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Needs Analysis of E-Modules with an Islamic Integrated Problem Based Learning approach to improve adaptive reasoning and students' spiritual attitudes

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Abstract

This study aims to analyze the needs and conditions of students as the basis for developing e-modules based on Problem Based Learning (PBL) integrated with Islam to improve algebraic reasoning and spiritual attitudes of students. The research was conducted at MTs Surya Buana Malang using a qualitative descriptive approach. Data collection techniques include interviews with teachers, distributing questionnaires to teachers and students, algebraic reasoning tests, and spiritual attitude questionnaires. The results showed that the teacher had never applied the PBL approach and still used conventional teaching materials. In addition, the pretest results showed low algebraic reasoning ability and spiritual attitudes of students. These findings indicate the need to develop e-modules that are not only contextual and problem-based, but also integrate Islamic values as part of character strengthening. This research is an important basis for the development of innovative e-modules that can improve the quality of mathematics learning holistically.

Keywords: Needs Analysis, E-Module, Problem Based Learning, Algebraic Reasoning

Abstrak

Penelitian ini bertujuan untuk menganalisis kebutuhan dan kondisi peserta didik sebagai dasar pengembangan e-modul berbasis Problem Based Learning (PBL) terintegrasi Islam guna meningkatkan penalaran aljabar dan sikap spiritual peserta didik. Penelitian dilakukan di MTs Surya Buana Malang dengan menggunakan pendekatan deskriptif kualitatif. Teknik pengumpulan data meliputi wawancara dengan guru, penyebaran angket kepada guru dan siswa, tes penalaran aljabar, serta angket sikap spiritual. Hasil penelitian menunjukkan bahwa guru belum pernah menerapkan pendekatan PBL dan masih menggunakan bahan ajar konvensional. Selain itu, hasil pretest menunjukkan rendahnya kemampuan penalaran aljabar dan sikap spiritual peserta didik. Temuan ini mengindikasikan perlunya pengembangan e-modul yang tidak hanya kontekstual dan berbasis masalah, tetapi juga mengintegrasikan nilai-nilai keislaman sebagai bagian dari penguatan karakter. Penelitian ini menjadi dasar penting bagi pengembangan e-modul inovatif yang dapat meningkatkan kualitas pembelajaran matematika secara holistik.

Kata kunci: Analisis Kebutuhan, E-Modul, Pembelajaran Berbasis Masalah, Penalaran Aljabar

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INTRODUCTION

The Indonesian education system in the era of globalization and digitalization is faced with the challenge of forming a generation that is not only knowledgeable, but also has good character and spirituality (Kemendikbud, 2022). The Merdeka Curriculum answers this challenge by emphasizing the importance of competency-oriented learning and the profile of Pancasila Students, which includes aspects of faith, fear of God Almighty, and noble character (Lovanti & Setiawan, 2023). However, in practice, many teachers still have difficulty integrating spiritual values, including Islamic values, into the learning process, especially in mathematics (Hakim, 2021). This is a gap between the lofty goals of the national curriculum and the implementation at the classroom level which is still purely cognitive, especially in mathematics (Hoque, 2016; Sugilar et al., 2019). Therefore, efforts are needed to bridge

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the strengthening of students' spiritual values with mastery of mathematics content.

As one of the fundamental subjects, mathematics plays an important role in shaping students' analytical, logical and critical thinking (Alghar, 2022; Ennis, 2011; Lailiyah et al., 2015). However, the results of national and international assessments show that students' math skills in Indonesia are still low. The National Assessment Report and the PISA study show that higher-order thinking skills, including adaptive reasoning, of Indonesian students are still lagging behind (OECD, 2022; Setyawati & Ratu, 2019). Adaptive reasoning is one of the important abilities because it reflects the ability of students to respond to new problems flexibly and meaningfully (Putra, 2016; Turner, 2013). Therefore, a learning approach is needed that is able to stimulate adaptive reasoning effectively, not only through routine problems, but also through analysis, problem solving, and critical evaluation activities. One of the relevant approaches to achieve this goal is Problem-Based Learning (PBL).

