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DEVELOPMENT OF ISLAMIC BOARDING SCHOOL-BASED TEACHING MODULES TO IMPROVE MATHEMATICS PROBLEM SOLVING ABILITY

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ABSTRACT

This study aims to develop a teaching module based on islamic boarding school and a valid, practical, and effective solution skill test question. This type of research is development research using the Thiagarajan 4D development model. The data collection techniques used were Observation of the implementation of learning devices, student observation, test results of mathematical problem-solving ability, and student response questionnaires. The research subjects consisted of 21 students in the large-scale trial class, 6 students in the small-scale trial class, 23 students in the experimental class, and 23 students in the control class. The findings of this study are that the teaching modules developed have valid, practical, and effective criteria. Validity obtained from the teaching module validity coefficient in format, content, and language are 3.57, 3.62, and 3.60, respectively. The practicality of the teaching module obtained from the Observation of learning implementation reached 92.5%. The results of student activity observations amounted to 90.5%, with an outstanding category. Furthermore, the third indicator in the practicality test is obtained from the results of the student response questionnaire with a total score of 699 and a percentage of 92.46% with an outstanding category. The effective criteria are based on the test results with a classical completeness of 84.7%. In addition, the teaching module developed can affect improving students' mathematical problem-solving ability based on statistical tests and *pretest* and *posttest* scores of experimental and control classes obtained Sig. (2-tailed) = 0.000 (Sig.<0.05). Therefore, the teaching module based on islamic boarding school is valid, practical, effective, and influential.

Keywords: *teaching module, Islamic boarding school-based, solving ability*

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PRELIMINARY

Islamic educational institutions in Indonesia, known as Islamic boarding schools, have a strong historical background and are considered one of the oldest Islamic educational institutions. Islamic boarding schools are Islamic educational institutions that developed during the spread of Islam in Indonesia.(Sudarta, 2022). In its development, pesantren, which was originally a traditional educational institution, has undergone many changes. The changes are in the form of changing the system and institutional structure in

the form of madrasas or formal schools to become part of the institutional structure in pesantren such as public schools from pre-school, elementary, secondary to tertiary levels. (Hanun, 2013). Apart from that, many boarding schools now establish pesantren-based formal schools or commonly referred to as pesantren-based schools (SBP).

Pesantren-based schools are a model of Islamic education that combines two social systems, namely boarding schools and school institutions. SBP is one of the social facts, which emerged due to awareness and the results of thoughts from various parties, as well as discussions between institutions, such as: Ministry of Religious Affairs, Ministry of National Education, Center for Educational Development (CERDEV) UIN Syarif Hidayatullah Jakarta, Pesantren, and Schools. Efforts to integrate formal school education with Islamic boarding schools will result in a stronger and more complete education system (Saepudin, 2019). Islamic boarding school-based learning has unique characteristics because it integrates general material with Islamic contexts. The integration is related to students' daily activities, so it helps teachers get closer to students. One of the general subjects integrated into madrasahs or formal schools is mathematics (Juliyanti et al., 2023).

Mathematics, one of the fields of education, has an important role in education. When looking at the learning period, mathematics is a subject that has a more extended learning period than other subjects. When viewed from a student interest in mathematics surveys, some students find mathematics challenging to master. Math instruction starts from elementary school to college. Several factors influence the difficulty of some students, especially madrasah students, in learning mathematics, namely the abstractness of mathematical objects and the inappropriate learning method approach (Hasanah, 2014). This makes math a subject that is considered quite difficult for some students to understand because it is always related to numbers and formulas (Fitrah & Kusnadi, 2022). states that math lessons are considered non-essential lessons in madrasah educational institutions. In fact, when viewed from a deeper perspective, mathematics is very important in Islamic education, especially in matters relating to prayer, zakat, hajj, fasting, etc.

