

Pembelajaran Pola Bilangan di SMP: Sebuah Aktivitas Lesson Study Berbasis Didactical Design Research

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Abstrak

Pola bilangan adalah salah satu konsep matematika yang dipelajari di SMP. Konsep tersebut merupakan konsep yang bermanfaat, tetapi siswa cenderung mengalami masalah ketika mempelajarinya. Cukup banyak penelitian yang mengkaji pola bilangan, tetapi tidak banyak yang berusaha mengkaji alternatif solusi dalam mengoptimalkan kemampuan pemecahan masalah dan motivasi belajar, khususnya menggunakan aktivitas *lesson study* berbasis *didactical design research*. Oleh karena itu, tujuan penelitian ini adalah untuk mengoptimalkan kemampuan pemecahan masalah dan motivasi belajar murid dengan penyusunan desain didaktis melalui aktivitas *lesson study*. Penelitian ini dilakukan pada salah satu SMP swasta di Mataram, Indonesia. Partisipan dalam penelitian ini adalah sepuluh orang murid kelas VIII (enam laki-laki dan empat perempuan). Peneliti adalah instrumen utama dengan beberapa instrumen tambahan, seperti desain pembelajaran, lembar observasi kemampuan pemecahan masalah dan motivasi belajar, serta studi dokumentasi. Data dianalisis dengan menggunakan analisis data kualitatif. Hasil penelitian mengungkapkan bahwa desain pembelajaran pola bilangan mampu mengoptimalkan kemampuan pemecahan masalah dan motivasi belajar murid. Beberapa faktor yang menyebabkan hasil positif tersebut adalah keberadaan masalah kontekstual sebagai situasi pemantik dalam pembelajaran dan aktivitas pembelajaran disesuaikan dengan hobi murid. Adapun rekomendasi dari penelitian ini adalah desain pembelajaran sebaiknya disusun dengan menggunakan *didactical design research* berbasis *lesson study*.

Kata Kunci: *didactical design research*, kemampuan pemecahan masalah, motivasi belajar, *lesson study*, pola bilangan

Learning Number Patterns in Middle School: A Lesson Study Activity Based on Didactical Design Research

Abstract

Number patterns were one of the mathematical concepts that were studied in junior high school. This concept was useful, but students tended to experience problems when learning it. Quite a lot of research has studied number patterns, but not many have attempted to study alternative solutions to optimize problem-solving abilities and learning motivation, especially using lesson study activities based on didactical design research. Therefore, this research aimed to optimize students' problem-solving abilities and learning motivation with the preparation of didactic designs through lesson study activities. This research was conducted at a private junior high school in Mataram, Indonesia. Participants in this research were ten class VIII students (six boys and four girls). The researcher was the main instrument, with several additional instruments, such as learning design, observation sheets on problem-solving abilities and learning motivation, as well as documentation studies. The data were analyzed using qualitative data analysis. The research results revealed that the number pattern learning design was able to optimize problem-solving abilities and student learning motivation. Several factors that caused these positive results were the existence of contextual problems as trigger situations in

learning and learning activities adapted to students' hobbies. The recommendation from this research was that learning design should be prepared using didactical design research based on lesson study.

Keywords: *didactical design research; learning motivation; lesson study; number patterns; problem-solving abilities*

INTRODUCTION

Several previous studies reveal that mathematics is one of the problems with learning at school (Hariyani, Herman, Suryadi, & Prabawanto, 2022; Pongsakdi et al., 2020). It has been proven that students' problem-solving abilities (Barbosa & Vale, 2021; Surya, Putri, & Mukhtar, 2017) and students' learning motivation (Abramovich, Grinshpan, & Milligan, 2019; Arthur, Dogbe, & Asiedu-Addo, 2022; Tossavainen & Faarinen, 2019) are quite low during the implementation of mathematics learning at school. Mathematics is an important subject (Koskinen & Pitkäniemi, 2022; Man-Keung, 2022; Walle et al., 2016) for life, and problem-solving ability is one of the important abilities that students must have in the 21st century (Harnani, Amijaya, & Setiadiwibawa, 2021; Shahroom & Hussin, 2018). Likewise, with learning motivation. Students at school are expected to have good learning motivation to make it easier for them to solve problems. Quite a lot of research studies problem-solving abilities (Hasibuan, Saragih, & Amry, 2018); however, not much is studied about learning designs that are tailored to students' needs (didactical designs), especially in learning number patterns. A number pattern is an arrangement of several numbers that forms a certain pattern. For example, triangular number patterns, square number patterns, rectangular number patterns, and so on (Fauzan & Diana, 2020; Risdiyanti & Prahmana, 2020). Moreover, learning is structured using a combination of didactical design research and lesson study steps.

