve the problem. • Look for other alternatives in solving problems.
Present and develop the results of problem solving	<ul style="list-style-type: none"> • Resolve problems in sequential stages. • Collection of problems can be made in the form of reports.
Analyze and evaluate the problem solving process	<ul style="list-style-type: none"> • Lecturers and students together in analyzing and evaluating the problem solving presented.

Overall, the development of problem-based modules in this basic logic material is declared to be very valid and can be used by teachers in designing devices in learning. This is indicated by the validation results from the validator obtained an average of 3.60 with the category of very valid. Validation results from material experts with an average of 3.55 with a very valid category. Validation results from media experts with an average of 3.70 with a very valid category. Validation results from linguists with an average of 3.55 with a very valid category. Based on the cavalry of material, media, and language experts, the problem-based module on basic logic material is developed that is feasible to use and interesting to learn. The distribution of the questionnaire was done in 2 stages, the first trial phase involved 10 students and the second trial phase involved 39 students in 2019B class. The results of the student questionnaire had a value of 3.55 with a very good category.

The development of problem based modules on this basic logic material makes learning more effective. Therefore, PBL is a good alternative teaching method to improve the academic achievement of students. In doing so, students need to develop social skills in order to be active in group discussion and exercise independent learning. There should also be a sense of trust among students (Argaw, Haile, Ayalew, & Kuma, 2017). In addition, PBL not only develops problem solving skills, but helps students gain knowledge based on problems encountered in daily life, develop positive skills and attitudes including teamwork and self-study skills, ethics and respect for other people's ideas (Kholis, 2018). Overall, students and staff indicated greater satisfaction with the PBL approach to learning (Strobel & van Barneveld, 2009).

4. CONCLUSION

Based on the result of research and discussion, it was concluded that the development of problem based modules on basic logic material, including: (1) teachers need basic logic modules for better learning; (2) Planning and development of basic logic modules is adjusted to the findings of problem based needs analysis. The development of problem based modules on basic logic material includes the define phase, the design phase, the develop phase, and the disseminate phase; (3) the quality of problem based modules on

basic logic material in terms of the validity of the material, the validity of material, the validity of the media, and the validity of the language, as a whole have very valid criteria with an average of 3.60. the result of the student questionnaire with a value of 3,55 with a very good category; and (4) the final product in the form of problem based module in basic logic courses for mathematics students in semester I. the suggestion is that teacher should develop learning modules so that learning is more active, innovative, and fun.

REFERENCES

- Argaw, A. S., Haile, B. B., Ayalew, B. T., & Kuma, S. G. (2017). The effect of problem based learning (PBL) instruction on students' motivation and problem solving skills of physics. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(3), 857–871. <https://doi.org/10.12973/eurasia.2017.00647a>
- Arpan, P., Aunurrahman, A., & Fadillah, F. (2018). The Development of Science Learning Module with Problem Solving Method. *JETL (Journal Of Education, Teaching and Learning)*, 3(2), 195–205. <https://doi.org/10.26737/jetl.v3i2.747>
- Camacho, H., & Christiansen, E. (2018). Teaching Critical Thinking within an Institutionalised Problem Based Learning Paradigm -- Quite a Challenge. *Journal of Problem Based Learning in Higher Education*, 6(2), 91–109.
- Gorbi Irawan, A., nyoman Padmadewi, N., & Putu Artini, L. (2018). Instructional materials development through 4D model. *SHS Web of Conferences*, 1(1), 1–4. <https://doi.org/10.1051/shsconf/20184200086>
- Hmelo-Silver, C. E., & Barrows, H. S. (2006). Goals and Strategies of a Problem-based Learning Facilitator. *Interdisciplinary Journal of Problem-Based Learning*, 1(1), 5–22. <https://doi.org/10.7771/1541-5015.1004>
- Ikam, Hasnawati, & Rezky, M. F. (2016). Effect of Problem Based Learning (Pbl) Models of Critical Thinking Ability Students on the Early Mathematics Ability. *International Journal of Education and Research*, 4(7), 361–374.
- Kholis, N. (2018). The Importance of Problem Based Learning in Islamic Higher Education Pendahuluan Kehadiran abad 21 telah memunculkan kompetisi global dalam berbagai bidang : ekonomi , politik , seni , pendidikan , dan bahkan agama . Persaingan bebas menyebabkan tuntutan . *Nadwa: Jurnal Pendidikan Islam*, 12(51), 345–362.
- Kusumawati, Ratih; Nayazik, A. (2018). Developing Mathematics Learning Strategy Module Based on Journal Review. *Journal of Chemical Information and Modeling*, 2(9), 111–120. <https://doi.org/10.1017/CBO9781107415324.004>
- Martiningsih, I., Lisdiana, L., & Susilowati, S. M. E. (2018). Development of module based on scientific contextual additives material to increase learning outcomes and science process skills in junior high school. *Journal of Innovative Science Education*, 7(1), 372–381. <https://doi.org/10.15294/jise.v0i0.27790>
- Merritt, J., Lee, M. Y., Rillero, P., & Kinach, B. M. (2017). Problem-based learning in K-8 mathematics and science education: A literature review. *Interdisciplinary Journal of Problem-Based Learning*, 11(2), 5–17. <https://doi.org/10.7771/1541-5015.1674>
- N, Issufiah D; Sunardi; W, S. A. G. (2018). The Implementation Off Problem Based Learning Model (PBL) on Teachers and Student Grade Five Elementary Schools in Surakarta City. *International Journal of Active Learning*, 3(1), 118–123.
- Riswari, L.A; Yanto, H; Sunarso, A. (2018). *The Effect Of Problem Based Learning by Using Demonstration Method on The Ability of Problem Solving*. 7(3), 356–362. <https://doi.org/10.2991/aisteel-18.2018.5>
- Savery, J. R. (2006). Overview of PBL: Definitions and distinctions. *Interdisciplinary Journal of Problem-Based Learning*, 1(1), 9–20.
- Strobel, J., & van Barneveld, A. (2009). When is PBL More Effective? A Meta-synthesis of Meta-analyses Comparing PBL to Conventional Classrooms. *Interdisciplinary Journal of Problem-Based Learning*, 3(1), 44–48. <https://doi.org/10.7771/1541-5015.1046>.
- Tohir, M. (2018). Hasil PISA Indonesia Tahun 2015 Mengalami Peningkatan. *ResearchGate*, 1(December 2016), 1–2.
- Yuni, R., & Thohiri, R. (2018). Module Development of Introduction Accounting Based on Problem Solving. *International Journal of Multicultural and Multireligious Understanding*, 5(5), 99–107.
- Zulfah, H., & Aznam, N. (2018). Development of Natural Sciences Module with Reflective Learning Journal

to Enhance Student's Reporting-Interpretative Skills. *Biosaintifika: Journal of Biology & Biology Education*, 10(2), 362–368. <https://doi.org/10.15294/biosaintifika.v10i2.14319>