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DEVELOPMENT OF STUDENT WORKSHEETS INTEGRATED WITH ISLAMIC VALUES TO EXPLORE MATHEMATICAL PROBLEM-SOLVING SKILLS IN PESANTREN

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ABSTRACT This development research aims to produce student worksheets integrated with Islamic values to enhance mathematical problem-solving skills on the Pythagorean Theorem topic. This type of research is Research and Development (R&D) using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The subjects of the small-scale trial involved 2 teachers and 10 ninth-grade students, while the field trial involved 25 eighth-grade students. The instruments used in this study were validation questionnaires to assess the feasibility of the worksheets by material experts, media experts, and Islamic experts. Additionally, to evaluate the effectiveness of the worksheets, student response questionnaires and the results of mathematical problem-solving skills tests were used. The results of the effectiveness analysis of the worksheets, calculated using the effect size, showed a value of 2.1 with a "strong effect" category, indicating that the use of worksheets integrated with Islamic values in the Pythagorean Theorem topic has a very high impact on developing mathematical problem-solving skills in Pesantren (Islamic boarding school) students.

Keywords: mathematical problem-solving skills, islamic values, students worksheets, pesantren.

ABSTRAK Penelitian pengembangan ini bertujuan untuk menghasilkan produk lembar kerja siswa (LKS) yang terintegrasi dengan nilai-nilai Islam guna meningkatkan keterampilan pemecahan masalah matematika pada materi Teorema Pythagoras. Jenis penelitian ini adalah Penelitian dan Pengembangan (R&D) dengan menggunakan model ADDIE (Analisis, Desain, Pengembangan, Implementasi, Evaluasi). Subjek uji coba skala kecil melibatkan 2 guru dan 10 siswa kelas IX, sementara uji coba lapangan melibatkan 25 siswa kelas VIII. Instrumen yang digunakan dalam penelitian ini adalah angket validasi untuk menilai kelayakan produk LKS oleh ahli materi, ahli media, dan ahli agama Islam. Selain itu, untuk menilai efektivitas LKS, digunakan angket respon siswa dan hasil tes keterampilan pemecahan masalah matematika. Hasil analisis efektivitas LKS yang dihitung menggunakan

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ukuran efek (effect size) menunjukkan nilai 2.1 dengan kategori "efek kuat", yang mengindikasikan bahwa penggunaan LKS yang terintegrasi dengan nilai-nilai Islam pada materi Teorema Pythagoras memiliki pengaruh yang sangat tinggi dalam mengembangkan keterampilan pemecahan masalah matematis pada siswa pesantren.

Keywords: kemampuan pemecahan masalah matematis, nilai islam, lembar kerja peserta didik, pesantren.

INTRODUCTION

Education plays a crucial role in life. It provides clearer and more directed perspectives and life goals. Therefore, good education not only prepares students for specific professions or positions but also equips them with the ability to solve everyday problems and apply their knowledge in various situations (Siagian, 2016). Education encompasses all knowledge and learning experiences throughout life in diverse places and situations, contributing positively to human development (Pristiwanti et al., 2022). Various forms of education help shape character and increase knowledge, one of which is formal education, such as schools based on Islamic boarding schools. In the school environment, teachers play an essential role in guiding students through the learning process.

According to Romyati & Achmad (2021), one of the key factors in improving the quality of mathematics education is the availability of high-quality learning resources. In the school learning process, aside from using textbooks, teachers are also encouraged to use media that can help students grasp lessons quickly, practically, and comprehensively (Susanti, 2020). However, many educators still rely heavily on conventional teaching materials like textbooks, which often do not align with students' needs and abilities. For example, observations at a private Islamic middle school (MTs) in Kuningan Regency reveal that students show little interest in textbooks, considering them monotonous and difficult to comprehend. This aligns with research by Desi & Lumbantoruan (2020), which highlights students' difficulties in understanding mathematical concepts and language due to the abstract nature of the available textbooks.

Additionally, existing textbooks do not adequately develop students' mathematical skills. The problems presented in the textbooks are mostly basic, with only a few at the level of national examination questions. In fact, mathematics has five fundamental competency standards known as mathematical powers. According to Hafriani (2021), these competencies include problem-solving, reasoning and proof, communication, connections, and representation. The first competency, problem-solving, is essential for laying the foundation for learning mathematics, as it is integral to the learning process in schools (Muawanah et al., 2023). Problem-solving skills rely not only on students' conceptual knowledge but also on their understanding of the problem, which enables them to choose the right strategies to solve mathematical problems (Sulistyani et al., 2020). Polya, as cited in Prabawa &

Zaenuri (2017), outlines four stages of problem-solving: understanding the problem, devising a plan, executing the plan, and reviewing the solution. This approach aligns with the objectives of mathematics education in schools as outlined in the Regulation of the Minister of National Education No. 22 of 2006, which emphasizes problem-solving, including problem comprehension, planning, solving, and interpreting the results (Christina & Adirakasiwi, 2021).

