ARTIKEL JPM ARIKA SARI DES 2021.

by Turnitin .

Jurnal Pendidikan Matematika
Volume xx, No. x, January xxxx, pp. x-xx
P-ISSN: 1978-0044, E-ISSN: 2549-1040, DOI: https://doi.org/10.22342/jpm.v.i.xxxx.y-yy
Website: https://ejournal.unsri.ac.id/index.php/jpm
Accredited by SINTA 2: http://sinta2.ristekdikti.go.id/journals/detail?id=1811

Inductive Reasoning Ability of Students Using the Palembang Songket Fabric Context in Rotational Learning in Grade IX

Abstract

Rotation (rotation) is one of the materials in the transformation of geometry. Rotational learning can be the basis for student understanding geometrically because of its dynamic nature. Rotational learning can allow students to relate some geometric concepts such as congruence and equivalence. The study aims to explore the students' inductive reasoning in rotation problem through the context of songket Palembang pattern in class IX. This research is related to the Indonesian Realistic Mathematics Approach (PMRI) as a learning approach used. The methodology used in this study is Design Research type validation studies consisting of three stages : preliminary design, experimental design, and retrospective analysis. The study was conducted for IX grade students of SMP Negeri 1 Palembang. The learning path (Hypothetical Learning Trajectory) in design research plays an important role as a research design and instrument. The Hypothetical Learning Trajectory was developed together with a series of activities using the contet of songket Palembang pattern such as pucuk rebung pattern, lepus pattern, lintang pattern, etc. Data collected in the form of video recordings and photos during the learning process, student interviews, student work results, discussion results, and field notes at each meeting. The instruments used include documentation in the form of video recordings and photos, interview sheets, student activity sheets, field note sheets, and the Learning Path Hypothesis (HLB).Media used in this study was the students' worksheet. The result of this study indicate that exploration using the context of songket Palembang patterns can help inductive reasoning ability on students when solving rotation problem. The conclusion of this study is the use of songket Palembang pattern as starting point in mathematics learning in rotation material helps the students to explore their inductive reasoning skill in solving rotation problems.

Keywords: Rotation, PMRI, Songket Palembang Pattern, Student Activity Sheet

Abstrak

Rotasi (perputaran) merupakan salah satu materi dalam transformasi geometri. Pembelajaran rotasi dapat menjadi dasar bagi pemahaman siswa secara geometris karena sifat dinamisnya. Pembelajaran rotasi dapat memungkinkan siswa untuk untuk menghubungkan beberapa konsep geometri seperti kongruensi dan ekuivalensi. Penelitian ini bertujuan untuk mengeksplorasi kemampuan penalaran induktif peserta didik pada pembelajaran rotasi menggunakan konteks motif kain songket Palembang di kelas IX. Penelitian ini menggunakan Pendekatan Matematika Realistik Indonesia (PMRI). Metode yang digunakan dalam penelitian ini adalah *Design Research* tipe validation studies yang terdiri dari tiga tahap : *preliminary design*, *experimental design* dan *retrospective analysis*. Subjek penelitian adalah peserta didik kelas IX SMP Negeri 1 Palembang. Dugaan lintasan belajar (*Hypotetical Learning Trajectory*) dalam penelitian ini berperan penting sebagai desain dan instrumen penelitian. HLT (*Hypotetical Learning Trajectory*) yang dikembangkan berisi rangkaian aktivitas pembelajaran rotasi menggunakan konteks motif songket Palembang, seperti : motif pucuk rebung, motif lepus, motif lintang, dll. Data yang dikumpulkan berupa rekaman video dan foto selama pembelajaran berlangsung, hasil wawancara siswa, hasil kerja siswa, hasil diskusi, serta catatan lapangan di setiap pertemuan. Instrumen yang digunakan antara lain dokumentasi berupa rekaman video dan foto, lembar wawancara, lembar aktivitas siswa, lembar catatan lapangan, dan Hipotesis Lintasan Belajar (HLB). Media yang digunakan dalam penelitian ini adalah Lembar Aktivitas Siswa (LAS). Hasil penelitian ini menunjukkan bahwa dengan menggunakan konteks motif kain songket Palembang pada pembelajaran rotasi dapat membantu mengeksplorasi kemampuan penalaran induktif peserta didik.