Research conducted by Risdiyanti & Prahmana (2020) has used a research design to develop a learning trajectory for learning number patterns in Indonesia. The results of this research have revealed that the story of the battle between *Barathayudha* and *Uno Stacko* can develop students' understanding of the concept of numbers. Research conducted by Fauzan & Diana (2020) has used the RME approach to teach number patterns in junior high schools in Indonesia. The results of this research have revealed that the learning trajectory can improve students' ability to reason when studying number patterns. Research conducted by Chan et al. Research conducted by Chan et al. (2021) has examined the impact of computational thinking on the performance of junior high school students in Singapore using the Rasch model. The results of this research have revealed that there is no significant difference between students who have integrated computational thinking into their learning and those who have not.

In contrast to several previous studies, this research attempts to use didactical design research and lesson study steps in preparing a learning design (didactic) that can optimize problem-solving abilities and student learning motivation. Problem-solving ability is a student's ability to use mental or physical activity to solve problems based on facts or information that are relevant to the problem. It consists of several indicators, namely understanding the problem, developing a strategy, implementing the strategy, checking again, and ensuring the problem solution is correct (Maksum, Wayan Widiana, & Marini, 2021; Mudhofir, 2021; Prema & Sathiskumar, 2021). Didactical design research is being used because it can produce differentiated didactical designs (Rudi, Suryadi, & Rosjanuardi, 2020; Suryadi, 2019b, 2019a), while lesson study is being used because it can provide various points of view on didactical design, making didactical design more effective and efficient (Haryoto & Narimo, 2013; Huang & Shimizu, 2016). Some of the questions in this research are as follows:

1. What is the description of the initial conditions of students' problem-solving abilities and learning motivation at school?
2. What is the form of didactic design for learning number patterns in schools?
3. What is the process of implementing didactic design for learning number patterns in schools?
4. What is the condition of students' problem-solving abilities and learning motivation after implementing the didactic design for learning number patterns at school?
5. How has the didactical design for learning number patterns in schools been revised after implementation?

METHOD

In this study, a didactical design research type was used along with a lesson study at every stage of the research process. Didactical design research was used because it was able to present learning designs that were tailored to the factors that caused students to experience learning obstacles (Prabowo, Suryadi, Dasari, Juandi, & Junaedi, 2022; Sukarma, Isnawan, & Alsulami, 2024; Suryadi, 2019b). Meanwhile, lesson study was used because it could make learning more practical and effective (Bintoro, Zaenuri, & Wardono, 2021; Haryoto & Narimo, 2013). Apart from that, the learning design obtained from implementing lesson study also tended to be more differentiated because it was adapted to students' conditions and used many perspectives from the lesson study team in preparation, implementation, and reflection (Huang & Shimizu, 2016).

This research was conducted from July 2023 to August 2023. It was conducted at a private junior high school in Mataram, Indonesia. This school was chosen because it was one of the private schools that had problems teaching mathematics. Participants in this research were selected using a purposive sampling technique to obtain 10 class VIII students. Participants' ages ranged from 12 to 15 years. Of the 10 participants, 4 were female and 6 were male. Five came from the Sasak tribe, and five came from the Samawa tribe. The work background of the parents of 7 students was farming, and the rest were traders. The parent's education background of eight students was high school, and the rest had bachelor's degrees. Four students had a hobby of playing football, two liked reading, and four enjoyed playing games.

The main instrument in this research was the researcher, along with several additional instruments, such as number pattern learning designs, learning motivation observation sheets, student activity observation sheets, and documentation studies. These three additional instruments had undergone content validity testing by 8 experts (1 mathematics education lecturer, 2 education lecturers, 4 teachers, and 1 school principal). Based on the results of the content validity analysis, the content validity ratio (CVR) value was 1, so it could be concluded that the additional instruments were essential for use in this research activity (Lawshe, 1975).