The 2013 curriculum outlines four key competencies: spiritual attitudes, social attitudes, knowledge, and skills. The core competencies of knowledge and skills are developed simultaneously during the learning process and serve as a means to nurture spiritual and social attitudes. However, nurture spiritual and social attitudes face limitations in mathematics learning, as they are often only addressed when students engage in activities such as praying before and after lessons or interacting socially with peers. Furthermore, textbooks used by students and teachers provide limited references to nurture spiritual and social attitudes. This is consistent with the findings of Novianti et al. (2021), who note the lack of specific teaching materials that help instill spiritual and social values. While teachers have tried to incorporate spiritual values into their lessons, the textbooks used remain general and are not integrated with spiritual and social values.

Pesantren, also known as *Islamic boarding schools*, are Islamic educational institutions where students, referred to as santri, live and study under the guidance of teachers, such as kyai. In pesantren, education is not only focused on religious studies but also includes formal subjects such as mathematics. Pesantren should integrate spiritual values into their curriculum, including in mathematics education. According to the Decree of the Directorate of Early Education and Islamic Boarding Schools of the Ministry of Religious Affairs (2015), mathematics instruction in pesantren should begin with problems that reflect the local context (muqtadhal hal) of the pesantren (Ramdhani et al., 2021). For instance, mathematics lessons can be linked to Islamic values to help santri, who are expected to become future Muslim scholars, meet their intellectual needs. However, the mathematics curriculum in pesantren is often identical to that used in public junior high schools. One of the challenges that arises is the limited time allocated for mathematics instruction in pesantren, which is not proportional to the breadth of the material that needs to be covered, leading to a lack of depth and comprehensiveness in mathematics learning.

Teachers, as facilitators, must provide solutions to these challenges so that students can actively and creatively engage in mathematics learning and develop mathematical skills integrated with Islamic values. This is supported by research conducted by Wulantina (2018), which shows that mathematics instruction using materials integrated with Islamic values is more effective than conventional teaching materials.

Based on this background, the researchers are interested in developing student worksheets integrated with Islamic values to enhance the mathematical problem-

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solving skills of Islamic boarding school students, specifically on the Pythagorean Theorem. This development aims to address the aforementioned challenges, helping students better understand the Pythagorean Theorem and improve their mathematical problem-solving skills through the use of worksheets integrated with Islamic values. The novelty of this research lies in the integration of Islamic values into the Pythagorean Theorem material and problems, which will be explored in depth in the worksheets. For example, by incorporating non-routine questions similar to those found in the Madrasah Science Competition (KSM). The KSM, organized by the Ministry of Religious Affairs of the Republic of Indonesia, is a platform to enhance students' intellectual, emotional, creative, and academic abilities and has been held annually since 2012 (Latifah & Yusuf, 2023).

METHODS

The type of research used in this study is Research and Development (R&D). The R&D research method aims to investigate, design, produce, and test the validity of the resulting product (Sugiyono, 2020). The subjects of this study were students of MTs Al-Mutawally Kuningan in the 2023/2024 academic year, who implemented the 2013 curriculum with a boarding school-based system. A small-scale trial was conducted in class IX with a total of 10 students, while the field test was conducted on class VIII students with a total of 25 students.

The development model used in this research is the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). This research aims to produce student worksheets integrated with Islamic values to enhance mathematical problem-solving skills on the Pythagorean Theorem topic. The first stage is the Analysis, which aims to gather information through a needs analysis, learning objectives analysis, and an analysis of the students' characteristics based on their diverse abilities and development. The second stage is the Design, where the researchers design the student worksheets based on the information obtained from the analysis stage. This design process includes collecting reference sources, designing the student worksheets, and designing the research instruments.

The third stage is the Development, where the researchers realize the design into a product ready for use. The resulting product is a student worksheet integrated with Islamic values to develop mathematical problem-solving skills on the Pythagorean Theorem topic. According to Choirudin et al. (2021), the development stage consists of two sub-stages: expert validation and product testing. Expert validation aims to assess the feasibility of the product based on specific standards, and in this study, validation was conducted by material experts, media experts, and Islamic studies experts. After validation, a small-scale trial was conducted on class IX students before the product was field-tested on class VIII students. The subjects for the small-scale test were selected based on several factors, including students who had

studied the Pythagorean Theorem, had sufficient time, and were able to communicate their ideas effectively both orally and in writing.

The fourth stage is the Implementation, which is carried out after the student worksheets have been validated by the experts. At this stage, the developed worksheets were field-tested on class VIII students. After the students completed the lessons using the developed worksheets, they were given response questionnaires and questions assessing their mathematical problem-solving skills related to the Pythagorean Theorem. This was done to determine the effectiveness of the worksheets in improving mathematical problem-solving skills integrated with Islamic values.