Kata kunci: Rotasi, PMRI,Motif Kain Songket Palembang, Lembar Aktivitas Siswa

How to Cite: Author, A.A., & Author, B.B. (2019). Instructions/Template for Preparing Manuscript for JPM. *Jurnal Pendidikan Matematika*, *x* (x), xx-xx.

INTRODUCTION

Geometric transformation is a vital material to learn because it is beneficial to build spatial ability, geometric reasoning ability and strengthen mathematical proof (Edward, 1997:187). According to Hollebrands (2003), there are three crucial reasons to learn geometric transformation in mathematics, i.e., an opportunity for students to think about essential mathematics concepts (e.g.,

Received October 4, 2019; Revised November 8, 2019; Accepted December 10, 2019

functions, symmetry), a context to observe mathematics as an interconnected science discipline, and an opportunity for students to be involved in performing high-level reasoning activities using various representations.

Several geometric transformation types exist, i.e., translation, reflection, rotation, and dilatation (Kemdikbud, 2014: 101-123). Rotation is material in geometric transformation. Rotation learning can be fundamental for students to understand geometry due to its dynamic nature. Rotation learning enables students to connect several geometric concepts, such as congruency and equivalency (Panorkou et al., 2015).

The challenges for students in rotation learning are determining the rotation direction and imagining rotation manipulation of a geometric object having a complex form (Morris and Paulsen, 2011). Another challenge is constructing a geometric transformation proof in algebra and writing its systematic reasoning (Naidoo, 2010:40). It illustrates the low reasoning ability of students in the rotation transformation material. Based on the TIMSS result of 2015, Indonesia ranked 44 out of 49 countries, achieving a score of 397 in the reasoning cognitive domain aspect, i.e., reasoning aspect. It indicates low student reasoning.

One of the measures in improving the reasoning ability of students in the rotation material is by conducting learning with a Realistic Mathematics Education (RME) approach. The RME approach is appropriate in learning observed from middle school students' mathematical reasoning and communication abilities (Zaini & Marsigit, 2014). Zulkardi (2002) also suggested that RME learning allows students to express their opinions and solve geometric transformation problems independently.

In the RME learning process, a context is used as a starting point towards the learning process (Zulkardi & Putri, 2006). The context in RME learning can be developed according to the local culture conditions in Indonesia (Sembiring, 2010). The context can take form of problems in daily life (Van den Heuvel-Panhuizen, 2003; Utari, Putri, & Hartono, 2015). Context utilization in mathematics learning allows mathematics learning to be valuable because the context can bring abstract mathematical concepts into a representative and understandable context (Nasution, Putri, & Zulkardi, 2018).

The researcher employed the Palembang songket fabric context as the starting point in rotation learning in this study. Songket fabric is a traditional cloth in the form of weaving decorated with various gold, silver, and silk threads. Following a study by Soegeng Toekio (1983), there are four types of decoration in songket: geometric ornaments, flora, living things, and decorative. From an aesthetic point of view, compositions in geometric decoration are based on straight or curved lines that describe (triangles, rectangles, circles, and polygons).

Geometric forms in songket fabric can be used as the contacts in transforming a point, line, or plain. A study that relates geometry and cultural context was performed by Zainab (2013), producing number sequence patterns from the Palembang Tajung fabric pattern. It is in line with Thaqi's (2011) findings, concluding that educators can teach geometric transformation aided by images. He argued that students could find transformation shadow characteristics through visuals to learn transformation.

Therefore, songket fabric pattern can be used as the context in rotation learning. Besides, no study utilizes the Palembang songket fabric pattern context in rotation learning. Based on the background, the current study aimed to explore the inductive reasoning ability of students in rotation learning using the Palembang songket fabric pattern in Grade IX.

METHOD

The method employed in this study was the design research type validation study method, aiming to develop Local Instructional Theory (LIT) by the cooperation between researchers and teachers to improve learning quality. The current study involved 15 Grade IX students of SMP Negeri 1 Palembang and a teacher as the model. The study was conducted in the odd semester of 2020/2021.