Based on the PISA results, Indonesia is ranked 69th out of 80 countries listed in the PISA 2022 assessment by the OECD. Indonesia's PISA scores for literacy were 359, math 366, and science 383. Although it can be seen that the numeracy score has increased from the previous year, it still puts Indonesia in the 11th position from the bottom. This is due to the low literacy score. Students' interest in reading books in Indonesia is still very low (OECD, 2019). UNESCO said that the reading interest index of Indonesian people is only

0.001%, or out of 1,000 Indonesians, only 1 person is diligent in reading. The data shows that the literacy and numeracy skills of students in Indonesia are still low(UNESCO, 2023)

Previous research has identified obstacles in students' mathematics learning due to their limitations. This is mainly because teachers rely solely on textbooks, preventing students from understanding mathematical concepts in relation to their surroundings or real-life situations in boarding schools (Ismah et al., 2024). Mathematics is a complex yet essential subject as it enhances students' thinking and problem-solving skills. However, in reality, students consider math subjects unimportant because there are differences in learning objectives, which aim to achieve understanding and high-level thinking skills and achieve good graduation scors (Fauzi, 2017)

As time goes by, there is much research on improving mathematics learning; the diversity of mathematics learning is an attraction to improve mathematics learning, and one of the innovations in mathematics learning is linking values and students' understanding of Islamic value (Firdaus et al., 2023). Indonesian education, especially Islamic boarding school-based schools, has begun to apply Islamic values in learning to improve students' abilities in mathematics material. Integrating Islamic values into mathematics learning is a method teachers use to motivate students to form their learning character. The integration of Islamic values in mathematics includes patience, honesty, never giving up, and tawakkal (Afifah et al., 2021)

Observations and interviews at SPM Wustha Al-Amiriyyah Banyuwangi indicate that the existing learning tools do not effectively develop mastery in basic literacy, particularly mathematical literacy. Acording to one of the teachers, the learning tools still use the tools provided in the education unit. The textbooks provided are good regarding material and book presentation, but they have not actively involved students in learning. In addition, the existing learning tools are still fixated on mathematics subjects only; there are no tools to improve mathematical problem-solving skills, so there is a lack of literacy in mathematics subjects. Therefore, learning tools are needed to achieve learning objectives and problems to stimulate mathematical problem-solving skills. So development is needed in the form of teaching materials in the form of Islamic boarding school-based teaching modules, where later, the mathematics learning material is associated with the environment around the boarding school. In this study, researchers used the teaching module as a learning reference to develop teaching materials that included mathematics material based on the environment around the boarding schools.

Modules were chosen because, in this independent curriculum, educators use teaching references, namely teaching modules that had never existed in the previous curriculum. Islamic boarding school-based mathematics teaching modules are still rarely found in the mathematics learning process, so this Islamic boarding school-based mathematics teaching module with flat-sided space-building material is expected to improve students' problem-solving abilities quickly because Islamic boarding school-based learning is always side by side with daily life in the Islamic boarding school environment(Lestari, 2020)

This Islamic boarding school-based module was created by integrating the culture, characteristics of students, and the Islamic boarding school environment with general learning. This Islamic boarding school-based teaching module also continues to use the module criteria put forward by the Ministry of Education and Culture. Here, the researcher makes an Islamic boarding school-based module that is made according to the conditions and needs of the students. This Islamic boarding school-based module is a teaching material or lesson plan device containing the education and Islamic boarding school curricula. The general module only refers to or uses criteria from the education curriculum. However, this Islamic boarding school-based module is compiled with two curricula: the education curriculum and the Islamic boarding school curriculum. The Islamic boarding school curriculum is made by the general provisions made by KEMENAG chapter 1 article 1 that the Islamic boarding school curriculum is developed by the peculiarities of the Islamic boarding school, which are based on the yellow book or dish islamiyah with a mullion education pattern.

METHODS

The development of learning devices in this study used Thiagarajan's development model, namely the 4D model, which consists of the defining stage (define), the design stage (design), the development stage (develop), and the dissemination stage (disseminate). In this study, the school studied was class VIII students of SPM Wustho Al Amiriyyah. The subjects in the study consisted of 6 small-scale trial students, 21 large-scale trial students, 23 experimental class students, and 23 control class students. In this study, researchers were interested in developing learning tools in the form of Islamic boarding school-based teaching modules. The research instruments in this study were the validation sheet, observation sheet, student response questionnaire, readability test sheet, and problem-solving ability test questions.

