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Pocket Book Design Based On Mathematical Puzzles To Improve The Mathematical Logical Intelligence Of Grade XI Students

Abadihon Fazli Sirait[1], Mara Samin Lubis[2]
[1, 2]Universitas Islam Negeri Sumatera Utara,
Jl. William Iskandar
Email: abadihonfazlisirait056@gmail.com[1], marasamin@uinsu.ac.id[2]

ABSTRACT

Teachers have a big role in developing and improving students' mathematical logical intelligence skills. However, teachers only focus on using package books in teaching in the classroom. As a result, students do not show a great attitude of enthusiasm, students struggle and are unable to think logically, creatively and innovatively in developing skills when doing math problems. Therefore, researchers are interested in creating a pocket book based on Mathematical Puzzles (TTM) class XI. This study aims to determine the feasibility, practicality and effectiveness of the pocketbook. This research is a research and development or R&D with a 4-D to 3-D model. The results of this study are the calculation value of V Aiken on the validation data of material experts of 0.903 and media experts of 0.8 are classified as feasible to use. Then the results of the calculation of V Aiken student response data of 0.932 and teacher response data of 0.894 are classified as very practical to use during learning. While the calculation of the t-Paired test in the pretest and posttest results obtained the value ,t-count.=6.1807, there is an increase in the mathematical logical intelligence of students so that the book is categorized as very effective. It can be concluded that the pocketbook based on class XI mathematical puzzles can improve the mathematical logical intelligence ability of class XI students.

Keywords : Pocket Books, Mathematical Puzzles (TTM), Students' Mathematical Logical Intelligence

ABSTRAK

Guru memiliki peran yang besar dalam mengembangkan serta meningkatkan kemampuan kecerdasan logis matematis siswa. Namun guru hanya berfokus pada penggunaan buku paket saja dalam mengajar di kelas. Akibatnya siswa tidak menunjukkan sikap antusiasme yang besar, siswa kesulitan serta tidak mampu berpikir logis, kreatif dan inovatif dalam mengembangkan skill saat mengerjakan soal matematika. Oleh karena itu peneliti tertarik membuat buku saku berbasis Teka-Teki Matematika (TTM) kelas XI. Penelitian ini bertujuan untuk mengetahui kelayakan, kepraktisan dan keefektifan buku saku tersebut. Penelitian ini merupakan peneltian dan pengembangan atau R&D dengan model 4-D menjadi 3-D. Hasil penelitian ini yaitu nilai perhitungan V Aiken pada data validasi ahli materi sebesar 0,903 dan ahli media sebesar 0,8 digolongkan layak digunakan. Kemudian hasil perhitungan V Aiken data respon siswa sebesar 0,932 dan data respon guru sebesar 0,894 digolongkan sangat praktis digunakan saat pembelajaran. Sedangkan perhitungan uji t-Paired pada hasil pretest dan posttest didapatkan nilai $t_{hitung} = 6{,}1807$ maka terdapat peningkatan kecerdasan logis matematis siswa sehingga buku dikategorikan sangat efektif. Dapat disimpulkan bahwa buku saku berbasis teka-teki matematika kelas XI dapat meningkatkan kemampuan kecerdasan logis matematis siswa kelas XI.

Kata kunci: Buku Saku, Teka-Teki Matematika (TTM), Kecerdasan Logis Matematis Siswa.

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PRELIMINARY

Mathematical logical intelligence is the ability to see, understand numbers, shape concepts, patterns and solve simple problems that exist in everyday life (Mufarizuddin, 2017). Mathematical logical intelligence is important to teach, so that students are able to solve simple problems that occur with mathematical concepts. According to Novitasari, (2020), the mathematical logical intelligence is important to teach, because students can cultivate good reasoning in learning mathematics starting from being able to solve problems, develop problems and create something through mathematical concepts. In fact, through this ability students can solve problems through a process of careful calculation and consideration. Moreover, mathematics is known as abstract learning, so without a high way of thinking students will always have difficulty in understanding mathematics (Murdiani, 2018).

