

Research Article

Development of domino media to improve problem solving and mathematical communication for Islamic boarding school students

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Abstract: Mathematical problem solving and communication skills are important factors in learning mathematics. Therefore, it is necessary to develop learning media, especially in Islamic boarding school curricula where the learning load is greater than the regular curriculum. On this basis, the aim of this research is to develop domino card media to improve problem solving and mathematical communication skills of Islamic boarding school students. Development was carried out at Al-Izzah IIBS Batu Middle School, Malang, using the ADDIE model. Data obtained from documents, observations, questionnaires and tests were analyzed using qualitative and quantitative approaches. Based on the results of the validation analysis, the domino card media was declared valid from the aspects of design, material, curriculum, consistency, language, practicality, problem solving development and mathematical communication. Meanwhile, the effectiveness of using domino card media in learning is classified as effective, if seen from the results of the problem solving ability test with an N-Gain score of 76.79%, and the results of the mathematical communication ability test with an N-Gain score of 61.79%. Many factors cause this non-optimality, including a lack of mathematics lesson hours, a busy lesson schedule that is less suited to conditions, many demands on students, and the learning load in the curriculum.

Keywords: communication skills, domino cards, Islamic boarding school, mathematical problem solving

Citation: Hidayah, N., Effendi, M. M., & Rosyadi, A. A. P. (2024). Development of domino media to improve problem solving and mathematical communication for Islamic boarding school students. *Research and Development in Education (RaDEn)*, 4(2), 746-761. <https://doi.org/10.22219/raden.v4.12.34102>

Received: 7 June 2024

Revised: 15 September 2024

Accepted: 17 September 2024

Published: 17 September 2024



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1. Introduction

It cannot be denied that the contribution of Islamic boarding schools in Indonesia to improving human resources is extraordinary. At least, it can be seen in terms of the number of 30,494 Islamic Boarding Schools (Arrasyid & Karim, 2022). Islamic boarding schools are educational institutions whose curriculum aims to form and develop moral values to become pioneers and inspirers of the nation's moral generators (Asha, 2020). Islamic boarding schools are a place for students to study Islamic knowledge. Not only do they teach Islamic religious knowledge, Islamic boarding schools also teach general subjects, namely science, social studies, language and mathematics. Therefore, Islamic boarding schools are also the biggest contributor to students' incompetence in general subjects, especially mathematics.

Mathematics has an important role in education, especially in creating humans who are able to solve and convey the problems they face (Simare-Mare & Harahap, 2020). Therefore, mathematics lessons are given at every level of education, with the aim that students can have the ability to solve problems and be able to convey the problems they face well. The school mathematics curriculum has five process standards that students need to have in solving problems, namely problem solving, reasoning, communication, connection, and representation (NCTM, 2020). Unfortunately, students' mathematical problem solving and communication skills are still low, they experience difficulties in planning, how to solve problems, arranging steps to solve problems, and still have difficulty in making arguments and drawing conclusions from the mathematical problems they have to solve (Kholizah, 2021). Mathematical problem solving and communication skills are things that are still needed to improve students' learning skills.

Problem solving ability is a skill or potential that exists within students so that they can solve problems and apply them in everyday life (Suryani et al., 2019). So, it can be concluded that this problem solving ability is a basic ability in the learning process. Therefore, in the learning process, teachers must be able to stimulate students' creativity in solving a problem (Kurino & Rosidah, 2021).

Mathematical communication skills are abilities that can help students build their understanding of concepts in mathematics and can certainly be easily understood (Sa'adah & Sumartini, 2021). Oral and written communication can bring students to a deep understanding of mathematics. Graphs, charts, diagrams, pictures, symbols, and equations are ways of communication that are often used in mathematics. Tables, diagrams, and graphs guide students to make new conclusions, predictions, and questions. Through tracing patterns and similarities, students learn to communicate understanding about sequence and repetition which are then symbolized using images or symbols.

Several research results state that the majority of Islamic boarding school students experience difficulties in understanding lessons and in honing their mathematical skills. This happens because teachers have not used learning media creatively (Eva & Syarif, 2020), and many still rely on textbooks using the lecture method (Biza, 2017). Even though learning media can help students understand difficult material, especially concepts abstract. Therefore, to overcome these problems and supporting students in the mathematics learning process, it will be easier if you utilize various learning media sources, especially in studying applicable concepts, such as the Pythagorean Theorem. The Pythagorean Theorem is widely used in everyday life, this material also includes prerequisite material for other mathematical material, so this material is important to master in order to study further material (Maryana et al., 2019).