The final stage is the Evaluation, which aims to assess whether the developed worksheets meet the needs identified in the initial development stage. At this stage, students' work results were also analyzed to evaluate their mathematical problem-solving skills, which are integrated with Islamic values on the Pythagorean Theorem topic.

FINDING AND DISCUSSION

The results of this study produced a product in the form of student worksheets integrated with Islamic values to develop mathematical problem-solving skills on the Pythagorean Theorem topic. This research was conducted through the five stages of the ADDIE development model, namely: Analysis, Design, Development, Implementation, and Evaluation. In the analysis stage, as stated by Fitraini & Andriani (2020), this stage consists of two parts: performance analysis and needs analysis. The purpose of this stage is to identify problems and find appropriate solutions. From the analysis results, it was found that there were limitations in the use of teaching materials, especially student worksheets integrated with Islamic values, as well as in students' ability to solve mathematical problems. Therefore, there is a need for teaching materials in the form of student worksheets that can facilitate mathematics learning and develop mathematical problem-solving skills integrated with Islamic values on the Pythagorean Theorem topic.

In the Design Stage, according to Baihaki et al. (2021), four key steps were followed. First, instruments were developed, including validation sheets for material experts, Islamic experts, and media experts, as well as test sheets for assessing students' mathematical problem-solving skills and response sheets for both students and teachers. Second, media selection was carried out, where paper-based student worksheets were chosen as the medium. Third, the format was selected, and the developed worksheets included several components: (1) title/cover, (2) instructions, (3) competencies and learning objectives, (4) a concept map, and (5) four sets of student worksheets. Based on the analysis of the mathematics syllabus for eighth-grade students in the 2013 Curriculum, the developed worksheets covered topics related to the Pythagorean Theorem.

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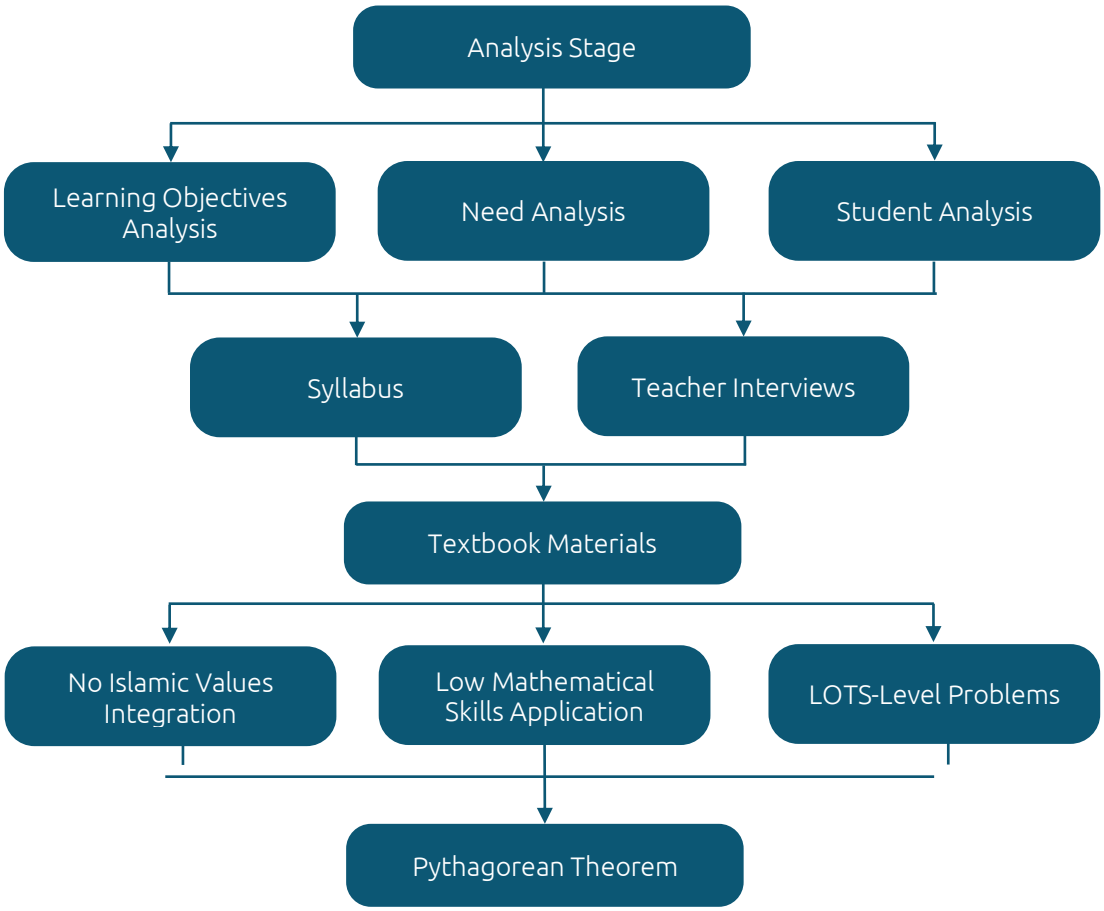

Figure 1. Analysis Stage Mapping

As part of the design process, four student worksheets were developed, each focusing on different aspects of the Pythagorean Theorem and integrating Islamic values. These worksheets are designed to guide students in exploring mathematical concepts while incorporating religious principles. The worksheets were created which were particularly useful for embedding mathematical symbols and enhancing the visual appeal of the materials.