Mathematical logical intelligence needs to be sharpened and developed, because this ability is one of the main points to help students in learning mathematics. The existence of this development students will easily master mathematical logical intelligence indicators, namely calculating, understanding patterns and solving problems with mathematics, so that students can solve problems well.Through writing (Fani, 2021), explains that the government is making careful preparations to face the challenges that will occur in the industrial era 5.0. As a result, the government emphasized to every educational institution to provide special development and training to foster high-level intelligence abilities in students, of course students will be able to solve problems creatively and innovatively. This indicates that the teacher has a big role to run this program. Teachers must find steps to develop that ability. Therefore, teachers are expected to be able to choose the right learning strategies and methods and approaches that are appropriate to the logic-mathematical development of students. Because this ability can be a measure of the success of students in solving problems.

Currently, students in Indonesia still show weak mathematical logical intelligence skills. This can be seen from research (Kamsari & Winarso, 2018) that the achievement of *the Programme for International Student Assessment* (PISA) score in 2012 shows that the position of Indonesian students in solving problems is 64th out of 65 countries. Then based on data obtained from the Ministry of Education and Culture, in 2015 the achievement in mathematics competence increased from 375 points in 2012 to 386 points in 2015. Then in 2018, Indonesia achieved an average score for the mathematics category of 379 with an OECD average score of 487. Despite the increase, Indonesia's achievements are relatively low from the average of the Organisation for Economic Cooperation and Development (OECD). In addition, through research by Sutrisno & Wulandari, (2018) explained that when solving HOTS-based trigonometric problems, most students experience difficulties. Especially if the question is varied differently from the example of students always complaining and unable to do the question according to what is expected, for example as in the example question below.

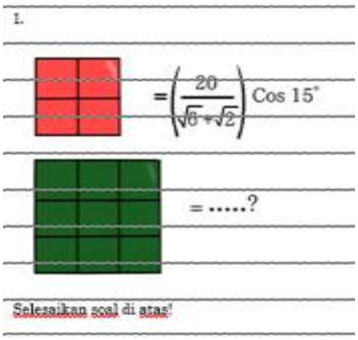

Figure 1. Trigonometric Problems

When doing the questions above, there are some students who are confused about the question in question, as a result, students always do not answer the question, and some students even just write back the content of the question as an answer on the paper.

Thus this shows that the logical and mathematical intelligence of students in Indonesia is still low, so that they are unable to solve problems in learning mathematics. In line with the presentation Fauziah et al., (2015) that mathematical logical intelligence has a close relationship with students' learning outcomes in mathematics. Because each indicator of mathematical logical intelligence is very helpful and has a good influence on students in solving mathematical problems, so that the lower the mathematical logical intelligence, the lower the student's mathematical achievement.

The cause of students' mathematical logical intelligence problems in general is that the expository learning process is still being implemented, meaning that the class atmosphere tends to be centered on a teacher, so students become passive in learning (Handayani & Mahrita, 2021). If seen based on the field conditions that occur, most teachers still apply learning strategies like that. Where the teacher is more active than the students, besides that the supporting media is still minimal. So that students cannot develop their insights from sources other than what is conveyed by the teacher in class. As a result, students' logical-mathematical intelligence is low. Based on research Sinaga & Rakhmawati, (2022), teaching that is monotonous without media will make learning passive. The interaction between the teacher and students will not go well, because the discussion forum is absolutely controlled by the teacher. Students are only listeners in class and there is no opportunity to develop their logical way of thinking.

Therefore, in order to help improve logical-mathematical intelligence, an innovation was made, namely a pocket book based on mathematical puzzles. This pocket book is designed as a supporting medium to help hone students' thinking skills. So that students can be assisted in developing their mathematical logical intelligence. This book contains questions that focus only on trigonometry material. The questions are in the form of story puzzles, where students are directed to understand what is required in the story presented to get the right answer. Rum et al., (2019) explained that puzzle-based media design is an appropriate alternative for honing and stimulating students' mathematical logic, because a puzzle contains elements of obstacles or challenges that must be faced. In addition, this story puzzle is also supported by visualization in the form of pictures and also a grid in the form of quick formulas related to the answers to the story.

The advantage of this pocket book design is that there are variations of questions made in the form of story puzzles, not just questions in the form of numbers. The questions are also designed with the HOTS model, questions that test high-level thinking skills. However, even though the questions use the HOTS model, there is also a quick formula that students can use to solve the story puzzle. This pocket book design is also classified as a unique learning medium. Because through this book, students are invited to think and find solutions to simple problems in everyday life. So that students can immediately apply it in real life if they find the same problem.