Learning media is one of the supporting factors that can help students succeed in learning, it can also help teachers convey material to students in a way that is not boring. Through learning media, teachers can also use it as a tool to help achieve learning goals (Hodiyanto et al., 2020). One learning media that can help in the learning process is by using a game, namely the domino card game. Domino is a card-based game that is played for fun. Dominoes are identical to being played using money as the final goal of the game. This results in the game being seen as a game that is not good to play, especially in Islamic boarding school environments. Thus, to change this negative perspective, efforts are made to modify and utilize the domino card game as an educational game medium that is adapted to the material and students in the class.

Domino cards have been widely developed and applied as a medium for teaching mathematics in elementary schools (Rahman & Amalia, 2019), there are also those in junior high school, MTs and high school. Development of domino card media in elementary school, among others, carried out by: 1) Wulandari et al., (2022) developing domino cards for addition material, 2) Sukma and Setyadi (2023) developing domino card media for integer material, 3) Adawiyah and Kowiyah (2021) developing domino cards as a medium for multiplication material, and 4) Priyatna and Dwi (2023) developing domino card media for material on counting whole number operations, 5) Priatna et al., (2022) developing domino media for fractional material. Then media development at junior high school level, among others, is carried out by; 1) Tamim et al., (2021) with his research which developed algebra video tutorial media (VITUBAR) for junior high school students, 2) Kumbara and Rodliyah (2021) developing interactive media for circle material for MTs class students using articulate storyline software, 3) Bulan and Idhar (2021) developing domino media to increase junior high school students' English vocabulary. Meanwhile, media development at the high school level is carried out, among others, by; 1) HN et al., (2023) implementing a learning technology using domino card media which is applied to high school students.

From the descriptions above, the development of domino card media in Islamic boarding schools has never been carried out, especially in relation to efforts to improve

mathematical problem solving and mathematical communication skills, so this is the latest in this research. On this basis, the aim of this research is developing domino card media to improve problem solving and mathematical communication skills of students at Islamic boarding schools. And the benefits of this research are helping students to hone their problem-solving abilities through playing challenges and stimulating good and correct mathematical communication skills.

2. Methods

2.1. Research Approach

Based on the objectives above, this research is included Research and Development (R&D), with a development model using ADDIE (Analysis, Design, Development, Implementation, Evaluation) (Branch, 2010). At the beginning is analysis, namely analyzing learning media needs related to problem solving abilities and mathematical communication through document data, interviews and observations at the Islamic boarding school where the research is located. Based on the results of the analysis of curriculum documents, teaching modules, classroom implementation, and learning evaluations, it is stated that learning the Pythagorean Theorem requires the development of domino card media. The next stage is designing research, research instruments, and domino card media design using the Microsoft Word application. The development results in the form of a domino card media draft with Pythagorean Theorem material were validated by 6 expert validators, namely 3 mathematics lecturers and 3 mathematics teachers. The domino card media draft that has been assessed as appropriate by the validator, is implemented in the form of learning, and analyzed to determine whether there is an increase in students' mathematical problem solving and communication abilities. The final stage is to evaluate and determine that the results of the development of domino card media are suitable for use in learning the Pythagorean Theorem in Islamic boarding schools.

2.2. Subjects

Development of domino card learning media at Al-Izzah IIBS (International Islamic Boarding School) Middle School, Batu, which will be implemented in the even semester of the 2023/2024 academic year. Education at this school takes the form of a ma' had or Islamic boarding school, therefore the research subjects were 31 female students from class VIII-E.

2.3. Data Collection and Instruments

The techniques used to obtain data were questionnaires and tests, while interviews, observations and documents were used as cross-checks. The questionnaire was used to validate the domino card media draft, consisting of 21 items covering design, content, language, consistency, curriculum, practicality, problem solving, and mathematical communication, with a Likert scale assessment; 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree. The results of the validation assessment (P) are confirmed with the Table 1 to determine the validity criteria (Lestari et al., 2022; Sari et al., 2023).

Table 1. Score Intervals and Validity Criteria

Rating (P) in %	Criteria
$85 < P \leq 100$	Highly Valid (SV)
$70 < P \leq 85$	Valid (V)
$55 < P \leq 70$	Enough (C)
$40 < P \leq 55$	Less Valid (KV)
$P \leq 40$	Invalid (TV)

The test technique was used to obtain data on the increase in students' problem solving and mathematical communication abilities after learning using domino cards. For this reason, each pre-test and post-test description question was created, with aspects, indicators and scoring as in the Table 2 (Cahyadi et al., 2023; Purnamasari & Sudarjat, 2021).

Table 2. Aspects, indicators and Test Scores

No	Aspect	Indicator	Max Score
1.	Problem solving skill	a. Understand the problem	20
		b. Plan problem solving	30
		c. Solve the problem	30
		d. Checking the results of troubleshooting	20
2.	Mathematical Communication	a. Connect real objects, pictures, and diagrams to mathematical ideas	30
		b. Explaining ideas, situations and mathematical relationships in writing	40
		c. Expressing events, ideas in language, mathematical symbols	30

To test the increase in problem solving and mathematical communication skills, use the N-Gain value calculation with the help of SPSS with the criteria as in the Table 3 (Wahab et al., 2021).