Data were collected from documents of photos, videos, observation, interviews, and worksheet results. Worksheet results were analyzed based on seven inductive reasoning steps according to Febriani & Rusyidi (2013): (1) understanding problems, (2) managing problems, (3) searching for and guessing patterns, (4) guessing a formula, (5) validating presumptions, (6) generalization, and (7) generalization enhancement. However, although these seven steps must emerge in analyzing students' inductive reasoning, not all of them must occur.

Subsequently, obtained data were analyzed using the descriptive qualitative approach. The design research has three steps, i.e., preparing for the experiment, designing the experiment, and retrospective analysis (Gravemeijer & Cobb, 2006; Bakker, 2004).

In the preparing-for-the-experiment step, the researcher conducted a literature review regarding the rotation material, concepts constructing such a topic, inductive reasoning, RME, design research, songket fabric, and geogebra to formulate an initial strategy presumption of students in geometric transformational rotation learning.

The researcher also examined initial student ability by interviewing several students. The interview results were used as the base to observe the extent of student comprehension of the learning prerequisite material. The results were also employed to design the learning activity series, i.e., Hypothetical Learning Trajectory (HLT). The designed HLT is dynamic; thus, allowing a cyclic process creation to be transformed and developed during the learning process trial (Putri, Dolk, & Zulkardi, 2015).

The second step of designing the experiment has two cycles, i.e., cycle 1 (pilot experiment) and cycle 2 (teaching experiment). And cycle one, the researcher played a role as teachers involving two groups with heterogeneous abilities, i.e., high, moderate, and poor abilities. This step aims to discover students' initial ability and try the designed HLT. Also, data in this step are necessary to adjust and revise the HLT before implementing it on the subsequent or teaching experiment steps. In cycle 2, students were taught by their teacher as the model teacher, well the researcher played a role as observers in the learning activity. After completing the learning activity, the researcher and teacher reflected on the learning activity to improve future learning. In conducting a teaching experiment, the researcher collected data by documenting the learning activity through videos, photos, worksheet results, and selecting several students to be interviewed.

The third step is a retrospective analysis. Data collected from the teaching experiment step were analyzed to develop the future learning design (Putri, Dolk, & Zulkardi, 2015).

RESULT AND DISCUSSION

The study was designed to produce a learning trajectory in rotation learning using the RME approach with the balance on cat fabric pattern contacts to explore the inductive reasoning ability of middle school students. Before starting the learning, in discovering students' initial ability, the researcher interviewed students as the study subjects. Moreover, the researcher also performed a pre-test on rotation.

Pre-test results show that students have understood the principle of rotation of simple geometric shapes. After discovering students' initial ability through pretest, the cycle line learning or pilot experiment was conducted. In this step, the researcher involved six students divided into two heterogeneous groups, with the researcher as the model teacher. The pilot experiment results demonstrated that students could execute rotation together in a group based on the problem given. Then, a retrospective analysis of cycle one was performed. The result was utilized for improvement (if necessary) before entering the teaching experiment step. After conducting the retrospective analysis of cycle 1, the actual learning trajectory during the teaching process has matched the designed HLT.

Then, the cycle 2 learning or teaching experiment was carried out. There were two problems delivered to students concerning rotation. The questions given to students are questions about determining the position of geometric figures before or after rotation and generalizing general shapes (x', y') as a result of rotation. The worksheet results of students were analyzed based on seven inductive reasoning steps, i.e., (1) understanding problems, (2) managing problems, (3) searching for and guessing patterns, (4) guessing a formula, (5) validating presumptions, (6) generalization, and (7) generalization enhancement. However, although these seven steps must emerge in analyzing students' inductive reasoning, not all of them must occur.

Below, the inductive reasoning description of students with high, moderate, and poor abilities is explained. Febriani & Rusyidi (2013) described the seven steps in detail, as presented in Table 1.

Inductive Reasoning Step	Indicator in Solving Rotation Problems
Understanding problems	Students can re-explain information available in the question
Managing problems	Students can use information on the question to draw the shape before/after rotation
Searching for and guessing patterns	Students can identify similarities or differences of coordinates on the shape before and after rotation
Guessing the formula	Students can guess rules in the shape coordinates

	before/after rotation from several coordinates
Validate presumptions	Students validate applicable presumed rules by examining all representing coordinates
Generalization	Students can determine rules for (x', y') as the rotation outcome
Generalization enhancement	Students can check (x', y')

Problem I can be observed in Figure 1.