METHODS

The method used by researchers is the method of research and development or R&D. Research and Development or R&D is a scientific method that is often used in disciplinary processes to produce creations according to certain fields while simultaneously testing the effectiveness and validity of the products that have been produced (Ahyar et al., 2020). The design procedure carried out by the researcher applies the Thiagarajan 4-D (four-D) model, which consists of 4 steps, namely:

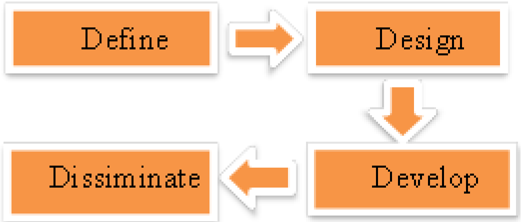

Figure 2. 4-D (four-D) model

However, researchers changed the 4-D model to 3-D, in order to save time and money in the research process. Therefore researchers only carry out up to the development stage (Prawismo et al., 2022). For the definition stage (define) the researcher carries out student analysis and learning media analysis, while in the planning (design) stage the researcher designs and processes math puzzle-based pocket books to completion and for the development stage (develop) the researcher conducts validation tests by media experts and material experts as well as the trial phase to students. The research was conducted for 2 months at MAS Persiapan (MAP) Negeri 4 Medan. The test subjects for this study were students of class XI IPA-1 MAPN 4 Medan totaled 32 people.

Data collection was carried out through questionnaire leaflets and soal tes. After the data was collected, the researcher conducted data analysis in 2 ways, namely qualitative data analysis and quantitative data analysis. Validation and practicality data were obtained by distributing questionnaires using a Likert scale. Furthermore, the results of validity and practicality data were analyzed using the V Aiken formula, namely: (Prawismo et al., 2022)

$$V = \frac{\sum s}{n(c-1)}$$

Information:

$s = r - lo$

lo = Lowest validity score

c = The highest validity score

r = The number given by the validator

Effectiveness data obtained through pretest and post-test. After that the results of the effectiveness data were analyzed using the t-paired test formula, namely:

$$t_{hitung} = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{N\sum D^2 - (\sum D)^2}{N-1}}}$$

If $t_{hitung} > t_{tabel}$ then there is an increase in students' mathematical logical intelligence so that pocket books are very effective for use in class. For V aiken calculation results for validity and practicality data will be classified into the feasibility and practicality level criteria as follows:

Table 1. Pocket Book Eligibility Criteria

Criteria Intervals	**Criteria**
0.76-1	Very Worth it
0.51-0.75	Worthy
0.26-0.5	Less Eligible
<0.25	Not feasible

(Sinaga & Rakhmawati, 2022)

Table 2. Pocket Book Practicality Criteria

Criteria Intervals	**Criteria**
0.76-1	Very Practical
0.51-0.75	Practical
0.26-0.5	Less Practical
<0.25	Impractical

(Rahmalia & Suryana, 2021)

RESULTS AND DISCUSSION

In designing a pocket book based on mathematical puzzles, here the researcher takes several steps according to a predetermined method model. The first step is the define stage. At this stage the researcher made observations to get some of the main problems that occurred in schools so that the researcher got the idea to design a pocket book based on math puzzles. The second step is the design stage (design). Here the researcher directly carries out the design stage for making a pocket book properly, therefore the researcher will start by collecting several relevant sources from both books and journals, then making a draft of the contents of the pocket book, visualizing the design and carrying out the process of making a pocket book based on puzzles. math puzzle. The third step is the develop stage. This stage is the final step in the research process. Researchers will validate this book and implement it directly in the field, so that later they will get the data needed by researchers to be analyzed statistically.

Based on observations made by researchers, it has been found that the main problems that occur in MAPN 4 Medan are: The teacher only focuses on using textbooks in teaching in class. Teachers who only rely on the book, provide a less optimal learning process. The absence of variations in learning in the classroom will result in minimal interaction between teachers and students. As a result students will not show great enthusiasm in learning, students have difficulty solving math problems and students are not able to think logically, creatively and innovatively in developing their answers when working on math problems. Through research conducted (Kurikulum et al., 2021) explained that enthusiasm and logical thinking are abilities that must be possessed by students, because with this ability it gives high self-confidence to students in learning mathematics. So the teacher has a very big role in developing and improving these abilities. Teachers must be smart, wise and creative and have a more varied learning design. Therefore, the use of learning media devices more than one mathematics is the right step in developing and improving these abilities.