Table 3. N-Gain Score Interval and Criteria

Score	Criteria
$N - Gain < 0,30$	Low
$0,30 \leq N - Gain \leq 0,70$	Currently
$N - Gain > 0,70$	Tall

2.4. Data Analysis

The data analysis techniques used are qualitative and quantitative. Qualitative analysis is used to determine whether or not the domino card media draft is appropriate for implementation in learning. Meanwhile, quantitative analysis is used to determine whether there is an increase in students' mathematical problem solving and communication skills in learning using domino cards with Pythagorean Theorem material. For data validity, triangulation is used.

3. Results

In this section, the research results will be presented based on the stages of the ADDIE model as follows.

3.1. Analysis stage

Based on a literature review, it was found that students' mathematical problem solving and communication skills are relatively low, especially in Islamic boarding schools where the curriculum load is greater than the regular curriculum. To ensure this, observations, documents and interviews were carried out with school administrators, teachers and students at Al-Izzah IIBS Batu Middle School, Malang. Mathematics learning does not involve many students, learning resources still depend on textbooks and do not use interactive learning media so that the learning process tends to be one-way, less interesting, and has an impact on low problem solving and mathematical communication skills.

Apart from that, it turns out that in the syllabus and curriculum of Al-Izzah IIBS Middle School, there are no competencies in mathematical problem solving and communication skills, even though these are important in learning mathematics. Teachers are not allowed to give assignments to students outside of class hours, because of their

busy religious activities. Based on the results of the analysis, it was found that it was necessary to develop interactive and interesting media to improve the problem solving and mathematical communication abilities of Al-Izzah IIBS Middle School students.

3.2. Design Stage

The interactive and interesting media development chosen was the development of domino card media. The design for developing domino card media to improve students' mathematical problem solving and communication skills at Islamic boarding schools is based on a grid as in the [Table 4](#).

Table 4. Domino Card Media Development Design Grid

No	Aspect	Indicator
Needs Analysis		
1.	Objective	a. Developing domino card media b. Improving students' problem solving and mathematical communication skills
2.	Student characteristics	Class VIII junior high school student
Learning objectives		
3.	Goal Formulation	Improving students' mathematical problem solving and communication skills based on the Pythagorean Theorem through domino cards
4.	Success Indicators	There is an increase in students' problem solving and mathematical communication skills on the Pythagorean Theorem through domino cards
Learning Media Design		
5.	Method	Group
6.	Channel	Step by step in using domino card media
Learning Media Development		
7.	Domino card design	Cover, foreword, usage guide, Pythagorean Theorem material, answer sheet, scoring sheet, Collection of Pythagorean Theorem questions and answers, bibliography.
8.	Device used	Microsoft word software
Media Validation		
9.	Reviews	6 expert validators
10.	Revision	As suggested
Implementation		
11.	Usage guide	The guide to using domino card media is easy and clear
12.	Facilities preparation	Using prepared domino card media
13.	Learning implementation	Carry out learning in 3 meetings, according to the usage guide.
Evaluation and Revision		
14.	Evaluation	Evaluate the process and results
15.	Data collection	pre-test and post-test
16.	Revision	Based on evaluation results

Media Domino cards are designed according to development objectives. This goal is realized by the effective use of media and the completeness of the material contained in it. Apart from that, this domino card media can attract students' attention during learning time in the classroom. Problem solving and communication skills are realized by students answering questions from the cards in find out whether the indicators for both abilities match or not. Apart from that, these two abilities too realized by answering pre-test and post-test questions that contain indicators of these two abilities.

Reference image display from freepik.com, background display from Canva, material from YouTube. The domino card media design uses the Microsoft Word application, while the domino card used is a simple image of a domino card (Figure 1).



Figure 1. Dominoes in Media

The domino card media design consists of: 1) cover containing the title, target class, identity of the compiler, and image of a domino card, 2) foreword, 3) usage guide, 4) materials, 5) collection of questions, 6) answer key, and 7) bibliography. Here are some of the displays in question (Figure 2, Figure 3, Figure 4, and Figure 5).