In the study, several tech were used, namely data on the device's validity and data analysis of the practicality of learning devices. An instrument is valid if it performs its measuring function precisely. Learning devices are considered valid if the validity score obtains an average value of at least 3 for each validation item (maximum score of 4(Hobri, 2020). The following indicators measure the practicality of learning devices:

a. Observation of the implementation of the learning device plan. This data was obtained from the results of the observation sheet. Furthermore, the data were analyzed by applying several steps in the appendix. The device is said to be practical if it obtains high criteria results with a minimum score of 3 (maximum score of 4)(Hobri, 2021)

b. student activity observation. The student activity observation category met was at least good.

c. Student response. The student scores reach a minimum percentage of 70% in all aspects or a minimum positive category.

In the next stage, data analysis of the effectiveness of learning devices will be measured by the following indicators.

a. The completeness of learning outcomes of flat-sided space building. The device is categorized as effective if the learning outcomes of at least more than 70% of the total number of students are classically complete with KKM 70.

b. Improvement in problem-solving. This study uses the N-Gain category. The number of students in the N-Gain category of moderate problem-solving ability is more than 70% of the total.

c. Statistical test. The statistical test results show a significant effect of implementing Islamic boarding school-based mathematics learning tools on improving problem-solving skills.

The statistical test aims to analyze the results of the experimental and control classes. Statistically, the research hypothesis can be formulated as follows.

Description:

$H0$ = There is no significant effect of implementing Islamic boarding school-based mathematics learning tools on improving students' problem-solving skills.

$H1$ = There is a significant effect of implementing Islamic boarding school-based mathematics learning tools on improving students' problem-solving skills.

RESULT AND DISCUSSION

This section describes the process and results of developing learning tools using Thiagarajan's 4D model. The description is as follows.

3.1 Define Stage

At this stage, five things are carried out: beginning-end analysis, student analysis, concept analysis, task analysis, and specification of learning objectives. Based on the results of observations, interviews show that the learning model used only uses lecture and assignment models; besides the pretest results, the available learning tools still cannot improve mathematical problem-solving skills because the learning tools used are only limited to mathematics material, so no literacy intersects in it. Therefore, creating a teaching module based on the existing problems is necessary.

3.2 Design Stage

At the design stage, the learning tools included teaching modules, LKPD, and test questions for mathematical problem-solving skills. Test preparation, media selection, format selection, and initial design of learning devices are done at this stage. At this stage, the design of learning devices using Islamic boarding school-based Flat Side Spaces material using the Problem-Based Learning (PBL) model. The design of teaching modules and LKPD is adjusted to the steps of the Problem-Based Learning (PBL) model, which is used for three meetings, and test questions for mathematical problem-solving skills are presented in the form of problems that are integrated with Islamic boarding school values and the Islamic boarding school environment which have several attachments as test tests. The following examples of teaching module designs, student worksheet attachments, and math problem-solving ability test attachments are presented in Figure 1, Figure 2, and Figure 3.

MODUL AJAR BANGUN RUANG SISI DATAR BERBASIS PESANTREN

BAGIAN I. IDENTITAS DAN INFORMASI MENGENAI MODUL

Kode Modul Ajar	MAT.D.8
Nama Penyusun/Instusi/Tahun	Izza Lukhi'ul Wafiroh/Satuan Pendidikan Muadalah Wustha Al-Amiriyyah/2024
Jenjang Sekolah	Sekolah Menengah Pertama (SMP)
Fase/Kelas	D/8
Alokasi Waktu (menit)	6 x 40 menit
Jumlah Pertemuan	2 JP
Domain/Topik	Geometri/Bangun Ruang Sisi Datar
Capaian Pembelajaran	Di akhir fase D, siswa dapat menentukan luas permukaan dan volume bangun ruang sisi datar (prisma dan limas), untuk menyelesaikan masalah yang terkait dengan pembelajaran berbasis pesantren bangun ruang sisi datar terhadap ukuran panjang, luas, dan volume.
Tujuan pembelajaran	• Menyelesaikan permasalahan yang berkaitan dengan konsep bangun ruang sisi datar dalam konteks menentukan luas permukaan dalam kehidupan sehari-hari dan lingkungan pesantren • Menyelesaikan permasalahan yang berkaitan dengan