Actually, the use of one learning media shows the lack of effectiveness of the teacher in creating a variety of learning. The diversity of teaching materials will provide additional knowledge related to mathematics. That way students will get used to practicing their logical thinking skills in solving various mathematical problems. Therefore, with a pocket book based on math puzzles, it is hoped that it can train and improve logical intelligence in class XI IPA-1 MAPN 4 Medan.

The design stage is a stage where the researcher carries out the process of planning, designing and making a pocket book of mathematical puzzles. In the beginning, the researchers planned to make cover designs, materials, and questions, by collecting all relevant sources of information from books, journals and internet media.

After collecting these sources, the researcher designed the pocket book as attractive as possible so that the reader will feel comfortable when using it. Therefore the researcher displays an element of interest in the book, namely:

(1) Explanation of the material is accompanied by colorful animated images. According to (Afifah et al., 2021), explained that a good teaching material is a material that does not contain monotonous elements, meaning that teaching materials must explain the material by providing comfort to the sense of sight, growing attractiveness to readers and not giving boredom while reading, therefore teaching materials must be supported by the existence of pictorial animations, which are filled with various color variations.

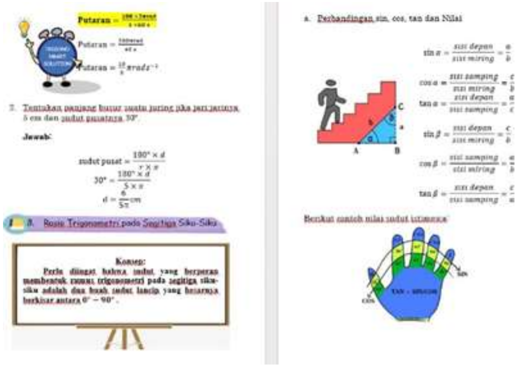

Figure 3. Material with Animation Variations

(2) The examples of questions presented in this book are made according to HOTS indicators (Higher Other Thinking Skills), so that this book can be used as a source of training for students to increase their ability to think logically, creatively and innovatively. (Hasyim & Andreina, 2019), explained that HOTS is a skill that can hone and develop the ability to understand, analyze, evaluate and apply well, then the use of HOTS questions will be the right alternative to stimulate students' mathematical logic, train students to imagine, innovate and train creativity bilities students in solving problems.

(3) Researchers make quick tricks to help students solve HOTS questions. This trick is called "Trigono Smart Solution". Research conducted (Kamila et al., 2021), explains that quick math tricks are very necessary in learning mathematics, because these tricks will make it easy for students to improve their understanding, logical thinking and skills in solving the questions presented by the teacher. Here's an example of a quick trick design form in the book.

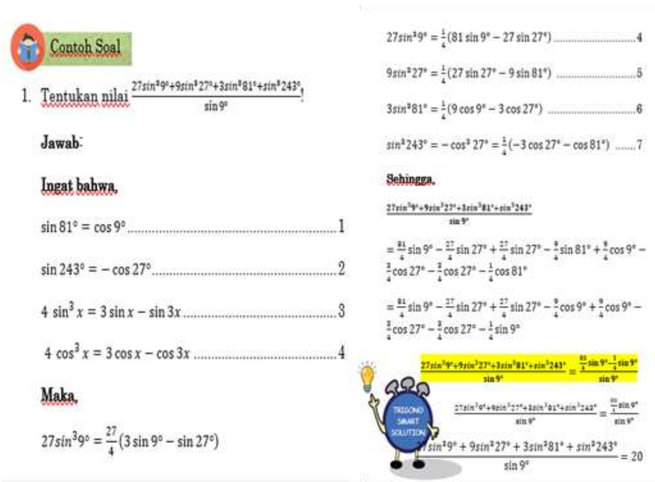

Figure 4. Form of Quick Trick Design

(4) Practice questions on math puzzle-based books. A puzzle is a problem model that has a variety of meanings with elements of ambiguity, obstacles or challenges so that this

problem model is able to hone and develop one's logical thinking skills and sense of sight (Gorev et al., 2018). So, the questions are presented with math riddles that contain HOTS elements. The following is an example of the form of practice questions that have been designed:

Figure 5. Design of Mathematical Puzzle-Based Problem Exercises

Next, the researcher visualizes the design, the aim is to make the book look more attractive. According to Baaqi & Aryanto, (2022), said the implementation of design visualization, namely the design in the process of coloring and layout of products by displaying graphic figures that are unique, attractive, and easily recorded by the brain and sensory eyes so that they can provide interest, comfort, and first impressions in product use. There are 3 parts to the design visualization carried out by the researcher, namely:

(1) Coloring. In this case the researcher looked at several parts of the book in coloring, is cover section. The color selection used for the cover is a combination of yellow and green. The reason is that the book looks more cheerful and fresh in the eyes. In research (Iskandar, 2020) explained that the combination of yellow and green is the right choice in giving color to a product. Because the yellow color symbolizes joy while the green color symbolizes calm, so this combination will give the impression of a fresh, comfortable and cool color to the user's sense of sight

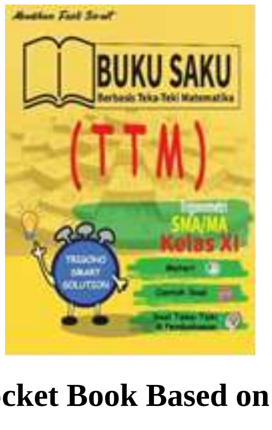

Figure 6. Cover of a Pocket Book Based on Mathematical Puzzles

(2) Animated Image on the Cover. The animation made by the researcher aims to provide an attractive value and illustrate the meaning of the book. There are 4 animated images contained on the cover, namely: a) animated images of books, explaining that the book contains concrete material, b) animated images of reading books, illustrating that sample questions help to increase understanding, c) animated images of intelligence, symbolizing that practice questions based on puzzles and d) animated images of smart clocks, meaning that the book is equipped with a quick trick called "Trigono Smart Solution".

Figure 7. Animated Picture of Pocket Book Cover Based on Mathematical Puzzles

(3) Font Determination. The researcher determines the type of font that will be used in the book, the aim is to make the book look easier to read. A quality product if the designer is able to organize and design books with text writing that is more structured, neat and easy to read (Saputra et al., 2018). In determining the type of letters, researchers used 3 types of letters namely, Comic Sans Ms, Century and Cambria Math.

After that, the researcher carried out the process of making a pocket book based on mathematical puzzles through supporting applications. In designing the cover of the book the researcher used the Adobe Illustrator (AI) application, for writing material and sample questions the researcher used the Microsoft Word application, in making KD and KI the researcher used the Mindomo application, then animated images on the cover and contents of the book the researcher made with the MediBang Paint application, while the puzzle questions the researcher made by connecting mathematics with real life which contained puzzle elements and the researcher designed them in the form of images through the MediBang Paint application which has various meanings in the images. The researcher uses a standard pocket book size, namely A6 (14.8 cm x 10.5 cm).

The develop stage is the final stage carried out by the researcher to obtain some valid and clear data to achieve the goal. Therefore, pocket books based on mathematical puzzles that have reached the manufacturing process will be validated so that they are suitable for use in the field, so that the books can be assessed for their practicality and effectiveness in learning mathematics.

Book validation was assessed by two experts, namely material experts and media experts. Validation was carried out by material experts once, with several improvements to the book, namely each definition of the material should be boxed to make it more attractive, given an explanation for each animated image, discussion of the examples of questions explained clearly and not briefly, writing "tg α" changed to "tan α" and each example problem is given 1 practice question below it. The following is validation data for books by material experts through the table below.

Table 3. Material Expert Validation Data.