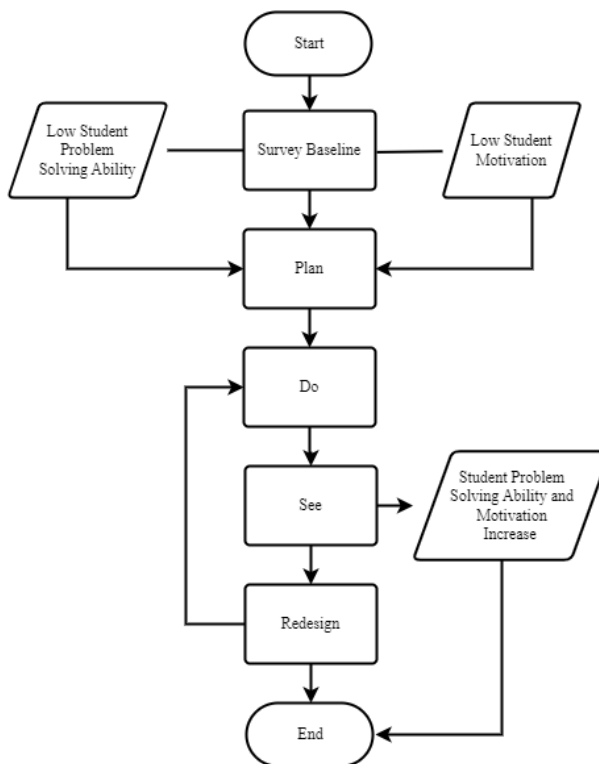


Figure 1. Research Procedure

The data in this research was analyzed using qualitative data analysis, which consisted of three stages: data reduction, data presentation, and conclusion. In strengthening trustworthiness, this research used data triangulation (Heale & Forbes, 2013) in the form of triangulation of data sources, namely students, teachers, and observers. The research ethics used did not force students to provide information or responses in learning, did not display students' true identities in research results and discussions, and only used the data in this research for scientific purposes (Esposito, 2012).

In this study, the steps of didactical design research were combined in a lesson study process that had three parts: prospective analysis (plan), metapedadidactic analysis (do), and retrospective analysis (see) (Huang & Shimizu, 2016; Suryadi, 2019b). The plan was carried out by analyzing the problems experienced by students and looking for factors that caused them to experience obstacles in learning. After that, the researcher prepared a learning design according to the results of the previous analysis. This was done by implementing the learning design that had been prepared in the classroom learning context. One of the important activities at the do stage was the existence of an observer whose job it was to observe and provide notes regarding student activities during class learning. This was the final activity, which was expected to identify obstacles experienced by students during learning to make improvements to the learning design at the next meeting. For more details regarding the procedures in this research, see Figure 1.

RESULTS

What is the description of the initial conditions of students' problem-solving abilities and learning motivation at school?

After conducting a qualitative analysis of the observation sheet data on problem-solving abilities before preparing the design, information was obtained that the majority of students were unable to solve problems correctly. Students were not able to follow problem-solving steps well enough. The results of observations of students' problem-solving abilities can be seen in Table 1.

Table 1. Observation Results of Students' Problem-solving Abilities

Indicators	The Number of Students
Students identify problems by gathering all the information needed to solve the problem.	0
Students formulate strategies to solve the problems the teacher gives.	4
Students implement previously formulated strategies to solve problems.	4
Students check the solutions or steps again, including strategies that have been used previously.	0
Correct solution.	0

Table 1 showed that the problem-solving abilities of most students were still not good. Evidently, not a single student offered the correct response to the teacher's problem. Although, for two steps, problem-solving skills had been able to be implemented by a small number of students,

As with problem-solving abilities, student learning motivation was still relatively low. It was proven that the majority of students had not been able to respond according to the indicators of learning motivation. Data on the number of students who responded correctly can be seen in Table 2.