Figure 1. Problem I in Student Worksheet

Problem I in Figure 1 aims to discover whether students understand the rotation definition and characteristics. Students were asked to understand the question and read comprehensively in the first step. The context of the songket spinning wheel is the starting point for this problem. The result from the question in Figure 1 asked students to conclude the rotation definition and characteristics based on the figure. Student answers are presented in Figure 2.

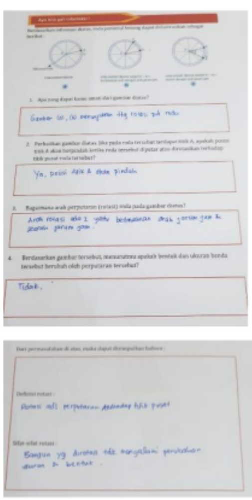
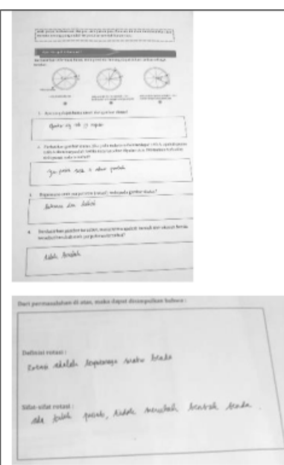
	
Answer of Student A	Answer of Student B

Figure 2. Student Answers on Problem I

From Figures 2 (a) and (b), overall, students could understand the question's instruction and information correctly, although they answered with different strategies and sentences. S1 and S2 could re-explain information that is available and asked from each question. It shows that S1 and S2 have applied the understanding problem step.

Both answers show that students have different reasoning processes. Student B could answer correctly, although the information is incomplete. Student B answered that the rotation directions are right and left. Then, in defining rotation, they only gave another term. Student B also incompletely defined rotation characteristics. Meanwhile, Student A could answer rotation direction, definition, and characteristics correctly and completely.

From the study of the first problem, it has been seen that the implementation of RME is in accordance with what was stated by Yansen, Putri, Zulkardi & Fatimah (2019) that learning begins by presenting realistic or contextual problems to facilitate the learning process. It will allow students to relate the events they have experienced with the mathematical concepts. At this stage, the role of the teacher is significant. Teachers must observe, remind, or assist students' works until they are aware and improve their mistakes. In applying this method, students are guessed to avoid conceptual and procedural mistakes in the next questions and be more meticulous in reading and solving the question. From 15 students, the following answers are the best for question 1.

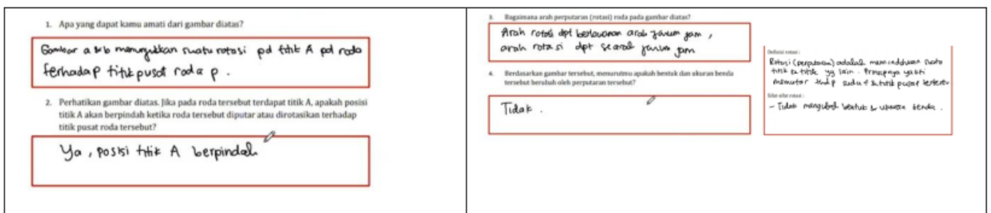


Figure 3. Best Student Answers for Problem 1

The utilization of Palembang songket fabric pattern context in question one is beneficial to help develop students' inductive reasoning in the rotation learning. The reasoning process occurs when students can re-explain information asked and provided from the question. Question 1 shows that students have learned following the designed HLT. Regardless of mistakes in Student B's answer, they have comprehended the problem and expressed their thought using their knowledge and words. Then, Problem 2 is presented in Figure 4.