	materi yang sulit memahami konsep
Moda Pembelajaran	Tatap muka penuh (interaksi secara langsung antara fasilitator dengan peserta pembelajaran)
Model Pembelajaran	*Problem Based Learning* (PBL) Berbasis Pesantren
Materi ajar, alat dan bahan	Materi ajar : • Buku panduk penggunaan • Lembar Kerja Peserta Didik (LKPD) • Buku teks pelajaran • Soal tes kemampuan pemecahan masalah Alat dan bahan : • Alat tulis • Buku teks

KOMPONEN INTI

Tujuan Pembelajaran

1. Menggali konsep dan menyelesaikan permasalahan berkaitan dengan luas permukaan dan volume bangun ruang sisi datar
2. Menyelesaikan masalah kontekstual yang berkaitan dengan bangun ruang sisi datar terhadap bangun bangun yang ada dilingkungan pondok pesantren, dimana masing masing bangun tersebut memiliki ruang atau volume dan memiliki sisi yang datar.

Pemahaman Bermakna

Figure 1. Teaching Module

Figure 2. Learner Worksheet

Figure 3. Mathematics Problem Solving Ability Test Questions

3.3 Development Stage

At the development stage, the design of the learning tools is then validated by experts to get suggestions and input so that they can be improved and tested on students. The experts comprised one mathematics education lecturer and a mathematics teacher at the test school. The suggestions and input from the validators are presented in Figure 5.


• Buku tulis

KOMPONEN INTI

Tujuan Pembelajaran

1. Menggali konsep dan menyelesaikan permasalahan b
permukaan dan volume bangun ruang sisi datar

2. Menyelesaikan masalah kontekstual yang berkaitan den
datar terhadap bangun bangun yang ada dilingkungan pon
masing masing bangun tersebut memiliki ruang atau vol
yang datar.

Pemahaman Bermakna

Kang shabiq ingin membuat bak kamar mandi berbentuk k
air 2 kulah atau setara dengan 216 liter agar air te
mukhofafah, berapa panjang cm masing sisi-sisi bak kamar

Lampiran 2

Lembar Kerja Peserta Didik

Setelah kalian mempelajari dan memahami tentang luas permukaan dan
bangun ruang sisi datar cobalah untuk memahami beberapa uraian berikut.

Kang Fahri ingin mengajarkan nilai kebersihan kepada santri dengan
lubang galian tanah untuk tempat pembuangan sampah di belakang
berbentuk kubus. Panjang galian tanah tersebut 70 cm. Hitunglah ber
permukaan galian tanah tersebut?

Alternatif Penyelesaian :

Diketahui: Panjang galian tanah = 70 cm

Ditanya: Berapa volume galian tanah tersebut?

Jawab:

Volume galian tanah = 6 × s × s

Figure 5. Validator Feedback

Based on data analysis of the teaching module, validation results on the format aspect with 3 indicators, the content aspect with 4 indicators, and the language aspect with 3 indicators are 3.57, 3.62, and 3.60, respectively. This shows that the validity coefficient value (Va) is at 3≤ Va< 4 and is categorized as valid. The validation results are presented in Table 1.

Table 1. Validation Results

No.	Aspects	Validity Coefficient (Va)	Criteria
1	Format	3,57	Valid
2	Content	3,62	Valid
3	Language	3,60	Valid

When the learning device has been declared valid, it is tested in the trial class. Class VIII was used for the trial, and 3 meetings were held. Based on the trial results, the learning device is practical and effective. Practicality indicators are obtained from observations of learning implementation using Islamic boarding school-based teaching modules, observations of student activity, and student response questionnaires. Data on the learning device practicality test are presented in Table 2.