Problem-Based Learning (PBL) is a learning approach that has been proven to improve learners' critical thinking, problem solving, and collaboration skills through the exploration of contextual problems (Evertson et al., 2020; Wahyuningsih, 2019). PBL positions learners as active subjects who are responsible for building their own knowledge through a cycle of questioning, investigating, and concluding (Fitriyah & Ghofur, 2022). PBL in mathematics learning provides space for the development of adaptive reasoning because learners are faced with various problems that require flexibility of thinking (Nahdi et al., 2023; Putra, 2016). However, PBL applied in classrooms often does not explicitly touch aspects of spirituality and Islamic values. In fact, when combined with Islamic integration, PBL has the potential to form a whole mathematics learning, involving cognitive, affective, and spiritual aspects.

The integration of Islamic values in mathematics learning is not only as a complement, but as a foundation in forming noble human beings (Abdussakir, 2014; Walidah et al., 2024). In Islam, science, including mathematics, is seen as a means to get closer to Allah SWT, not just as a tool to solve worldly problems (Sugilar et al., 2019). In the context of mathematics learning, this integration can be realized by selecting the context of problems with Islamic nuances, using relevant verses of the Qur'an or hadith as a context and introduction to a mathematical problem, and reflecting on Islamic values integrated in the problem-solving process (Alghar et al., 2023; Arianto et al., 2021; Sugilar et al., 2019). Therefore, the integration of mathematics and Islamic values is an interesting thing to be developed and applied further in mathematics learning.

In addition to integrating Islamic values, digital technology also offers great opportunities to support meaningful and adaptive mathematics learning. One of the media that is widely used as a learning tool is e-modules. E-modules not only provide freedom in learning space and time, but also allow for interesting and interactive presentation of materials (Afrianti & Qohar, 2019; Deviana & Sulistyani, 2021). However, most of the e-modules developed by various studies have not integrated Islamic values into mathematics. Some studies still focus on aspects of mathematical content developed through e-modules (Afrianti & Qohar, 2019; Latif, 2022; Ulfah et al., 2020). Thus, the utilization of

digital technology is still limited to cognitive aspects of a mathematical nature. Therefore, it is important to develop e-modules that not only involve students' knowledge, but also integrate Islamic values in it.

Although there have been many studies on PBL, adaptive reasoning, and Islamic integrated mathematics, research that combines the three in an e-learning module is still very limited. Many studies only focus on certain aspects, such as the effectiveness of PBL on mathematics learning outcomes or the use of e-modules to improve student reasoning, without mentioning the dimension of spirituality (Deviana & Sulistyani, 2021; Utami et al., 2018; Widyaningsih et al., 2023). On the other hand, Islamic integrated mathematics is often still conceptual research or classroom application (Sugilar et al., 2019). Islamic integrated mathematics themes have not been widely involved in digital learning tools. Therefore, it is necessary to develop an e-module in learning mathematics that focuses on the PBL approach integrated with Islam to improve students' adaptive reasoning and spiritual attitudes.

To develop an electronic learning media, such as e-modules, cannot be done haphazardly. An in-depth needs analysis is needed as a foundation so that the product developed is in accordance with the needs of students, teachers, and the learning context (Deviana & Sulistyani, 2021; Ulfah et al., 2020). In addition, needs analysis helps in identifying gaps between ideal conditions and realities in the field (Hakim, 2021). Needs analysis also helps in determining what features need to be included in the e-module (Ulfah et al., 2020). Therefore, it is important to conduct a needs analysis to explore the perspectives of various parties, such as teachers, students, and education experts so that the design of PBL-based e-modules integrated with Islam really answers the real problems faced in schools.