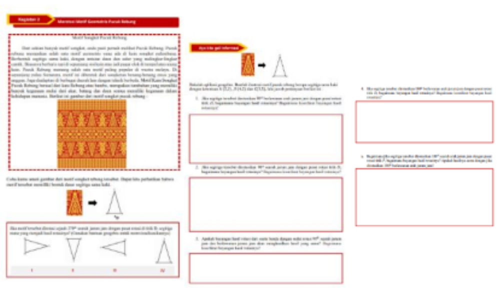
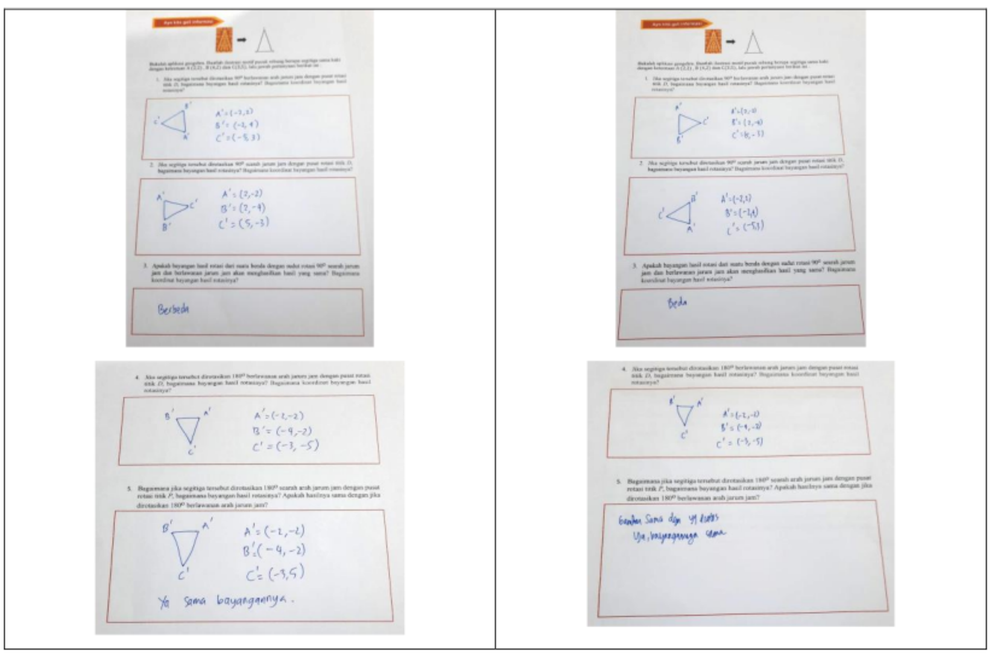


Figure 4. Problem 2 in Student Worksheet

Problem 2 in Figure 4 aims to enable students to draw simple geometry shapes after clockwise and counterclockwise 90° and 180° rotations to the center (0,0) and determine the general form (x',y') after (x, y) is clockwise and counterclockwise 90° and 180° rotations to the center (0,0). The bamboo shoot pattern context is the starting point for this problem. The final result given in Figure 4 asked students to explain the steps for getting the image of a rotated object and painting the image of a rotated object. Here are the students' answers.

From Figure 5, student A could understand the rotation problem and re-explain the information that is known and asked on the question properly and completely. Student A managed to rotate geometric shapes by 90° and 180° either counterclockwise or clockwise. The picture made by student A is also correct. It demonstrates that student A could understand the problem and manage data. Student A also made conjectures for (x',y') as the rotation result. Student A could determine all the corner points of the shape before and after rotation. It indicates that student A searched for and guessed patterns.

In determining the general form of (x',y'), after rotating (x,y) by 90° and 180° counterclockwise and clockwise with the center (0,0), student A connected each corner point with the center (0,0) and compared it with the imaged point. It illustrates that student A could generalize appropriately in the stage of making general forms. Student A has also enhanced generalizations by examining the general forms made.