Table 2. Results of Learning Device Genericity

Observation Results	Meeting			Average	Category
	1	2	3		
Learning Implementation	90%	92,5%	95%	92,5%	Very good
Student Activity	89%	90, 8%	92%	90,5%	Very good
	Criteria				**Practical**

Table 2 shows that the average observation results of learning implementation using Islamic boarding school-based teaching modules with three meetings of 92.5% are in the range of 90%≤ SR≤ 100% with an outstanding category. The average student activity observation with three meetings was 90.5%, an outstanding category. Furthermore, the third indicator in the practicality test is obtained from the results of the student response questionnaire with a total score of 699 and a percentage of 92.46% with a very positive category. From the three indicators of practicality, it can be said that the module is used in practical learning activities.

The analysis of the effectiveness of learning devices is based on the results of learning tests in the form of mathematical problem-solving ability test questions. Of 21 students, 4 were incomplete, and 17 were complete, obtaining an average score of 82.1 with a classical completeness of 84.7%. This shows that the teaching module developed is practical because the students' mathematical problem-solving skills are classically complete. The effect of learning devices is based on the posttest scores of experimental and control classes through statistical tests presented in Table 3 .

Tabel 3. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Gain_percent	Equal variances assumed	,997	,324	44	,000	-20,16037	3,84531	-27,91008	-12,41065
	Equal variances are not assumed.			43,050	,000	-20,16037	3,84531	-27,91492	-12,40582

Table 3. Statistical Test of *Postest* of Experimental Class and Control Class

Based on Table 3 above, the value of Sig. (2-tailed) = 0.000 (Sig.< 0.05). Therefore, the development of learning tools has a significant effect. Thus, the teaching module is declared valid, practical, and effective.

3.4 Deployment Stage

The last step is the distribution of teaching modules offline and online. Offline dissemination was carried out at the research site, the Muadalah Wustha Al-Amiriyyah Banyuwangi Education Unit, where complex files of teaching modules were distributed. Online distribution of teaching modules is carried out by uploading teaching modules to Google Drive and spreading teaching module links on social media such as Instagram and WhatsApp so that anyone can access teaching modules.

Based on the analysis of the research results, the Islamic boarding school-based teaching module that meets the valid criteria is then tested. The teaching modules developed are adjusted to problem-solving skill indicators using the Problem-Based Learning (PBL) model. Many students were still not active in group discussions or discussions with the teacher at the first meeting, so the indicators of mathematical problem-solving ability were not seen. This is because students are unfamiliar with the learning model and are embarrassed to ask questions or express opinions. Furthermore, in the second meeting, students with high understanding power have begun to be active in leading group discussions and have even dared to present the results of their group discussions in front of others. By the third meeting, many students began to confidently discuss mathematical concepts integrated with the Islamic boarding school context and actively engaged in asking each other about the results of other groups' presentations. At this meeting, the indicators of mathematical problem-solving ability have been seen. Many students have been able to solve islamic boarding school-based mathematics problems; this is in line with research (Yuliani et al., 2021) that teaching modules that are by student needs can improve student abilities (Aulia, 2023) states that Islamic boarding school learning can improve students' mathematical problem-solving skills by integrating mathematics subjects with Islamic boarding schools. Based on the findings of this study, Islamic boarding school-based learning can improve problem-solving skills in the daily lives of students in the Islamic boarding school environment.

Islamic boarding school-based learning using the Problem-Based Learning (PBL) model can improve problem-solving skills and encourage students to actively learn through student worksheets (Rahmadila, Doni Permana 2022). This is because, This is because the

LKPD contains steps that guide students in solving problems independently. In this second meeting, students can work with their respective groups by utilizing the steps in the LKPD. The math problem-solving ability test results in the trial class obtained a more than 70% classical completeness, namely 84.7%. This is by the effectiveness analysis indicator stating that students have completed classically.