Based on the previous description, it can be concluded that the development of PBL-based e-modules integrated with Islam to improve adaptive reasoning is a novelty in the context of mathematics education. But before that, a comprehensive needs analysis is needed to explore the reality in the field, ideal expectations, and existing obstacles. Therefore, this research aims to conduct a needs analysis of the development of PBL-based e-modules integrated with Islam to improve adaptive reasoning and students' spiritual attitudes. The hope is that the research can open space for the development of learning media that is not only cognitively effective, but also effective in shaping students' spiritual character.

METHODS

This research is part of the initial stages in development research that refers to the ADDIE model (Dick & Carey, 1985), focusing on the preliminary study stage, namely needs analysis. This stage aims to explore in depth the need for developing a mathematics e-Module based on the Problem Based Learning (PBL) approach integrated with Islamic values to improve algebraic reasoning and spiritual attitudes of students. The subjects in this study were 8th grade students at MTs Surya Buana Malang and mathematics teachers. Data collection techniques were carried out through lesson observations, interviews with teachers, open questionnaires to students, and documentation studies of syllabuses, lesson plans, and teaching materials used. The aspects and indicators analyzed in the needs analysis stage are described in Table 1 below:

Table 1. The aspects analyzed in the needs analysis

No	Analysis Aspect	Indicator
1	Literature Study	Theoretical studies on: (1) learning e-Modules, (2) PBL approach, (3) algebraic reasoning, (4) Islamic values in learning, and (5) spiritual attitude development.
2	Field Study	(1) Observation of mathematics learning in the classroom, (2) teacher interviews about the constraints and needs of algebra learning, (3) student questionnaires related to expectations of learning.
3	Curriculum Analysis	Identification of learning outcomes and algebra materials in the 8th grade curriculum that are relevant to the PBL approach and integration of Islamic values.
4	Material Analysis	Analysis of algebra material studied at certain levels, classes, and semesters that will be used as guidelines in the e-module content
5	Analysis of Student Characteristics	Analysis of initial abilities, learning difficulties, and religious tendencies of students.
6	Learning Analysis	Comparison between the ideal conditions of PBL learning integrated with Islamic values and the reality of learning in the classroom.
7	Teaching Material Analysis	Availability and quality of teaching materials used, as well as the need for interactive learning media such as e-Modules.
8	Analysis of Spiritual Attitudes and Islamic Values	Potential Islamic values that can be integrated in the context of algebraic reasoning material.

Based on Table 1, the data collected were then analyzed using data analysis techniques with a qualitative approach (Miles et al., 2014). This stage consists of a process of data reduction, data presentation, and conclusion drawing and verification. The findings of this needs analysis will be the basis for the design and development of e-Modules in the next stage.

RESULTS

The PBL-based E-Module integrated with Islam to improve students' adaptive reasoning and spiritual attitudes was designed based on preliminary analysis or needs analysis. The needs analysis activities began with curriculum analysis, material analysis, and analysis of student characteristics, analysis of learning and teaching materials, and analysis of spiritual attitudes and Islamic values. The description of the results of the preliminary analysis is as follows:

Curriculum Analysis

Curriculum analysis aims to evaluate the extent to which the material taught is in accordance with the expected learning outcomes. In the context of the independent curriculum at the junior high school/MTs level, learning outcomes contain basic competencies and indicators of competency achievement. In the two-variable linear equation system material, there are two basic competencies, namely basic competencies 3.5 and 4.5. Both competencies emphasize students' ability to explain SPLDV and relate it to contextual problems and the ability to solve SPLDV problems.

The two basic competencies are derived into competency achievement indicators consisting of 3 items, namely competency achievement indicators 3.5.1, 3.5.2, and 4.5.1. The indicator 3.5.1 emphasizes the ability of students to make mathematical models of SPLDV problems. Indicator 3.5.2. Emphasizes the ability to solve SPLDV with substitution, elimination, and mixed methods. Indicator 4.5.1 emphasizes the ability of students to solve daily life problems related to SPLDV. The results of curriculum analysis containing details of basic competencies and indicators of competency achievement are presented in Table 2.