Table 2. Student Learning Motivation Data

Indicators	The Number of Students
Students are active in paying attention to the teacher's explanation.	3
Students actively ask the teacher or peers.	2
Students complete assignments or problems given on time.	3
Students use class time to discuss with teachers or peers.	4
Students actively seek answers to the assignments or problems given.	3
Students actively discuss with their peers while completing assignments or problems.	5
Students are diligent when working on assignments or problems given by the teacher.	3

Indicators	The Number of Students
Students never give up when working on assignments or problems in class.	4
Students do not feel embarrassed to express their opinions, even though they have been wrong in their opinions.	2
Students can relate the concepts learned to everyday life.	2
Students care about their peers who have not succeeded in completing the assignments or problems that the teacher has given them.	2
Students try to do tasks or problems according to their abilities.	5
Students feel confident when expressing opinions during learning.	2
Students can respond to the opinions of their peers or teachers.	2
Students use the facilities in the classroom to work on assignments or problems.	5

Apart from identifying students’ problem-solving abilities and learning motivation, researchers also analyzed students’ biodata, especially students’ hobbies. The results of this analysis were used as a consideration in preparing activities for learning design. The results of the hobby analysis can be seen in Table 3.

Table 3. Results of Analysis of Student Hobbies

Hobby	The Number of Students
Football	4
Playing games	4
Read	2

What is the form of didactic design for learning number patterns in schools?

Based on Table 3, information was obtained that there were at least three types of hobbies that students enjoyed, namely football, playing games, and reading. Therefore, the learning design sought to facilitate these three hobbies in the students’ worksheets. For students who liked football, activities were associated with football stars such as *Cristiano Ronaldo* and *Lionel Messi*. Examples of activities that facilitated students whose hobby was soccer can be seen in Figure 2.

Ayo Mencari Tahu (15 Menit)

Masalah

Siapakah yang menurut kalian lebih hebat? Ronaldo atau Messi? Siapapun pilihan kalian, kedua pemain tersebut adalah pemain terbaik di Dunia. Messi terkenal dengan bakatnya, Ronaldo terkenal dengan latihannya yang kerasnya. Misal Messi berlatih 1 jam sehari, maka Ronaldo 4 jam sehari. Misal Messi berlatih 4 jam sehari, maka Ronaldo berlatih 9 jam sehari. Misal Messi berlatih 9 jam sehari, maka Ronaldo berlatih 16 jam sehari. Pola bilangan apakah yang dibentuk dari angka-angka tersebut?

CRISTIANO RONALDO		LIONEL MESSI	
35	AGE	33	
JUVENTUS	CLUB	BARCELONA	
PORTUGUESE	NATIONALITY	ARGENTINE	
854	CLUB GAMES	737	
641	CLUB GOALS	636	
0.75	CLUB GOALS/GAME	0.86	
107	INT'L GAMES	140	
101	INT'L GOALS	71	
0.6	INT'L GOALS/GAME	0.57	
28	CLUB TROPHIES	34	
1	INT'L TROPHIES	0	
5	BALLONS D'OR	6	
W10 - D9 - L16	HEAD-TO-HEAD	W16 - D9 - L10	

Figure 2. Examples of Football Based Activities

Translate of Figure 2. Let's Find Out (15 Minutes). Problem. Who do you think is greater? Ronaldo or Messi? Whoever you choose, these two players are the best player in the world. Messi is famous for his talent, and Ronaldo is famous for his hard training. For example, Messi trains for 1 hour a day, then Ronaldo 4 hours a day. For example, Messi trains 4 hours a day, then Ronaldo trains 9 hours a day. For example, Messi trains 9 hours a day, then Ronaldo trains 16 hours a day. What number pattern is formed from these numbers?

Additionally, providing a game-based activity during learning helped students who liked playing games. The game application used was *Kahoot!* Footage of the game-playing activity can be seen in Figure 3.



Figure 3. Activity Footage *Let's Play with Kahoot!*

Translate of Figure 3. Let's Play (5 Minutes). Play by clicking the link below. The group that gets a better podium will get additional points from the teacher.
https://kahoot.it/?pin=9316898&refer_method=link

As for students who enjoyed reading, this was facilitated by presenting story-based problems to students. A snippet of this activity can be seen in Figure 4. A complete description of the learning design can be accessed on the following page: <https://shorturl.at/ghvH8>.



Figure 4. Story-Based Problem Activity Snapshot

Translate of Figure 4. Let's Practice (15 Minutes). Does anyone know Mbape? Yes, he is a Francis national team player. Every day, Mbape practices free kicks using a square pattern. Determine how many free kicks Mbape had during training on day 7.

What is the process of implementing didactic design for learning number patterns in schools?