The first worksheet, Discovering the Concept of the Pythagorean Theorem, introduces students to the fundamental ideas of the theorem through a hands-on activity titled *'Let's Try'*. This activity encourages students to actively participate in discovering the relationship between the sides of a right triangle, as shown in Figure 2. Next, Pythagorean Theorem Concept builds on the initial understanding by deepening students' knowledge through the *'Did You Know?'* activity, which provides historical and contextual insights into the theorem. This is illustrated in Figure 3.

In the third worksheet, Pythagorean Triples, students explore the concept of Pythagorean triples, a special set of integer solutions to the theorem. The *'Let's Try'* activity in this worksheet, depicted in Figure 4, engages students in identifying and verifying Pythagorean triples through guided exercises.

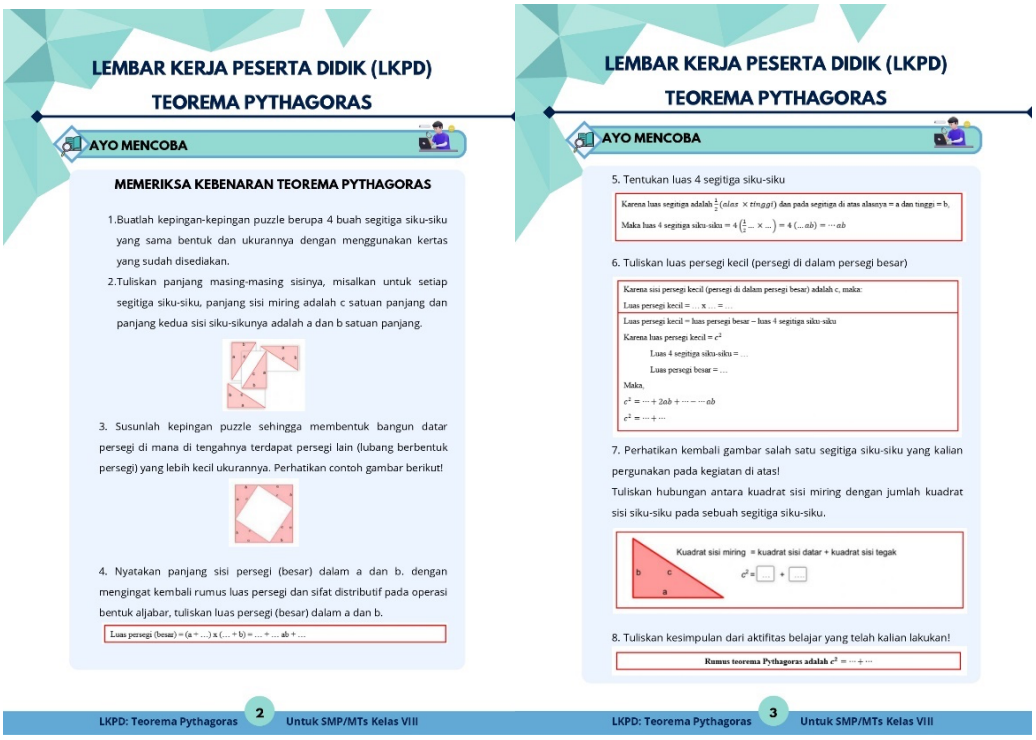

Figure 1. 'Let's Try' activity on first worksheet

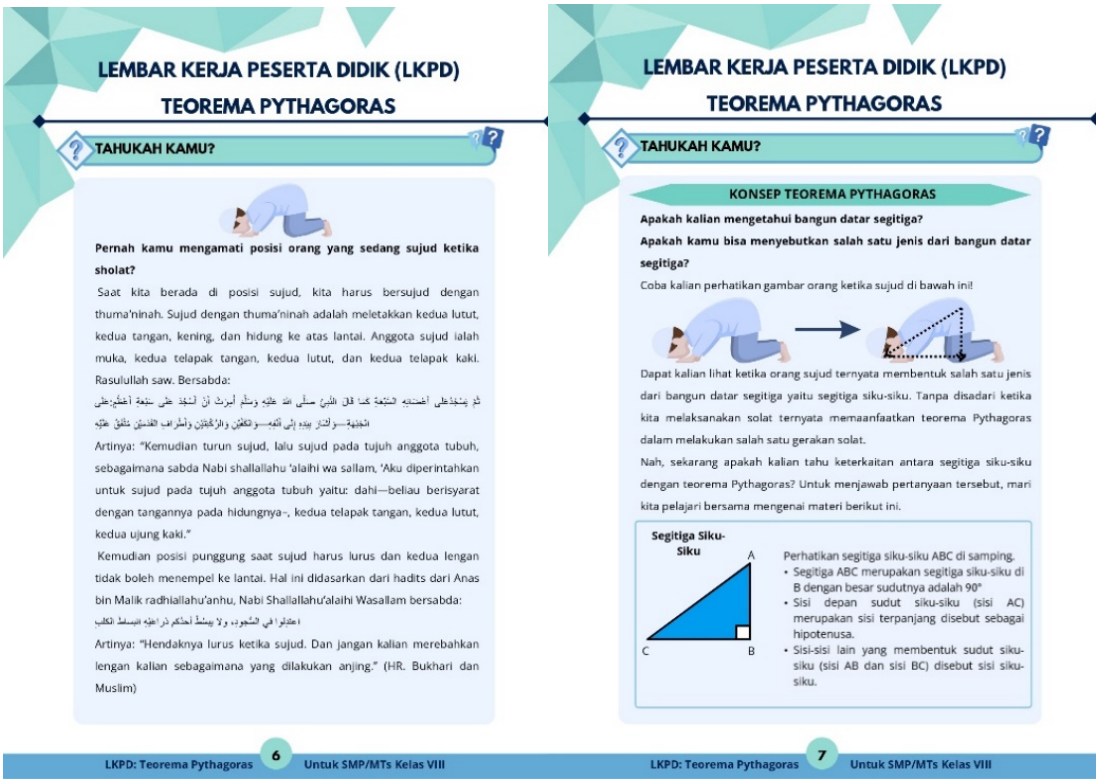

Figure 3. 'Did you know' activity on second worksheet

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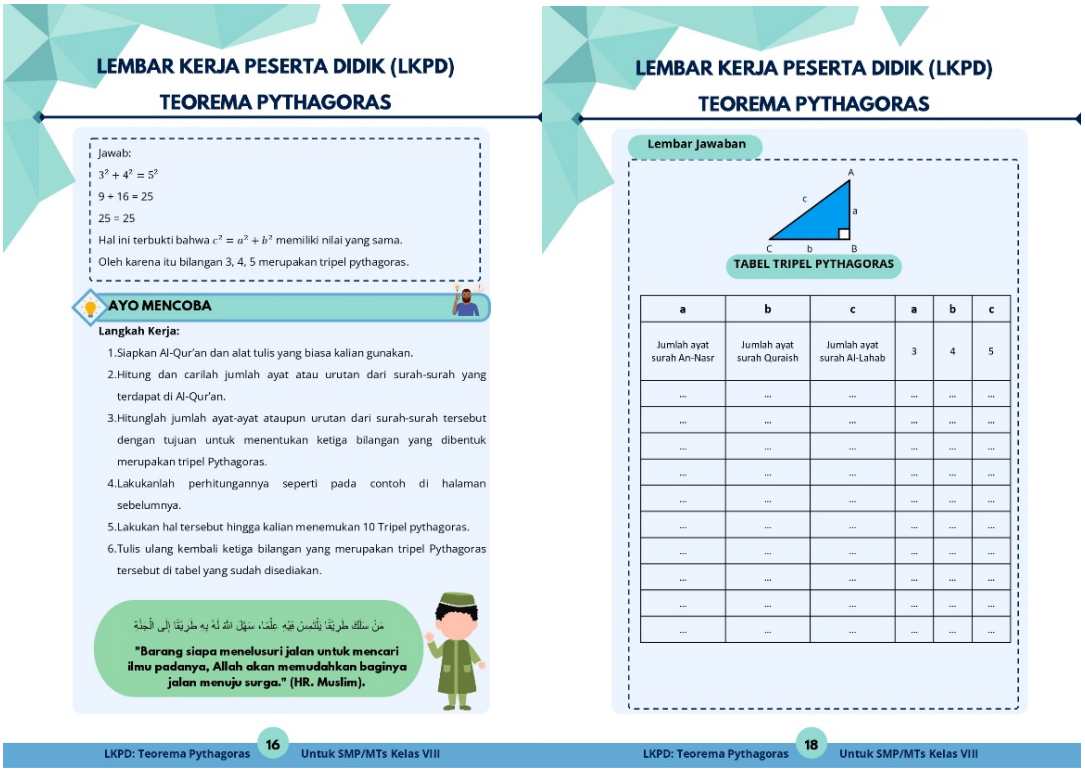

Figure 4. 'Lets try' activity on third worksheet

Finally, Application of the Pythagorean Theorem focuses on real-world applications of the theorem. The practical tasks presented in Figure 5 guide students in solving everyday problems using the theorem, reinforcing the utility of mathematical knowledge integrated with Islamic values.