Table 2. The aspects analyzed in the needs analysis

Basic Competencies	Competency Achievement Indicators
3.5 Explain the system of linear equations of two variables and its solution connected with contextual problems	3.5.1 Learners can make a mathematical model of the given problem properly
4.5 Solve problems related to the system of linear equations of two variables	3.5.2 Learners can determine the solution of SPLDV by substitution, elimination and combination of the given problem appropriately 4.5.1 Learners can solve problems related to SPLDV in everyday life skillfully

Material Analysis

Material analysis is an activity to find out what material is taught. In addition, material analysis also shows what material is considered difficult by students. Material analysis has the main purpose of describing the part of the material that will be taught. The material taught is the material of the Two-Variable Linear Equation System (SPLDV).

The reason the researcher chose SPLDV was because this material was difficult according to some students. Of the 30 students surveyed by researchers, 24 students answered difficult. In other words, 80% of students consider it difficult to understand SPLDV material. This shows that alternative teaching materials are needed that can be used by students to learn the concept of practical and interesting SPLDV material. The analysis of algebraic field material at the junior high school / MTs grade 8 level is shown in Table 3 below

Table 3. Material Needs Analysis in Algebra at the Secondary Education Level

Topic	Material	Grade
Algebra	Simplifying algebraic forms System of linear equations of two variables (SPLDV) Linear functions	Eight (8)

Based on Table 3, it can be seen that the material for simplifying algebraic forms, SPLDV, and linear functions is an algebraic topic studied in grade 8. Then the researcher chose SPLDV as the material to be developed in the e-module. In addition, researchers also conducted interviews with 8th grade students related to SPLDV material. The interviews with students include the following guidelines.

Table 4. Interview Guidelines with Students at the Class VIII Material Analysis Stage

Aspect	Number of question items
Material	Two (2)

The results of the researcher's interview with the teacher showed that the teacher experienced obstacles when having to apply SPLDV material that was related to real life. While the results of interviews with students show that students have difficulty in learning SPLDV because it involves more than one variable. In addition, students also experience problems in using the right method to solve SPLDV and problems in understanding story problems. Thus, the results of the material analysis show that the topic of algebra with specifications on SPLDV material is still difficult for students to understand comprehensively.

Analysis of Student Characteristics

Student analysis is the process of obtaining information on student characteristics such as looking at the initial abilities of students as a basis for providing new and advanced material. The ability of students analyzed by the author is the ability of algebraic reasoning and spiritual attitudes. The algebraic reasoning ability of students is tested through a pretest. The pretest given in the form of two description questions related to SPLDV material with learning outcomes is that students are able to solve the SPLDV system through several solution methods. The pretest question guidelines are presented in Table 5.

Table 5. Guideline for Preparing Pretest Questions related to Algebraic Reasoning on the Material of the System of Linear Equations of Two Variables

Topic	Material	Grade
Algebra	Learners can solve a system of linear equations of two variables through several ways for problem solving	2 Questions

Based on table 5, researchers tested students' algebraic reasoning skills. This test was conducted on 30 students in class VIII. The pre-test results are presented in Table 6.

Table 6. Algebraic Reasoning Pretest Results SPLDV Material

No.	Respondent Code	Algebraic Reasoning Pretest Score	No.	Respondent Code	Algebraic Reasoning Pretest Score
1	R1	22	16	R16	15
2	R2	30	17	R17	65
3	R3	35	18	R18	18
4	R4	40	19	R19	10
5	R5	28	20	R20	72
6	R6	32	21	R21	38
7	R7	45	22	R22	66
8	R8	36	23	R23	30
9	R9	34	24	R24	28
10	R10	48	25	R25	44
11	R11	28	26	R26	35
12	R12	54	27	R27	52
13	R13	30	28	R28	34
14	R14	42	29	R29	12
15	R15	25	30	R30	36

Based on Table 5, it can be seen that of the 30 students who took the pre-test, only 6 students scored above 50. This means that students' algebraic reasoning tends to be very poor, because only 20% get a score of more than 50. Thus, an effective learning media is needed to improve students' algebraic reasoning. These results are also in line with the results of the researcher's interview with the VIII grade teacher, that students tend to have difficulty in solving algebraic problems in story form. Students have difficulty in representing real problems into mathematical models.