Before carrying out implementation activities or open classes, all six-lesson study participants prepared the facilities and infrastructure needed for learning activities. This activity was carried out 15 minutes before the learning activity took place. Some of the facilities and infrastructure that had been prepared were the Chrome Book, LCD, and ensuring that the internet connection was properly connected to the Chrome Book. Apart from that, the model teacher also ensured that all observers had received the student activity observation sheet.

The model teacher opened the learning activity with an opening greeting and raised student motivation by holding an icebreaker and clapping. All students were asked to stand when doing the icebreaking to be more enthusiastic. The activity was stopped after all students were able to perform the clapping movement with unity and strong clapping power. After that, students listened to the learning objectives presented by the teacher. The learning objective at this meeting was that students were able to use the concept of square-row patterns in solving everyday life problems. Students then carried out the *Let's Watch* activity by watching the inspiring video on the LKPD on the Chrome Book. However, there was a problem with this activity, namely that the internet connection was unstable, so the video could not be watched. Likewise with the *Let's Play* activity, this activity also could not be done because it used *Kahoot!* as a basis for student play.

One interesting thing that was quite good was that when students saw the worksheet, they started smiling and having small discussions because they saw some of their idol players on the worksheet. The next learning activity was *Let's Find Out*. In this activity, students started by reading a story to understand the problem given by the teacher. Students then used *GeoBoard* to help solve problems. Students were seen starting to connect the points on the *GeoBoard* by using rubber bands according to the numbers in the problem. In this activity, students did not encounter any significant difficulties. However, during the process of using the *GeoBoard*, several students were seen forming squares that were overlapping each other. With guidance from the model teacher, the students were finally able to make the shape it should be, namely a square shape. For this activity, more time was allocated than planned. Figure 5 provides an excerpt of students' answers during the *Let's Find Out* activity.

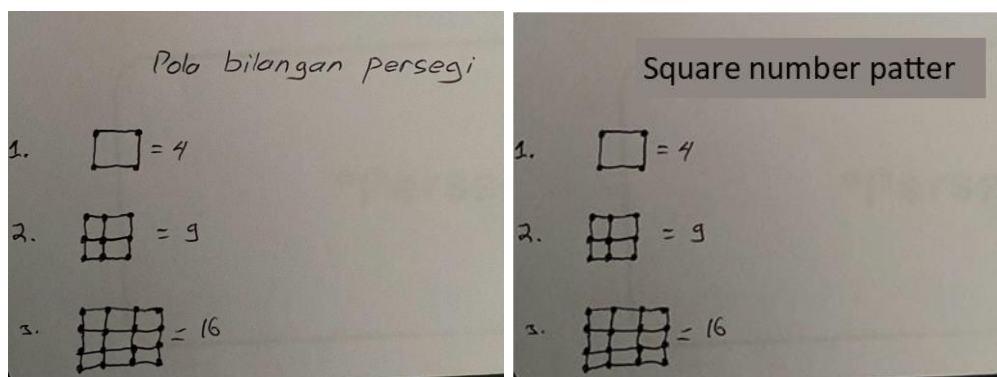


Figure 5. Excerpts of Student Answers Activities *Let's Find Out*

After that, each group of students was told about the process and results obtained. Two groups presented quite well. Meanwhile, one group was less enthusiastic, so the model teacher had to persuade the group to present the results and processes that had been carried out. The next activity was to come to a Conclusion. In this activity, the model teacher, together with the students, concluded the general formula for square number patterns. With some scaffolding, students were able to discover that the general formula for square number patterns was $U_n = n^2$. Excerpts of student answers can be seen in Figure 6.