Figure 2. Domino Card Media Cover

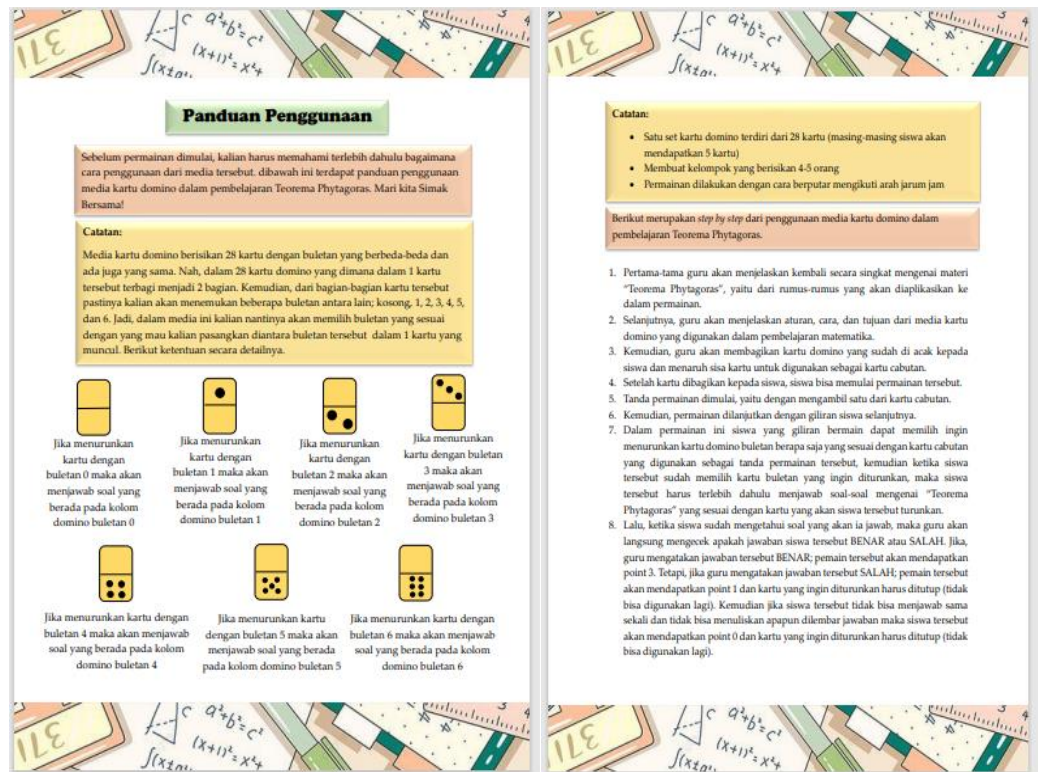


Figure 3. Usage guide

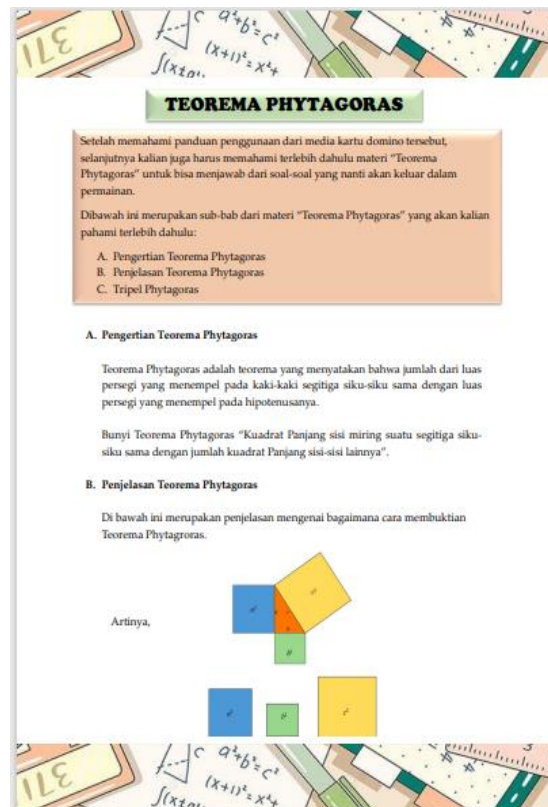


Figure 4. Material View

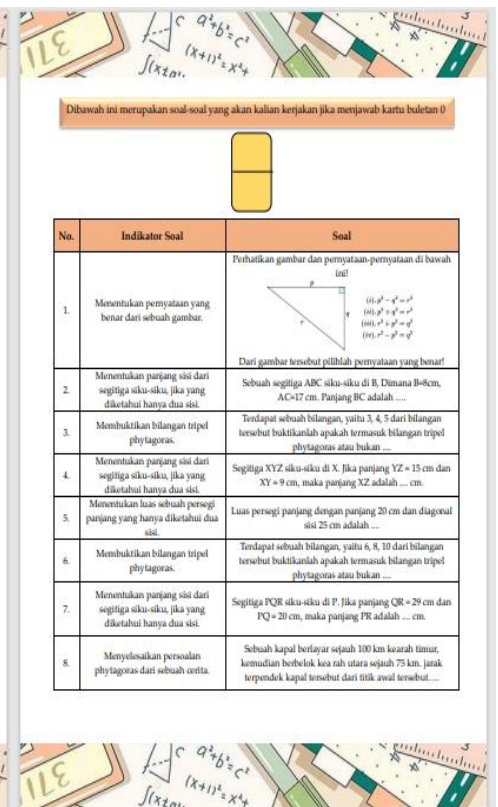


Figure 5. Collection of questions

The design of the validation questionnaire instrument consists of aspects of design, use, consistency, curriculum, content, language, problem solving skills and mathematical communication, with 21 statement items (Table 5).