Analysis of learning and teaching materials

Based on the results of observations and researchers and interviews with mathematics teachers, the learning applied in class VIII C and VIII D MTs Surya Buana Malang uses learning with a scientific approach and a cooperative learning model. Researchers found that teachers have never done learning with the Problem Based Learning approach. Furthermore, teachers consider PBL learning requires more careful preparation than other models.

On the other hand, researchers found that the teaching materials used in class VIII C and VIII D MTs Surya Buana Malang were in the form of student worksheets (LKS) and package books. Procurement of electronic teaching materials such as e-modules for learning math independently has

never been used. In addition, the teacher also added that teaching materials such as LKS and package books tend to be considered boring for students. So an electronic teaching material is needed that can be a reference for teachers and students in addition to books provided by the school. Thus, e-modules can be an alternative solution to fill the needs of teaching materials at MTs Surya Buana Malang.

Spiritual Attitude Analysis and Islamic Values

In addition to analyzing students' algebraic reasoning skills, researchers also distributed spiritual attitude questionnaires to students. This questionnaire aims to analyze the spiritual attitudes of students and see Islamic values that can be included in the e-module to be developed. The questionnaire consists of 20 questions that are answered using a Likert scale. The spiritual aspects presented in the questionnaire are aspects of faith (9 statements), aspects of piety (6 statements), and aspects of gratitude (5 statements). The questionnaire has been validated by a material expert. The guideline of the spiritual attitude questionnaire is presented in Table 7.

Table 7. Questionnaire Guideline related to Spiritual Attitude

Topic	Spiritual Aspect	Number of Questions
Spiritual Attitude	Believing	2
	Pious	
	Grateful	

Based on Table 7, the researcher gave a spiritual attitude questionnaire to students. This test was conducted on 30 students in class VIII. The results of the spiritual aspect are presented in Table 8.

Table 8. The results of the student's spiritual attitude questionnaire

Respondent Code	Spiritual Attitude Questionnaire Score				Respondent Code	Spiritual Attitude Questionnaire Score			
	Believing	Pious	Grateful	Total		Believing	Pious	Grateful	Total
R1	20	16	16	52	R16	21	16	14	51
R2	20	18	15	53	R17	25	18	19	62
R3	20	18	16	54	R18	24	17	17	58
R4	26	20	18	64	R19	24	16	16	56
R5	23	20	18	61	R20	32	20	20	72
R6	21	18	17	56	R21	23	14	15	52
R7	22	18	18	58	R22	28	20	18	66
R8	31	20	20	71	R23	23	15	15	53
R9	21	17	16	54	R24	20	16	16	52
R10	22	16	16	54	R25	22	16	16	54
R11	24	16	15	55	R26	25	16	17	58
R12	20	16	18	54	R27	20	16	16	52
R13	23	17	20	60	R28	26	17	14	57
R14	25	14	14	53	R29	28	16	16	60

R15	18	18	19	55	R30	22	17	16	55

Based on Table 8, it shows that the highest and lowest scores are 72 and 51. In the spiritual attitude questionnaire, the total maximum score is 80, while each aspect has a different maximum score. In the aspect of faith the maximum score is 36, the aspect of devotion the maximum score is 24, and the aspect of gratitude the maximum score is 20. From the 30 students who filled out the questionnaire only 6 students got a score above 50. In addition, the overall average value is 57.067. While the average value in each aspect is the aspect of faith 23.3, the aspect of piety 17.067, and in the aspect of gratitude 16.7. These results indicate that students' spiritual attitudes are still in the sufficient category. This means that there needs to be an increase in students' spiritual attitudes so that it leads to a good spiritual attitude.