Figure 4. Application of the Pythagorean Theorem on LKPD 4

Through these student worksheets, students are not only able to explore mathematical problem-solving but also reflect on the significance of integrating religious values into their learning process.

In the development stage, student worksheets integrated with Islamic values to enhance students' mathematical problem-solving skills on the Pythagorean Theorem were created using a Likert scale questionnaire. This questionnaire offered four answer options: (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree. Product validation was carried out by several experts, including media experts, material experts, and Islamic studies experts, to gather feedback and suggestions for improvement. The aim of this validation process was to ensure that the worksheets were suitable for further testing. Based on the data analysis, the following results were obtained:

Table 1. Expert Assessment Results

Expert Assessment	Total Score	Percentage Validity Level	Criteria
Materials Expert (Validator 1)	126	98%	Very worthy
Materials Expert (Validator 2)	96	75%	Worthy
Media Expert (Validator 1)	82	89%	Very worthy
Islamic Expert (Validator 1)	26	93%	Very worthy

The average validity percentage from all experts was 88.75%, placing the worksheets in the "very worthy" category, though some minor revisions were required. Based on the graph of the validator assessments shown in Figure 6, it was concluded that the worksheets were highly feasible. However, before proceeding to the small-scale trial, several revisions were suggested by the validators. These included limiting the use of fonts to a maximum of two and maintaining consistency in font size across the cover design and content. Additionally, the validators recommended adding a statement indicating that the worksheets align with the 2013 curriculum, improving the proportions of objects for better symmetry, and adding a summary of the material on the last page before the author's bio.

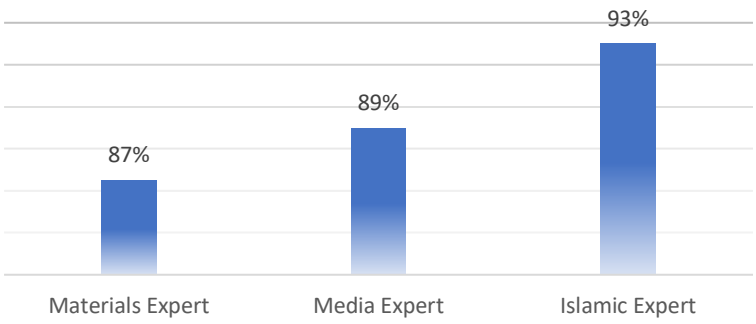

Figure 6. Graph of Validator Assessment Results

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After making these revisions, the worksheets were tested on a small scale with 10 grade IX students who had studied the Pythagorean Theorem, along with two mathematics teachers. The results from the teacher respondents are shown in Table 2.

Table 2. Teacher Respondent Assessment on Small-Scale Trial

Respondent	Material	Language	Interest	Average
Teacher 1	100%	100%	100%	100%
Teacher 2	88%	94%	79%	87%

Teacher 1 gave a score of 100% across all aspects, while Teacher 2 gave an average score of 87%. The overall average from both teachers was 93.5%, categorized as "very good." Additionally, the small-scale trial with 10 students resulted in an average score of 77%, categorized as "good."

Thus, it can be concluded that the worksheets are highly feasible based on feedback from both teachers and students. This indicates that the worksheets are ready for the next stage of field testing.

In the implementation stage, before the student worksheets were applied, students were given a pre-test to assess their initial abilities before engaging with the Pythagorean Theorem worksheets. Afterward, the developed worksheets were tested in the field with 25 eighth-grade students over six learning sessions. Throughout the learning process, students were asked to fill out a response questionnaire to gauge their reactions to the worksheets. The questionnaire assessed three main aspects: material (6 questions), language (4 questions), and interest (7 questions), totaling 17 questions.

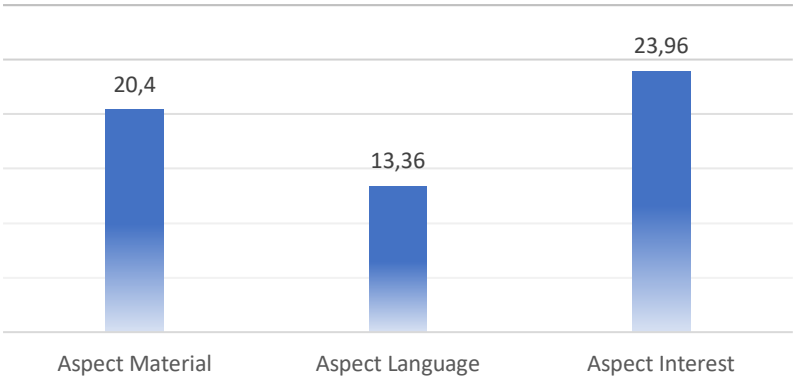

Figure 9. Average Student Response Results for Each Aspect

The results from the student responses are displayed in Figure 9, which shows the average score for each aspect. The material aspect received a score of 20.4, the language aspect 13.36, and the interest aspect 23.96. The overall calculation for the

field test yielded an average of 85%, placing it in the "very good" category. Comparatively, during the small-scale trial with 10 students, the average score was 77%, categorized as "good." This indicates an 8% improvement from the small-scale trial to the field test, shifting the rating from "good" to "very good."