Table 5. Assessment Aspects, Number and Statement Number

No	Assessment Aspects	Number of Statements	Statement Number
1.	Design	6	1,2,3,4,5,6
2.	Use	3	7,8,9
3.	Consistency	2	10,11
4.	Curriculum	2	12,13
5.	Contents	3	14,15,16
6.	Language	3	17,18,19
7.	Solution to problem	1	20
8.	Communication	1	21

Based on the grid in Table 5, mathematical problem solving and communication ability questions were designed for the pre-test and post-test with 3 questions each containing all the indicators (Table 6).

Table 6. Pre-Test and Post-Test Aspects and Questions

No	Aspect	Question	
		Pre-Test	Post-Test
1.	Problem solving skill	1. Triangle PQR is right-angled at P. If the length of QR = 29 cm and PQ = 20 cm, then determine the length of PR! 2. A ship sails 100 km east, then turns north 75 km. Determine the shortest distance of the ship from the starting point! 3. If the length of the hypotenuse is 29 cm and one of the right sides is 19 cm, then determine the length of the other side!	1. There is a triangle ABC right-angled at B, where AB = 8 cm, AC = 17 cm. Determine the length of BC! 2. A pole 12 cm high stands upright on flat ground. From the top end of the pole, a rope is pulled to a stake in the ground. If the length of the rope is 15 m, then determine the distance between the stake and the base of the bottom pole! 3. If the length of the hypotenuse is 29 cm and one of the right sides is 19 cm, then determine the length of the other side!
2.	Mathematical Communication	1. Determine the area of a triangle whose side lengths are 15 cm, 15 cm, and 18 cm 2. Determine the area of a rectangle with a length of 20 cm and a side diagonal of 25 cm! 3. A ladder 3.8 m long is leaned against a wall. If the distance between the bottom of the stairs and the wall is 2.1m, determine the height of the top of the stairs from the floor!	1. Determine the area of a triangle whose sides are 15 cm, 15 cm and 18 cm! 2. Determine the area of a rectangle with a length of 15 cm and a side diagonal of 17 cm! 3. A ladder 3.8 m long is leaned against a wall. If the distance between the bottom of the stairs and the wall is 2.1m, determine the height of the top of the stairs from the floor!

3.3. Development Stage

At this stage, namely developing domino card media that is in accordance with the design that was created at the design stage. The steps in the development stage are that the researcher creates a design that will be contained in the media, then written in Microsoft Word, and finally made into PDF format. After that, the file is put on Google Drive so that it can be accessed and downloaded using the internet and is flexible for repeated use. The following is a link to the development results of domino card media: [Domino Card Learning Media - Google Drive](#).

Before being implemented, the domino card media draft was validated first by 6 validators, with the validated aspects being: design (D), use (G), consistency (Ko), curriculum (Ku), content (I), language (B), problem solving (PM) and mathematical communication (KM) abilities. The validation results are very valid with a score of 97.8 with details of each aspect as in the Table 7.

Table 7. Domino Card Media Validation Results

No	Validator	Validated Aspects								Average	Criteria
		D	G	Ko	My	I	B	PM	KM		
1.	A.I	100	100	87.5	100	100	92	100	100	97.6	SV
2.	YMC	100	100	87.5	100	100	100	100	100	98.8	SV
3.	ASK	100	100	100	100	100	83	100	100	97.6	SV
4.	B.D	100	91	100	100	100	83	100	100	96.4	SV
5.	BI	100	100	100	87.5	100	92	100	100	97.6	SV
6.	BW	100	100	100	100	100	92	100	100	98.8	SV
Average		100	98.6	95.8	97.9	100	90.3	100	100	97.8	SV
Criteria		SV	SV	SV	SV	SV	SV	SV	SV	SV	SV

Based on the validation results, the domino card media draft was declared very valid (SV) with a score of 97.8 without revision, from the aspects of design, use, consistency, curriculum, content, language, problem solving abilities and mathematical communication.

3.4 Implementation Stage

The draft domino card media which had been declared valid/feasible by the validator, was then implemented in class VIII Al-Izzah IIBS, Batu, which was aimed at 30 students in learning the Pythagorean Theorem for 3 meetings, with 1 meeting per week being 3x50 minutes. The aim at this implementation stage is to find out whether learning using domino cards can improve students' mathematical problem solving and communication skills. Therefore, before and after implementation, pre-tests and post-tests were carried out on problem solving abilities and mathematical communication.