RESULTS AND DISCUSSION

The analysis stage in this study consisted of needs analysis and analysis of learner conditions. The needs analysis data was obtained through interviews and filling out questionnaires by teachers and students. This is in line with the findings of Deviana & Sulistyani (2021) and Ulfah et al. (2020) who emphasized that a comprehensive needs analysis needs to involve the views of both parties so that the development of learning tools is truly contextual. Based on the results of this study, it is known that teachers have never used the Problem Based Learning (PBL) approach in learning mathematics, especially on the material of the Two-Variable Linear Equation System (SPLDV). In addition, the teaching materials used by teachers are still limited to textbooks from the government that do not encourage students' critical thinking activities. This finding is in line with research by Afrianti & Qohar (2019) and Latif (2022) which shows that conventional printed teaching materials are not sufficient to support the development of 21st century skills, especially in the aspects of reasoning and problem solving.

The students' condition was analyzed through two instruments, namely the algebraic reasoning pretest and the spiritual attitude questionnaire. The pretest results showed that only 6 out of 30 students scored above 50 in algebraic reasoning. In addition, the initial questionnaire results showed that students' spiritual attitudes were in the medium category. This condition shows that students need a learning approach that can encourage adaptive thinking skills and build spiritual character. This is in line with Aditya (2018) and Hasyim (2020) statements that mapping the characteristics of students through pretests and questionnaires can provide an accurate picture to design appropriate learning. In addition, the findings of Deviana & Sulistyani (2021) confirm that the initial test is able to identify student learning difficulties more accurately, so that teachers can provide more targeted treatment in learning.

These conditions strengthen the urgency of developing PBL-based e-modules integrated with Islam. The PBL approach has great potential to develop algebraic reasoning skills because it emphasizes critical thinking and problem solving. Research results by Jalal & Afandi (2017) and Ulfah et al. (2020)

show that the use of PBL in mathematics learning can significantly improve students' mathematical thinking skills. Meanwhile, in terms of learning media, research by Fitriyah & Ghofur (2022) concluded that interactive e-modules designed with the PBL approach can help students understand concepts more deeply because they are actively involved in the learning process. Therefore, the e-module developed in this study aims to overcome the limitations of conventional teaching materials by presenting contextual, structured, and problem-solving-based learning.

Furthermore, the integration of Islamic values in the module does not only function as a complement, but becomes an important part in the formation of students' spiritual character (Sugilar et al., 2019). Values such as honesty, responsibility, cooperation, and gratitude are instilled through the context of questions and reflection of activities (Ali, 2020). This is reinforced by research by Alghar et al. (2023) and Arianto et al. (2021) which states that the integration of Islamic values in mathematics learning can increase spiritual awareness and form an ethical mindset in the problem solving process. Thus, students not only understand mathematical concepts cognitively, but also internalize values derived from Islamic teachings in everyday life.

The development of PBL-based e-modules integrated with Islam is an innovative solution to the problems found in the needs analysis stage and the condition of students. This module makes an important contribution in two domains of learning at once, namely cognitive (algebraic reasoning) and affective (spiritual attitude). This is in line with the 21st century education paradigm that emphasizes the balance between knowledge, skills, and values (Abdussakir, 2014; Kemendikbud, 2022; Suwandi, 2020). This development also supports the results of research by Afrianti & Qohar (2019) and Latif & Talib (2021) which emphasize the importance of digital-based learning media in improving the quality of learning interactions and encouraging independent learning. Therefore, this e-module is expected to be a relevant and applicable alternative learning media in the context of learning mathematics integrated with Islamic values.

CONCLUSION

Based on the results of the analysis of the needs and conditions of students, it can be concluded that teachers and students at MTs Surya Buana Malang require innovative teaching materials in the form of E-Module based on Problem Based Learning (PBL) integrated Islam. The teacher has never used the PBL approach, and the teaching materials used are still conventional. Meanwhile, the ability to reason algebra and spiritual attitudes of students is classified as low, so learning media is needed that can improve these two aspects simultaneously. Therefore, the development of this module is a strategic solution in improving the quality of mathematics learning that not only focuses on cognition, but also forms student spiritual characters through the integration of Islamic values.

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