In the evaluation stage, the results from the student response questionnaire indicated that the worksheets were rated as very good. To further determine the effectiveness of the worksheets, a comparison between students' pre-test and post-test results was made. The passing grade for mathematics (known as KKM) in the school is 70, meaning that students who score ≥70 are considered to have mastered the material, while those who score below 70 are considered not yet competent. From the pre-test results, the lowest score was 0, the highest was 70, and the average was 36.4. In contrast, the post-test results showed an improvement, with the lowest score being 25, the highest 95, and an average score of 69.6. Out of 25 students, 16 met the mastery criteria with scores ≥70, while 9 students did not.

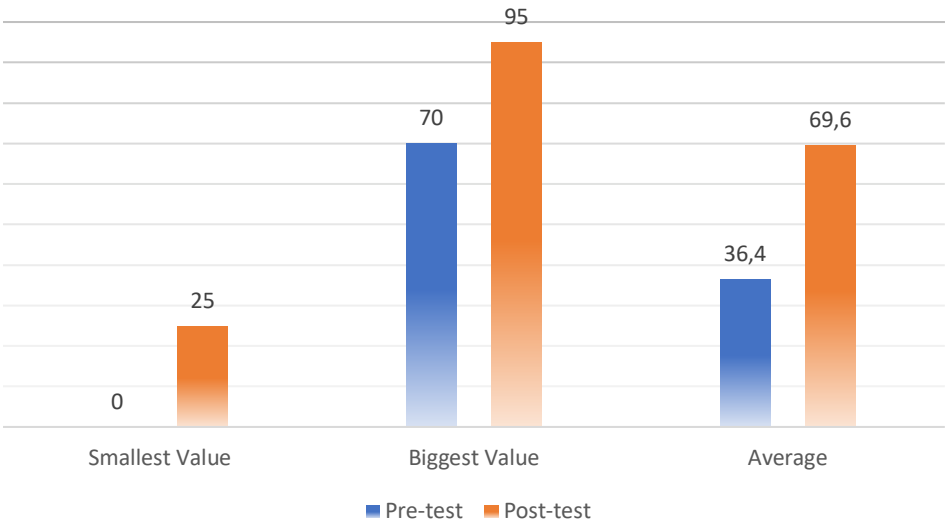

Figure 10. Comparison of Pre-Test and Post-Test Results

The comparison between the pre-test and post-test scores demonstrates a clear improvement in students' mathematical problem-solving skills, as shown in Figure 10. To measure the effectiveness of the worksheets integrated with Islamic values, the effect size was calculated using Cohen's formula. The calculation is as follows:

$$\text{Effect size} = \frac{(\text{mean of post-test} - \text{mean of pre-test})}{\text{standard deviation of pre-test}} = \frac{(69.6 - 36.4)}{15.5} = 2.1$$

The result of the effect size is 2.1, which is greater than 1, categorizing it as having a "strong effect." This suggests that the use of student worksheets integrated with Islamic values on the Pythagorean Theorem had a very high impact on developing the mathematical problem-solving skills of the students in the pesantren. This

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finding aligns with research by Ramadhani et al. (2021), which showed that the use of student worksheets is effective in improving students' learning outcomes.

CONCLUSIONS AND RECOMMENDATIONS

Based on the data analysis and discussion conducted, it can be concluded that the student worksheets were deemed highly feasible by four validators, with an average percentage of 88.75%. In the small-scale trial with two teacher respondents, an average score of 87% (very good) was obtained, while the 10 students achieved an average of 77% (good). Furthermore, in the field test, there was an increase in students' responses to the worksheets, with an average score of 85% in the very good category. The effectiveness of the worksheets integrated with Islamic values on the Pythagorean Theorem material, calculated using the effect size, showed a value of 2.1, which falls into the "strong effect" category. This result indicates that the use of these worksheets had a very significant impact on enhancing the mathematical problem-solving skills of students in pesantren.

However, the worksheets have some limitations, as the integration of Islamic values in the Pythagorean Theorem material is only limited to prayer movements, the number of verses, and the order of surahs in the Qur'an. Therefore, it is suggested that future researchers further expand the integration of Islamic values, such as including mathematical problems related to the number of prophets, angels, pillars of Islam, the number of raka'ats in prayer, and so on. Additionally, future researchers can develop worksheets for other mathematical topics and skills, and explore the use of digital-based media.