The lesson is designed to be a group study to discover the Pythagorean concept through the domino card game, and the results of the group study are discussed so that they are trained and capable in problem solving and mathematical communication. In group learning, students seemed enthusiastic and active in carrying out learning activities using domino cards and practice questions (Figure 6).



Figure 6. Group Learning Atmosphere

In discussions between groups, it appears that each group, through its speakers, is actively arguing to defend their group's opinion. However, only a few students were able to express their group's opinion. There are many factors why this is so, one of which is time constraints (Figure 7).



Figure 7. Inter-Group Discussion

3.5. Evaluation Stage

After the learning process has been evaluated, the aim is to find out whether there has been an increase in problem solving and communication skills mathematical students on Pythagorean Theorem material. To find out this, a pre-test and post-test were given. The results of this test were analyzed using SPSS *Samples Paired T-Test* and can be grouped into 2, as follows:

a. Problem solving skill

The average post-test result for problem solving ability (81.67) is higher than the pre-test result (48.17), and this is a significant difference. Apart from that, the post-test standard deviation is smaller (28.69) than the pre-test results (33.17). It can be said that learning using domino cards can improve problem solving abilities, and the ability to become homogeneous (Table 8).

Table 8. Pre-Test and Post-Test Results of Problem Solving Ability

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-test	48.17	30	33.57	6.13
	Post-test	81.67	30	28.69	5.24

To prove whether the difference is significant, it needs to be tested using the Paired Sample T-Test. The results of this test (Table 9) show that significance (2-tailed) means that the difference between the pre-test and post-test results is significant. Thus, the use of domino cards in learning the Pythagorean Theorem can improve problem solving abilities. This is in line with research $p = 0.000 < 0.05$, Rahim and Rahman (2022) which shows an

increase in the average problem solving and is in the medium category, so that the learning media used can improve students' mathematical problem solving abilities.

Table 9. Paired Sample T-Test Results for Problem Solving

		Paired Samples Test							
		Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	95% confidence interval of difference		Q	df	Sig. (2-tailed)	
				Lower	Upper				
Pair 1	Pre-test Post test	-33.5	33.22	6,066	-45.90	-21.09	-5.52	29	.000

The ability to solve problems has not been optimized because there are several indicators that have not been met, namely understanding the problem, planning a solution, resolving it, and checking the results of solving the problem. Some examples of this inability are in Figure 8 and Figure 9.