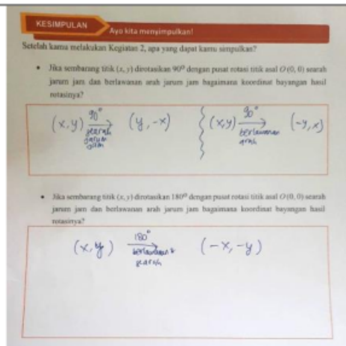
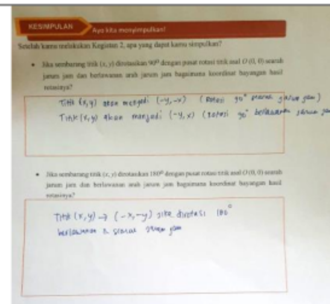
	

Figure 5. Student Answer A	Figure 6. Student Answer B

From Figure 5, student A could understand the rotation problem and re-explain the information that is known and asked on the question properly and completely. Student A managed to rotate geometric shapes by 90° and 180° either counterclockwise or clockwise. The picture made by student A is also correct. It demonstrates that student A could understand the problem and manage data. Student A also made conjectures for (x',y') as the rotation result. Student A could determine all the corner points of the shape before and after rotation. It indicates that student A searched for and guessed patterns.

In determining the general form of (x',y'), after rotating (x,y) by 90° and 180° counterclockwise and clockwise with the center (0,0), student A connected each corner point with the center (0,0) and compared it with the imaged point. It illustrates that student A could generalize appropriately in the stage of making general forms. Student A has also enhanced generalizations by examining the general forms made.

From Figure 6, student B comprehended several rotation problems, re-explained the information that is known and asked from the question well. Student B made a mistake while rotating the geometric figure by 90° counterclockwise and clockwise. The picture made by student B is incorrect. However, student B could rotate the geometric figure by 180° counterclockwise and clockwise. It shows that student B has not fully understood the problem and managed data. However, student B made conjectures for (x', y') as the rotation result. Student B could determine all corner points of the figure before and after rotation. It demonstrates that student B searched for and guessed patterns. In determining the general form of $(x',)$, after rotating $(x,)$ by 90° counterclockwise and clockwise with the center (0,0), student B could not connect every corner point with the center (0,0) and compare it with the image result point. However, student B managed to determine the general form of (x',y') after rotating (x,y) by 180° counterclockwise and clockwise with the center (0,0). It illustrates that in the stage of making a general form, student B can generalize some problems correctly.

Based on problems 1 and 2, from the analysis of students' answers, it can be concluded that both students have different answer models influenced by their respective strategies and mindsets. As in problems 1 and 2, students have consistently studied the designed HLT. Although student B's was incorrect, since it does not provide complete evidence in his answer, the teacher had to play a role and be more attentive to guiding the student. The teacher must help students to correct errors to understand the correct concepts, procedures, and results. However, from both answers, the two students did not check the general shape by entering another corner point on the shape before it was rotated to match the corner point on the rotated shape. It shows that both students have not generalized and enhanced generalizations.

Among the 15 students who solved the problem, here is a picture of the best answer that fits the concept and procedure of problem 2.

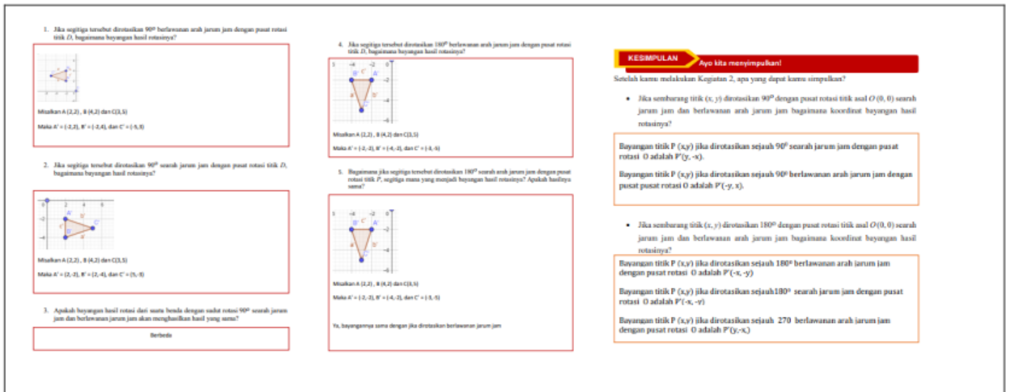


Figure 7. Students' Correct Answers to Problem 2

In problem 2, there were no significant errors in student answers. The use of Palembang songket pattern to explore students' inductive reasoning on the rotation material in problem 2 can be said to be helpful because it helps students solve the problems given. The reasoning process occurs when students apply the concept of rotation to find the coordinates of a songket pattern.