No	Indicators	Value Scale					s (r-l_0)
		1	2	3	4	5	
1	Material according to kd and ki presented					✓	4
2	The material is presented in accordance with the objectives of learning mathematics class XI					✓	4
3	The material is presented briefly and easily understood by class XI students				✓		3
4	The language used is easy to understand by class XI students				✓		3
5	The material fosters the interest in learning of class XI students					✓	4
6	The material relates to the cognitive improvement of class XI students				✓		3
7	Contains examples and practice questions for class XI students					✓	4
8	Animated images give interest to class XI students					✓	4
9	Examples of HOTS questions that are made have met 3 indicators, namely analyzing (C4), evaluating (C5) and creating (C6)				✓		3
10	Quick tricks designed to help class XI students to solve math problems					✓	4
11	The problem exercises already contain elements of mathematical logical intelligence, namely calculating, understanding patterns and solving problems					✓	4
12	The use of mathematical symbols is not arbitrary					✓	4
13	The use of sentences is in accordance with the rules of Indonesian				✓		3
	$\sum s$						47
	V						0,903

Through the results of calculations on the material validation data carried out by researchers, it can be seen the value $\sum s$ obtained is 47 so that the result of Aiken's V value obtained is 0.903. This indicates that the trigonometry material presented in the math puzzle-based pocket book for class XI SMA/MA is classified as very appropriate to be taught to students in class with an interval category of 0.76-1. Lena et al., (2020) says that material is good and of good quality and worth teaching if the researcher presents the material content according to and relevant to the competencies and learning objectives to be achieved, the researcher designs the material content in an interesting and systematic way that reflects increased learning abilities within oneself students and researchers present content material that helps students to understand learning in the classroom.

Then the pocket book based on mathematical puzzles was validated by media experts, where several errors were also found in the media design carried out by the researcher. Therefore, media experts provide suggestions and input as improvements to the media appearance of the book, namely, do not separate the writing "based on mathematical puzzles", add trigonometry symbols to the cover and remove the background page "Trigonometry and Identity". After that the researcher revised the book according to the suggestions and input given by media experts and the revised book was immediately given an assessment by media experts. Following are the results of validation by media experts through the table below.

Table 4. Media Expert Validation Data.

No	**Indicator**	**Value Scale**					**s(r-l0)**
		1	**2**	**3**	**4**	**5**	
1	The pocket book size is A6 (10.5 cm x 14.8 cm). Corresponding					✓	4
2	Elements of coloring and layout design on the cover make an interesting impression					✓	4
3	The use of the layout of the image icons already consistent and good				✓		3
4	Displays a variety of colors and good contrast					✓	4
5	The font used is easy to read and increase attractiveness				✓		3
6	Do not use a large variety of fonts					✓	4
7	Animated images provide clarity to the content book material				✓		3
8	Ease of use					✓	4
9	The font size used is appropriate by standard pocketbook				✓		3
	$\sum s$						32
	V						0.8

Based on the calculation resultsconducted by researchers it appears that the value of $\sum s$ which obtained by 32 and the result of the Aiken V value obtained was 0.8. This illustrates that the pocket book media based on math puzzles for class XI SMA/MA designed by researchers is categorized as very suitable for use in class with an interval value of 0.76-1. Through research (Saccharosa, 2016) explaining the appearance of media on products is important, because media gives meaning and impressions that are recorded by sensory nerves and can affect students' psychology in using these products. Therefore, an assessment of the appearance of the media really needs to be done so that the product can be tested properly in the field.

After the validation is carried out and declared feasible, the book can be implemented in the field to see the practicality and effectiveness of the book in the classroom. In this implementation, initially the researcher gave the product to students and teachers. Then give a questionnaire to get student and teacher responses to the book. The following table shows the results of student and teacher response to the product.

Table 5. Data on Student and Teacher Response Results.

No	Aspect	Score					
		Response	s(r-l0)	n(c-1)	Response	s(r-l0)	n(c-1)
		Student			Teacher		
1	Convenience	558	438	480	19	15	16
2	Motivation	714	564	600	24	19	20
3	Attractiveness	718	568	600	22	17	20
4	Usefulness	706	556	600	22	17	20
		n = 32	∑= 2126	∑= 1140	n = 1	∑= 68	∑= 76
		Vstudents	0.932		Vguru	0.894	

The table above explains that the results of the analysis of the calculations carried out by the researcher show that the V Aiken value in the student response data is 0.932, while the Aiken V value in the teacher's response data to books is 0.894. These results indicate that student response data and teacher responses are included in the interval criteria of 0.76-1, so that pocket books based on math puzzles for class XI SMA/MA provide comfort to students and teachers during the learning process in the classroom. Therefore the pocket book that has been made by the researcher is classified as very practical to use when learning mathematics is in progress. In line with research conducted (Ardianti et al., 2019), that the practicality of a product illustrates good quality criteria for the product. To find out how good the quality of the product is to be used as a relevant source of learning for students, the product must be tested for its practicality. A practicality of the product can be obtained through a responsiveness given by students and teachers to the product. If the response is positive then the product is very practical when used in learning.