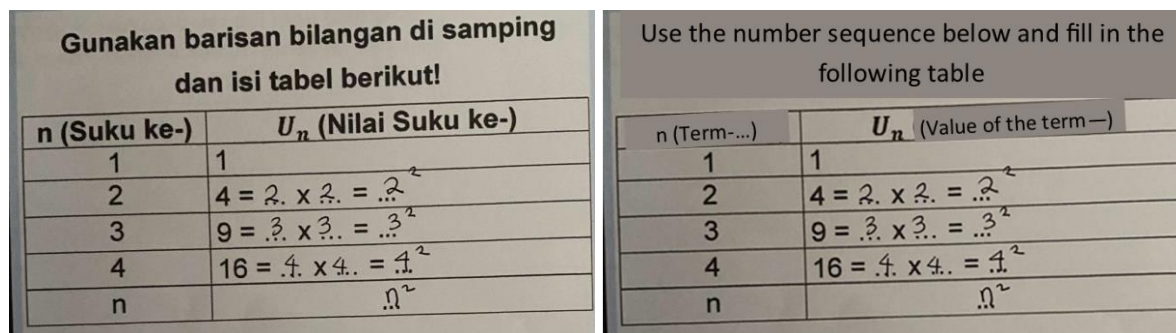


Figure 6. Excerpts of Student Answers Activities *Let's Conclude*

The next activity was *Let's Practice*. However, because there was not enough learning time for this activity, the *Let's Practice* activity using the problems presented could not be carried out. In this activity, students only answered a few examples of questions that the model teacher considered relevant. The last activity was my Reflection. In this activity, students were able to confirm that a number was not included in the square number pattern. Regarding feelings, all male students stated that they enjoyed learning at the meeting. Meanwhile, most female students still felt sad during learning activities. The model teacher then closed the learning activity with a prayer and closing greetings. One example of a learning video clip can be accessed on the following page: <https://rb.gy/pd7a5>.

What is the condition of students' problem-solving abilities and learning motivation after implementing the didactic design for learning number patterns at school?

After conducting a qualitative analysis of the results of problem-solving abilities after implementing the learning design, information was obtained that there was an increase in the number of students for each indicator of problem-solving abilities. The results of these observations can be seen in Table 5.

Table 5. Observation Results of Students' Problem-solving Abilities After Implementation

Indicators	The Number of Students
Students identify problems by gathering all the information needed to solve the problem.	5
Students formulate strategies to solve the problems the teacher gives.	8
Students implement previously formulated strategies to solve problems.	8
Students check the solutions or steps again, including strategies that have been used previously.	4
Correct solution.	9

As for what was related to learning motivation, it can be seen in Table 6. This table showed that there had been an increase in the number of students who showed indicators of learning motivation.

Table 6. Student Learning Motivation Data After Implementation

Indicators	The Number of Students
Students are active in paying attention to the teacher's explanation.	7
Students actively ask the teacher or peers.	5
Students complete assignments or problems given on time.	5
Students use class time to discuss with teachers or peers.	6
Students actively seek answers to the assignments or problems given.	5
Students actively discuss with their peers while completing assignments or problems.	5
Students are diligent when working on assignments or problems given by the teacher.	6
Students never give up when working on assignments or problems in class.	6
Students do not feel embarrassed to express their opinions, even though they have been wrong in their opinions.	5
Students can relate the concepts learned to everyday life.	6
Students care about their peers who have not succeeded in completing the assignments or problems that the teacher has given them.	6
Students try to do tasks or problems according to their abilities.	6
Students feel confident when expressing opinions during learning.	5
Students can respond to the opinions of their peers or teachers.	5
Students use the facilities in the classroom to work on assignments or problems.	8

How has the didactical design for learning number patterns in schools been revised after implementation?

After implementation, there were no significant revisions to the design of number pattern learning in schools. However, because the *Let's Play* activity could not be carried out optimally, the activity was replaced with the activity of pairing certain numbers or number pattern formulas with the names of the corresponding number patterns. This activity was paper-based, so it was not affected by an internet connection. Revisions related to the design can be seen in Table 7.

Table 7. Revision of Learning Design After Implementation

Design Before Implementation	Revisions

Translate of Table 7. Design before implementation: Let's Play (5 Minutes). Play by clicking the link below. The group that gets a better podium will get additional points from the teacher. https://kahoot.it/?pin=9316898&refer_method=link. Revisions: Let's guess (5 minutes). (Connect the formula on the left with the name of the number pattern on the right correctly. You can use arrows or lines to connect them). Not a triangle.

DISCUSSION

Based on the research results described previously, we obtained information that students' problem-solving abilities before implementing the design are relatively low. No student can solve the problem correctly, and most students cannot represent the existing indicators of problem-solving ability. The results of this research are in line with several previous studies (Maksum et al., 2021; Mudhofir, 2021) revealing that students' mathematical problem-solving abilities in schools are still relatively low. This is because teachers frequently do not use problem-based learning, which makes the existence of problems taboo for students and does not pique their interest in learning (Nurhayati, Priatna, & Juandi, 2021; Prema & Sathiskumar, 2021).