The series of activities that have been carried out have shown the characteristics of PMRI proposed by Putri & Zulkardi (2018): The characteristics of RME are the basic foundation in the learning process on each problem. (a) The use of context for phenomenological exploration is the first characteristic where learning activities begin by introducing contextual problems faced by students in everyday life as experience-based activities; (b) The use of models for the construction of mathematical concepts. The use of the context of the Palembang songket pattern is an off-referential rotation model. Furthermore, the three characteristics of PMRI are (c) Utilization of student work and contributions. This characteristic can be seen in the rotational learning process of the questions given. The teacher appreciates the contribution of students in the learning process, both in groups and individually. Learning becomes meaningful because of variations in students' answers and strategies in solving problems; (d) Student activities and interactivity in the learning process.

The interaction between students and teachers occurs in every learning activity. Students in this experimental learning are very cooperative so that the learning process goes well; e) Linking concepts, aspects, and mathematical units (connectivity). Rotational design learning cannot be carried out unless it is associated with other materials such as the concepts of addition, subtraction, and rotation which are prerequisites for this learning.

Retrospective Analysis

In the first and second problems, it appears that students have studied consistently with the designed HLT. It can be seen from the fact that students can find several strategies to solve problems 1 and 2. It shows that students have correctly understood the concept of rotation in the context of the Palembang songket pattern. The results of the learning experiment showed that the learning process using the actual learning trajectory was following the designed HLT.

CONCLUSION

The use of Palembang songket pattern in solving rotation problems with the RME approach helps students' inductive reasoning. Through designed activities, students understand using their informal intuition to solve problems formally in a more mathematical way. This is because the teacher starts learning by introducing the context taken from the students' daily lives and using context in learning to meet the principles of realistic mathematics. Thus, it can be concluded that using the Palembang songket pattern as a starting point for rotational learning helps students explore their inductive reasoning in solving mathematical problems.

ACKNOWLEDGMENT

The researcher expresses gratitude to students of SMP Negeri 1 Palembang who have been the subjects in this study and Mrs. Nurjannah, M.Pd who have been willing to correct and design together the questions and activities on the HLT that have been made.

DAFTAR PUSTAKA

Arifin. (2017). Penerapan model penemuan terbimbing pada lesson study pembelajaran materi transformasi berbantuan geogebra. APOTEMA: Jurnal Program Studi Pendidikan Matematika, 3(2).

Edwards, LD. (1997). "Explore Ring the Terrority before Proof: Students' Generalization in a computer Microworld for Transformation Geometry". International Journal of Computers for Mathematical Learning, 1:187-215.

Febrian & Perdana. (2017). Memfasilitasi Penalaran Geometri Transformasi Siswa Melalui Eksplorasi Motif Melayu dengan Bantuan Grid. JURNAL GANTANG Vol. II, No. 2, September 2017 p-ISSN. 2503-0671, e-ISSN. 2548-5547

Febriani, C., & Rosyidi, M. (2013). Identifikasi Penalaran Induktif Siswa Dalam Memecahkan Masalah Matematika. Jurnal Mathedenusa, 2(1).

Gravemeijer dan Cobb (2006).” *Design Research from a Learning Perpective*, dalam *Educational Design Research*. New York : Routledge

Ina V.S. Mullis, M. O. (2015). TIMSS 2015 International Results in Mathematics. TIMSS & PIRLS International Study Center, Lynch School of Education, Boston.

Morris, T. & Paulsen, R. (2011). "Using Tracing Paper to Teach Transformation Geometry". Amesa Vol. 2. Johannensberg: Amesa.

Naidoo, J. (2010). Strategies Used by Grade 12 Mathematics Learners in Transformation Geometry. Natal: University of Kwazulu.

Nasution, M.F, Putri, R.I.I, & Zulkardi. (2018). Rowing sport in learning fractions of the fourth grade students. Journal on Mathematics Education, 9(1), 69-80. https://doi.org/10.22342/jme.9.1.4270.69-80

Putri, R.I.I., Dolk, M., & Zulkardi. (2015). Professional development of PMRI teachers for introducing social norms. Journal on Mathematics Education, 6(1), 11-19. https://doi.org/10.22342/jme.6.1.1900.11-19.