The learning tools categorized as practical and effective are then given to the experimental class. In the control class, learning uses learning tools usually used in schools, such as lecture and assignment methods. This is due to the limited teaching materials used by research(Firdaus et al., 2023); this happens because the indicators of mathematical problem-solving ability do not appear, while in the experimental class, students look active and excited when studying mathematics material that is integrated with students' daily lives in the Islamic boarding school environment so that the Islamic boarding school-based teaching module in the experimental class raises indicators of problem-solving ability. Based on this explanation, the findings of this study state that Islamic boarding school-based teaching modules can improve students' mathematical problem-solving skills.

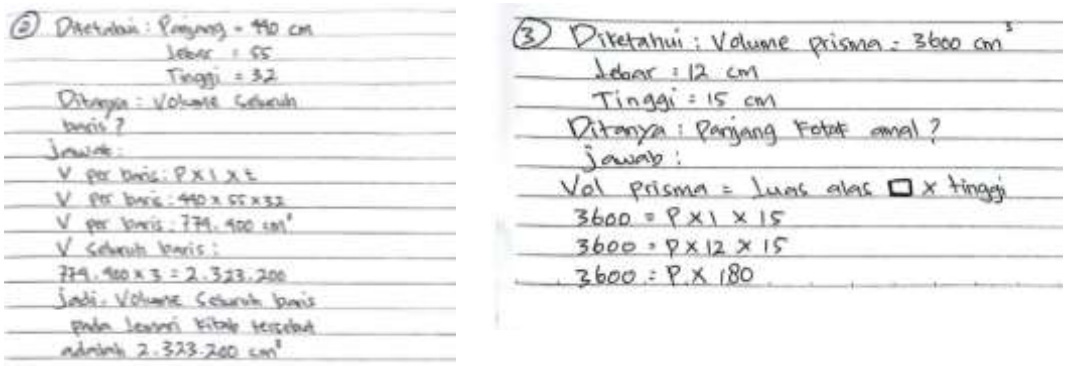

Figure 6. Test Results of Numeracy Skills of Experimental Class Students

The advantages of Islamic boarding school-based teaching modules to improve mathematics problem-solving skills: 1) the teaching modules prepared have been adapted to the independent curriculum and the Islamic boarding school curriculum and are equipped with attachments to student worksheets, 2) LKPD compiled some steps are by the indicators of mathematical problem-solving ability 3) examples of problems that contain Islamic boarding school

CONCLUSION AND SUGGESTIONS

Based on the presentation of the results and discussion above, the Islamic boarding school-based teaching module on flat-sided space building material developed using

Thiagarajan's 4D development model can improve students' mathematical problem-solving ability. The developed learning tools meet the criteria of validity, practicality, and effectiveness. The validity coefficient of the teaching module in the format aspect with 3 indicators, content aspect with 4 indicators, and language aspect with 3 indicators are 3.57, 3.62, and 3.60, respectively. The practicality of the teaching module obtained from the Observation of learning implementation reached 92.5% with an outstanding category. The results of student activity observations amounted to 90.5%, with an outstanding category. Furthermore, the third indicator in the practicality test is obtained from the results of the student response questionnaire with a total score of 699 and a percentage of 92.46% with an outstanding category. Effective criteria are based on test results with a classical completeness of 84.7%. Therefore, the learning tools are valid, practical, and effective. In addition, the teaching module developed can improve students' numeracy skills based on statistical tests and pretest and posttest scores of experimental and control classes obtained Sig. (2-tailed) = 0.000 (Sig.< 0.05).

The developed teaching modules can be used in the learning process of students who have the same obstacles and characteristics, namely having difficulty in understanding mathematical concepts, so that they are expected to be able to solve math problems using mathematical concepts. In addition to this research, it is hoped that other researchers can develop teaching modules based on pesantren with other materials such as flat shapes, algebra, number patterns or others.

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