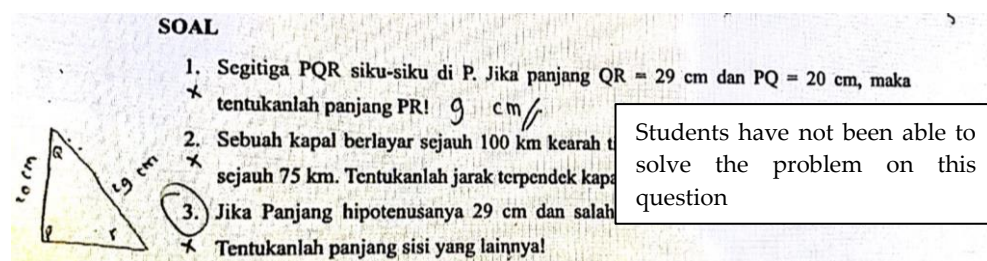


Figure 8. Example Unable to Complete

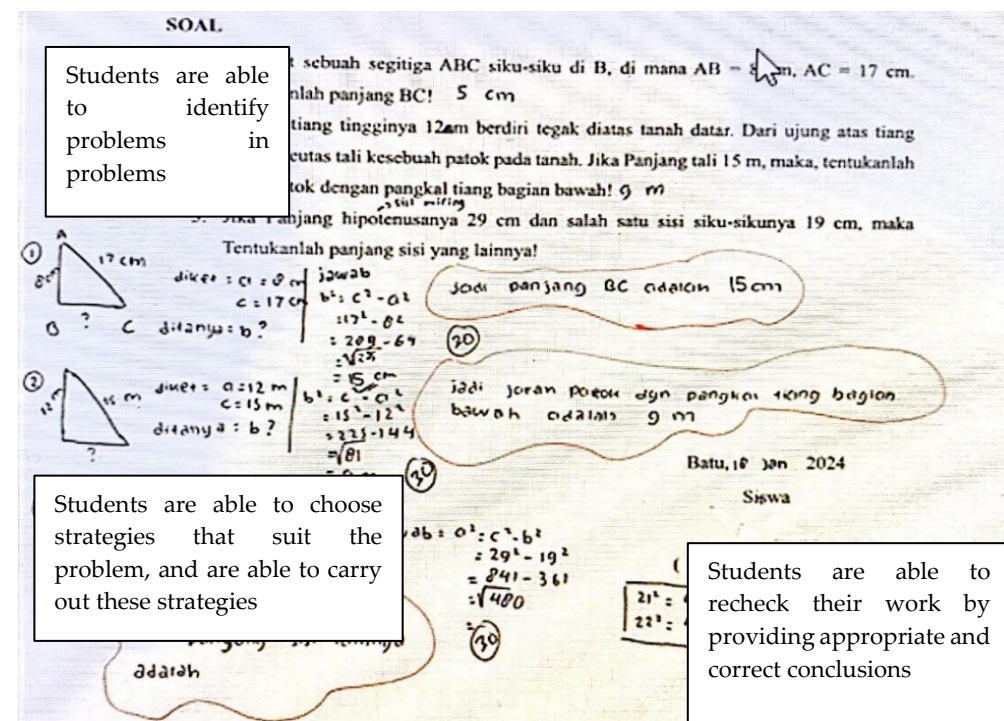


Figure 9. Example of being able to identify, carry out strategies, and conclude

b. Ability Mathematical Communication

Based on the results of the analysis (Table 10), it was found that mathematical communication skills increased. This can be seen from the post-test results (67.33) which are higher than the pre-test results (44.33), but the standard deviation is lower.

Table 10. Pre-Test and Post-Test Results of Communication Skills

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-test	44.33	30	30.92	5.65
	Post-test	67.33	30	35.28	6.44

Improvements in the form of differences in pre-test and post-test results in communication skills must be tested for significance. Based on the results of the Paired Sample T-Test, it was found that the significance value was (2-tailed) (Table 11), meaning that the use of domino cards in learning the Pythagorean Theorem can improve communication skills. This is also in accordance with research $p = 0.000 < 0.05$. Sandy et al., (2022) which shows an average increase in communication skills and is in the medium category, so that the learning media used can improve students' mathematical communication skills.

Table 11. Paired Sample T-Test Communication test results

		Paired Samples Test							
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% confidence interval of difference		Q	df	Sig. (2-tailed)
						Lower	Upper		
Pair 1	Pre-test Post-test	-23.0	26.57	4.85	-32.92	-13.07	-4.74	29	,000

Mathematical communication skills are still low, not optimal, even below problem solving abilities. There are several indicators that have not been met or have errors, which are considered an inability in mathematical communication, namely: connecting real objects, pictures and diagrams into mathematical ideas; express events, ideas in language, mathematical symbols. Here are some examples as in the Figure 10 and Figure 11.

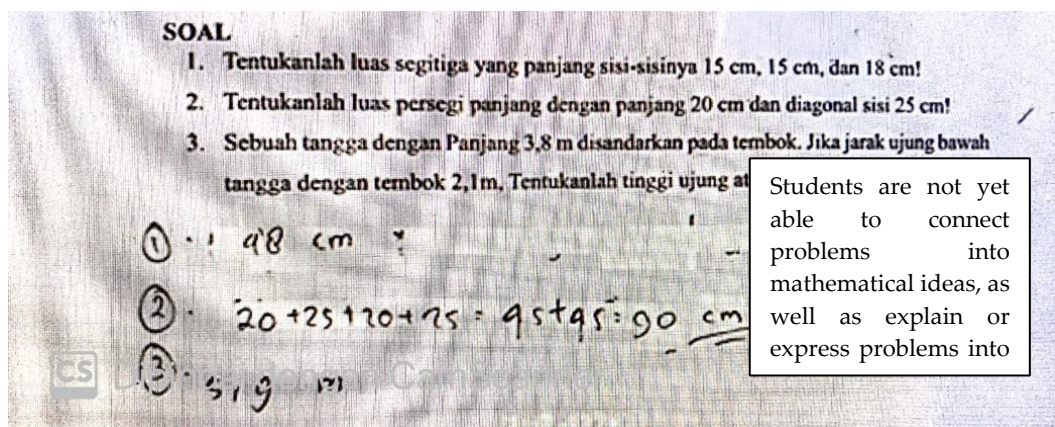


Figure 10. Example of Not Connecting Mathematical Ideas

Students have been able to connect problems into pictures, but have not been able to continue, and have not been able to explain ideas and express events into mathematical symbols

Students are able to use mathematical symbols to present ideas, able to enter them into mathematical formulas

Students are able to draw conclusions from mathematical statements and the calculated results are correct

SOAL

1. Tentukanlah luas segitiga yang panjang sisi-sisinya 15 cm, 15 cm, dan 18 cm! ~~108 cm²~~
2. Tentukanlah luas persegi panjang dengan panjang 15 cm dan diagonal sisi 17 cm! 90 cm²
3. Sebuah tangga dengan Panjang 3,8 m disandarkan pada tembok. Jika jarak ujung bawah tangga dengan tembok 2,1m, Tentukanlah tinggi ujung atas tangga dari lantai tersebut!