In line with problem-solving abilities, students at school also experience problems related to learning motivation. Student learning motivation is quite low. It is proven that most students are unable to show indicators of learning motivation during observations of learning implementation. The results of this research are in line with several previous studies (El-Adl & Alkharusi, 2020; Pohan, Asmin, & Menanti, 2020), which reveal that low learning motivation is one of the obstacles to learning mathematics. One of the factors causing this is the tendency for mathematics learning given by teachers to not involve student activities at school (Lestari, Syahrilfuddin, Hermita, & Putra, 2019; Putri, Hasratuddin, & Syahputra, 2019).

Based on the two previous descriptions, we obtain information that one of the relevant solutions to solve this problem is to develop a problem-based learning design and involve students in solving the problem. The problems presented are also adapted to students' hobbies so that learning activities become

more active, namely those related to football. Apart from that, the didactic design that is prepared also includes play activities to arouse student motivation. The learning design also presents problems in the form of story questions in the hope of facilitating students who like to read. This solution is based on theory, which reveals that one way to optimize student activities in learning is by integrating games, including online games and several student activities in learning (Açıkgül & Aslaner, 2020; Villalba, Marín, & Salgado, 2019). This kind of learning is referred to as differentiated learning, especially process differentiation.

Implementation sometimes does not go according to plan. That is what happens when implementing a didactic design that has been developed previously. There are several obstacles found during implementation, such as several online-based activities (*Let's Watch* and *Let's Play*), which cannot be implemented according to the learning sequence because of internet connection problems. The results of this research are in line with several previous studies that reveal that unstable internet connections are one of the causes of obstacles in ICT-assisted learning (Isnawan, Azis, & Almazroei, 2023). Moreover, students look enthusiastic when doing other activities because they find several activities that are quite close to their hobbies. Students also seem quite skilled in using *GeoBoard* and can present their work results in front of the class. In the *Let's Conclude* activity, students seem to be able to conclude well that the general formula for square number patterns is $U_n = n^2$.

The implementation results show positive results for students. Several students are starting to show signs of problem-solving abilities. Likewise for indicators of learning motivation. The number of students who show indicators of motivation to learn increases compared to before learning. The results of this research are then in line with several previous studies that reveal that students' problem-solving abilities and learning motivation will develop through students' problem-solving activities (Lestari et al., 2019; Nurhayati et al., 2021; Prema & Sathiskumar, 2021).

Based on deficiencies during learning, the learning design is revised by changing the online-based *Let's Play* activity to a paper-based *Let's Guess* activity. This revision is expected to be able to optimize student activities in learning and overcome problems related to internet connections. This revision is based on theory, which reveals that hands-on activity during mathematics learning will be able to optimize students' problem-solving abilities and motivation during learning (Lestari et al., 2019; Nurhayati et al., 2021). Several previous studies also support the results of this research (Pohan et al., 2020; Putri et al., 2019).

One of the obstacles to learning is an unstable internet connection, which causes some student activities to not run optimally. The revision involves replacing the activity with hands-on activities. Therefore, this research provides space for future research to examine whether the revised didactic design is adaptable to students or not. The recommendation from this research is that mathematics teachers should develop learning designs according to students' hobbies or learning interests. Additionally, design (plan), implementation (do), and reflection (see) activities are carried out together with other teachers using a lesson study pattern. This aims to make the learning design better than before and richer in points of view. The recommended learning steps from this research are initial activities (*Let's Listen*, *Let's Watch*, and *Let's Play*), core activities (*Let's Search*, *Let's Tell*, *Let's Conclude*, and *Let's Practice*), and closing activities (*My Reflection*). Researchers refer to this activity as *the epistemic learning pattern*, which will be discussed on another occasion.

CONCLUSION

Based on the previous description, it can be concluded that the didactic design used in this research optimizes problem-solving abilities and student learning motivation. There is an increase in the number of students showing indicators of these two abilities after implementing the didactic design. Several reasons support the design's ability to optimize problem-solving abilities and student learning motivation. First, the didactic design integrates contextual problems into learning. Second, it arranges contextual problems based on students' hobbies, namely football, and reading. This learning design is also known as process-differentiated learning.

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