Putri, R.I.I. & Zulkardi. (2018). Learning fraction through the context of Asian Games 2018. Journal of Physics: Conference Series, 1088(1), 1-8. https://doi.org/10.1088/1742-6596/1088/1/012023.

Panorkou et al,. (2015). Developing Elementary Students' Reasoning of Geometric Transformations through Dynamic Animation. Montclair State University, Montclair, USA, North Carolina State University, Raleigh, USA

Pemerintah Indonesia, Kementerian Pendidikan dan Kebudayaan, Dapodik PAUD DIKDAS DIKMEN, April 2020

Pjanić, K. (2014). The Origins and Products of Japanese Lesson Study. *Teaching Innovations*, 27(3), 83-93

Sarah Bansilal, Angela James and Magiembal Naidoo. (2014). Whose voice matters? LEARNERS. South African Journal of Education, Vol.30, 2010

Schultz, K, dkk. (1983). "Directional effect in transformation tasks". Journal Reseacrh in Mathematics Education, Vol 14 No. 2. National Council of Teachers of Mathematics. hal. 95-101.

Sembiring, R., Hoogland, K., & Dolk, M. (Eds.). (2010). A decade of PMRI in Indonesia. Bandung, Utrecht: APS International.

Soegeng Toekio. Mengenal Ragam Hias Indonesia. Surakarta: Proyek pengembangan IKI Sub Proyek Aski Surakarta, 1983/1984.

Thaqi, X. dan Gimenez, J. (2012). "Prospective Teacher's Understanding of Geometric Transformation". 12th International Congress on Mathematical Education. Seoul:TSG10.

Van den Heuvel-Panhuizen, M. (2003). The didactical use of models in realistics mathematics education: an example from a longitudinal trajectory on percentage. Educational Studies in Mathematics, 54, 9-35. https://doi.org/10.1023/B:EDUC.0000005212.03219.dc.

Zulkardi. (2002). Developing A Learning Environment on Realistic Mathematics Education for Indonesian Student Teachers. Doctoral Thesis of Twente University. Enschede: Twente University.

Zulkardi & Ilma, R. (2006). Mendesain Sendiri Soal Kontekstual Matematika Prosiding KNM13. Semarang : Indonesia.

Zainab. Zulkardi, & Yusuf. (2013). Desain Pembelajaran Materi Pola Bilangan Dengan Pendekatan PMRI Menggunakan Kerajinan Tradisional Kain Tajung Palembang Untuk Kelas IX SMP. Jurnal Edukasi Matematika (EDUMAT), Vol.4, No.7, Juni 2013, hlmn. 467 – 478.

Zaini, A., & Marsigit. (2014). Perbandingan keefektifan pembelajaran matematika dengan pendekatan matematika realistik dan konvensional ditinjau dari kemampuan penalaran dan komunikasi matematik siswa. Jurnal Riset Pendidikan Matematika, 1 (2), 152-163.

Zubaidah, S. (2019). Keterampilan Abad 21: Keterampilan Yang Diajarkan Melalui Pembelajaran. *Disampaikan dalam Seminar Nasional Pendidikan dengan tema Isu-isu Starategi Pembelajaran MIPA Abad 21*.

ARTIKEL JPM ARIKA SARI DES 2021.

ORIGINALITY REPORT

11%	10%	3%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ejournal.unsri.ac.id Internet Source	5%
2	Submitted to University of Muhammadiyah Malang Student Paper	2%
3	Submitted to Universitas Islam Bandung Student Paper	1%
4	garuda.kemdikbud.go.id Internet Source	1%
5	repository.unj.ac.id Internet Source	1%
6	Aji Permana Putra. "PENINGKATAN PRESTASI BELAJAR MATEMATIKA SISWA DENGAN MODEL PEMBELAJARAN KOOPERATIF TIPE TEAM INVESTIGATION SMP NEGERI 2 CEPER KLATEN", Intersections, 2020 Publication	1%
7	123dok.com Internet Source	<1%

8	Submitted to Sriwijaya University Student Paper	<1 %
9	www.scilit.net Internet Source	<1 %

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		