anya: Luas?

jawab: $a^2 = c^2 - b^2$
 $= 18^2 - 9^2$
 $= 324 - 81$
 $= 243$
 $= \sqrt{243}$
 $= 15,6$

$L = \frac{1}{2} \cdot a \cdot b$
 $= \frac{1}{2} \cdot 18 \cdot 12$
 $= 108$

Jadi luas segitiganya adalah 108 cm²

jawab: $a^2 = c^2 - b^2$
 $= 17^2 - 15^2$
 $= 289 - 225$
 $= 64$
 $a = 8$

$L = p \times l$
 $= 15 \times 6$
 $= 90$

Jadi luas persegi panjangnya adalah 90 cm²

jawab: $a^2 = c^2 - b^2$
 $= 3,8^2 - 2,1^2$
 $= 14,44 - 4,41$
 $= 10,03$

Jadi tinggi ujung tangga dari lantai tersebut adalah

Figure 11. Example of being able to express ideas into mathematical formulas

4. Discussion

Development of media that utilizes the domino card game, designed to improve students' mathematical problem solving and communication skills. Domino cards are designed for three meetings of mathematics learning. By focusing on the problems and obstacles faced in learning at Al-Izzah IIBS Middle School, Batu. Students often have difficulty planning how to solve problems, arranging steps to solve problems, and still have difficulty making arguments and drawing conclusions from the mathematical problems they have to solve (Kholizah, 2021). Apart from that, student interest is low because mathematics learning is less creative. The media used is less effective in helping students understand the material, even though the learning is not just that in the classroom, but also in activities religious outside class. Therefore, if the learning media used by the teacher tends to be boring, students will automatically be unable to focus and will be less interested in the learning carried out in class.

Study Bhakti et al., (2019) concluded that fun learning can help students learn easily. There has also been research on learning media that uses domino cards in mathematics learning done by Setiawan et al., (2020), which developed fractional domino card media to measure students' level of mathematical understanding. Then on to research Sabella et al., (2022) concluding that using domino cards in mathematics learning can overcome problems with student activity in class, the mathematics material used is spatial figures. Both studies focused on the elementary school level. Through their research, they proved that learning media using learning media, one of which is domino cards, can increase fun learning models and student activity in class. However, from the several studies mentioned above, most of these studies developed domino card media for elementary school level students which focused on training students' mathematical understanding. Then, media development in Islamic boarding schools has never used or utilized the domino card game as a learning tool in the classroom.

The advantages of domino media in increasing problem solving abilities include; 1) encouraging students' creative solving of mathematical problems, 2) helping students' understanding of concepts become more concrete and easier to understand, 3) helping students to use logic and strategies to solve problems. Meanwhile, improving

mathematical communication skills includes; 1) encourage students to communicate, discuss and exchange ideas with their classmates, 2) train students to use appropriate mathematical terms and language to carry out strategies, 3) train students to listen to other people's opinions and provide constructive feedback.

The limitations of this research lie in the lesson times and school conditions, namely the lack of mathematics lesson hours, the busy lesson schedule because the school is an Islamic boarding school, where students not only study general lessons but also study Islamic lessons, and then there are many demands on students, and the study load in the curriculum, so students have to go the extra mile to be able to balance various aspects of their life and study.

5. Conclusion

Domino cards can be used to improve students' mathematical problem solving and communication skills at Islamic boarding schools, especially in learning the Pythagorean Theorem. However, there are several indicators that problem solving and mathematical communication abilities are not yet optimal. The dominant factor is the large learning load of students at Al-Izzah Middle School, Batu, and the learning system uses a boarding school which is busy with activities. Therefore, it is necessary to manage curriculum development and learning of mandatory lessons, and according to students' needs, interests and passions.

Author Contributions: Nur Hidayah, principal investigator and author of this article, was responsible for various key tasks in this research project. These tasks include data collection, formulation of needs assessment survey tools, validation of media and materials, and the overall evaluation process. Furthermore, N. H. was actively involved in the development and testing of research products, and contributed significantly to the data processing stages. Working with N. H. is M. M. E, and A. A. P. R, who acted as co-researchers and second and third authors of the article. It is noteworthy that both M. M. E. and A. A. P. R. also act as supervising educators, providing guidance and direction to the main author during the completion of this scientific work.

Acknowledgment: The invaluable support and assistance provided by the leadership, lecturers, and grade 8 teachers of SMP Al-Izzah IIBS Batu must be acknowledged for providing the necessary service opportunities and facilities during the research endeavor. Apart from that, a big thank you is also expressed to the supervisor who has provided guidance and support to make this article a success.

Conflict of Interest: The author declares that there is no conflict of interest.

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