Next, the researcher carried out the learning process using a math puzzle-based pocket book in class XI IPA-1 MAPN 4 Medan. Then the researcher gave a pretest and posttest to 32 students to see an increase in the logical mathematical intelligence abilities of class XI IPA-1 students. However, before being given questions by the researcher, it is necessary to carry out a test of the appropriateness of the items to see the validity, reliability, distinguishing power and level of difficulty of the questions. The following table shows the results of the analysis of validity, reliability, differentiating power and level of difficulty.

Table 6. Results of the Eligibility Test of Question Items

Grain About	rcount	criteria	r11	Criteria	DP	Criteria	TK	Criteria
1	0.635				2,8	Well very	0.4	Currently
2	0.443				3	Well very	0.4	Currently
3	0.531	Valid	0.686	Tall	1,4	Well very	0.3	Currently
4	0.768				3,6	Well very	0.5	Currently
5	0.509				0.6	Well	0.4	Currently
6	0.513				0.67	Well	0.5	Currently

The table above shows that the six questions have fulfilled the question eligibility test, so that the questions are appropriate for use to be given to students in the form of pretest and posttest questions. Through product trials conducted by researchers with a total of 32 students, a paired t-test was calculated on the pretest and posttest scores to see the significance level of the increase in students' mathematical logical intelligence abilities. Following are the results of the analysis of the t-paired test calculation through the table below.

Table 7. Analysis results of the paired t-test

	Average	Average Difference (D)	Standard Deviation	t count	t table
Pretest	62,343	13,281	12.155	6.1807	2,039
Posttest	72,625				

Based on the table above, it can be seen that the results of the t-paired test for pretest and posttest data obtained tcount = 6.1807 and ttable = 2.039. Because tcount ≥ ttable, namely 6.1807 ≥ 2.039, there is a significant increase in the mathematical logical intelligence of class XI IPA-1 students significantly. This indicates that the pocket book based on math puzzles for class XI is very effective in teaching mathematics in class. Study conducted (Tebe et al., 2019), explained that pocket books based on mathematical puzzles were able to provide an increase in students' mathematical logical intelligence abilities. This increase shows the effectiveness of the book when used in the classroom. Students who are intellectually able to work on well-designed math puzzles can train high-level intelligence and student imagination in solving given problems, so that learning activities like this will provide an increase in students' logical-mathematical intelligence through the learning outcomes achieved student.

CONCLUSION

Pocket books based on math puzzles for class XI are explained to be very suitable for use when learning in class. This can be seen from the results of V Aiken's calculations on material expert validation data of 0.903 and from media experts of 0.8 with an interval category of 0.76-1. So it was concluded that pocket books based on math puzzles for class XI were categorized as very suitable for use in learning mathematics.

Class XI math puzzle-based pocket books are also very practical to use when learning mathematics in class, because students feel comfortable and helped in understanding math problems. This is shown by the results of V Aiken calculations on student response data of 0.932 and the results of V Aiken calculations on teacher response data of 0.894. The Siyogiya book given by the researcher received a very positive response with an interval criterion of 0.76-1. Thus pocket books based on math puzzles are very practical to use by students when learning mathematics in the classroom.

Based on the calculation results of the paired t-test for the pretest and posttest results, the tcount = 6.1807 and the ttable = 2.039. Because tcount ≥ ttable, namely 6.1807 ≥ 2.039, there is a significant increase in the mathematical logical intelligence of class XI IPA-1 students significantly. So it was concluded that pocket books based on math puzzles were very effective in learning mathematics.

It is hoped that in the future it will be able to provide new ideas related to increasing mathematical logical intelligence, especially with today's technological sophistication of course it can be suggested to conduct further research on IT-based pocket book media which makes it easier for students to develop their logical thinking.

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