REFERENCES

Baihaki, B., Danaryanti, A., & Kamaliyah, K. (2021). Pengembangan LKPD elektronik berbasis HOTS menggunakan Quizizz. *Journal of Mathematics, Science and Computer Education*, *1*(1), 36–43. https://doi.org/10.20527/jmscedu.v1i1.3352

Christina, E. N., & Adirakasiwi, A. G. (2021). Analisis kemampuan pemecahan masalah tahapan Polya dalam menyelesaikan persamaan dan pertidaksamaan linear satu variabel. *Jurnal Pembelajaran Matematika Inovatif*, *4*(2), 405–424.

Desi, D., & Lumbantoruan, J. H. (2020). Pengembangan buku cerita matematika pada kelas VII SMP dalam materi perbandingan. *Edumatsains*, *Special Issue*, *1*(1), 23–34. http://ejournal.uki.ac.id/index.php/edumatsains

Fitraini, D., & Andriani, L. (2020). Pengembangan LKS berbasis model pembelajaran REACT terintegrasi nilai keislaman untuk siswa MTs Kabupaten Kampar. *Suska Journal of Mathematics Education*, *6*(2), 079. https://doi.org/10.24014/sjme.v6i2.10654

Hafriani. (2021). Mengembangkan kemampuan dasar matematika siswa berdasarkan NCTM melalui tugas terstruktur dengan menggunakan ICT. *Jurnal Ilmiah*

Didaktika, *22*(1), 63.

Latifah, E., & Yusuf. (2023). Pembinaan Kompetisi Sains Madrasah (KSM) sebagai bentuk pengabdian masyarakat di bidang pendidikan. *Jurnal Pengabdian Masyarakat Sabangka*, *2*(4), 229–242. https://doi.org/10.62668/sabangka.v2i04.712

Muawanah, S., Rahmawati, A. D., & Mashuri, A. (2023). Analisis kemampuan matematika siswa dalam memecahkan masalah teorema Pythagoras di MTs Terpadu Al Firdaus. *Jurnal Pendidikan Matematika Inovatif*, *1*(4), 333–343.

Prabawa, E. A., & Zaenuri. (2017). Analisis kemampuan pemecahan masalah ditinjau dari gaya kognitif siswa pada model project based learning bernuansa etnomatematika. *Unnes Journal of Mathematics Education Research*, *6*(1), 120–129. http://journal.unnes.ac.id/sju/index.php/ujmer

Pristiwanti, D., Badariah, B., Hidayat, S., & Dewi, R. S. (2022). Pengertian pendidikan. *Jurnal Pendidikan Dan Konseling*, *4*(6), 7911–7915. http://repo.iain-

Ramadhani, D. P., Asrizal, & Festiyed. (2021). Analisis effect size pengaruh penerapan LKS terhadap hasil belajar siswa pada pembelajaran IPA dan Fisika. *Jurnal IPA & Pembelajaran IPA*, *5*(1), 77–89. https://doi.org/10.24815/jipi.v5i1.19607

Ramdhani, S., Suryadi, D., & Prabawanto, S. (2021). Hambatan belajar matematika di pondok pesantren. *Jurnal Analisa*, *7*(1), 46–55. http://journal.uinsgd.ac.id/index.php/analisa/index

Romyati, E., & Achmad, T. (2021). Pemanfaatan buku teks dalam menunjang pembelajaran matematika di Sekolah Menengah Kejuruan Negeri 1 Kebumen tahun 2019. *Jurnal Riset Akuntansi dan Bisnis Indonesia STIE Widya Wiwaha*, *1*(1), 217–227. https://doi.org/10.32477/jrabi.v1i1.xxx

Siagian, M. D. (2016). Kemampuan koneksi matematik dalam pembelajaran matematika. *Journal of Mathematics Education and Science*, *2*(1), 58–67.

Sugiyono. (2020). *Metode penelitian kuantitatif, kualitatif, dan R&D* (Sutopo, Ed.; 2nd ed.). Alfabeta.

Sulistyani, D., Roza, Y., & Maimunah. (2020). Hubungan kemandirian belajar dengan kemampuan pemecahan masalah matematis. *Jurnal Pendidikan Matematika*, *11*(1), 1–12. https://doi.org/10.36709/jpm.v11i1.9638

Susanti, Y. (2020). Pembelajaran matematika dengan menggunakan media berhitung di sekolah dasar dalam meningkatkan pemahaman siswa. *EDISI: Jurnal Edukasi dan Sains*, *2*(3). https://ejournal.stitpn.ac.id/index.php/edisi

Wulantina, E. (2018). Pengembangan bahan ajar matematika yang terintegrasi nilai-nilai keislaman pada materi garis dan sudut. *Prosiding Seminar Nasional Matematika dan Pendidikan Matematika*, *1*(2), 367–373.

https://doi.org/10.30606/absis.v7i1.2707