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Development of learning video rotation using Palembang *tanjak* context to determine students' mathematical reasoning

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Abstract

This research is essential as a starting point in using learning videos on rotation material assisted by the Palembang *tanjak* context so that students' mathematical reasoning abilities are good. This research aims to produce a learning video on rotation material using the Palembang *tanjak* context that is valid and practical, as well as to determine the potential effect of using videos on rotation material using the Palembang *tanjak* context on students' mathematical reasoning ability. PMRI and collaborative learning approaches were also used in this research. This type of research is a design research type of development studies. The subjects of this study involved 28 students of class IX.A. Data collection techniques were observation, tests, and interviews. The data analysis technique is descriptive. This research resulted in a learning video on rotation material using the context of Palembang *tanjak*, which was developed to be valid and practical and potentially affected students' mathematical reasoning ability with an average of 67.625. Learning videos on rotation material can be used to train students' mathematical reasoning skills within the Palembang *Tanjak* context.

Keywords: learning video; mathematical reasoning; palembang *tanjak*; rotation

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Introduction

Rotation material is important because it is related to everyday life such as a circular motorcycle wheel that rotates with the center point so that it can cover the distance quickly (Feriyanto & Oktaviana, 2020). Rotation is also part of geometry transformation, for example, the rotation movement of a wheel (Subchan et al., 2018). Visualizing transformed objects in geometry transformation material is very important to help students solve problems (Hidayati & Sugeng, 2021). Geometry transformation is important because it can hone students' mathematical abilities (Maulani & Zanthy, 2020). It is clear from the previous statement that rotation content is crucial for pupils.

However, in reality, students still experience some difficulties in learning geometry transformation material (Haqq et al., 2019). In addition, students do not have a clear visual picture of the transformation process (Taihuttu et al., 2021). Another opinion was expressed by Maulani and Zanthy (2020) that many students still make mistakes in applying procedures to solve problems related to geometric transformations.

Factors that cause students' difficulties in learning geometry transformation material, especially rotation, are teacher-centered learning without paying attention to students' abstract needs so that students cannot think abstractly (Ma'rifah & Qohar, 2020). In addition, there is a lack of enthusiasm for learning and the utilization of technological media in the learning process (Pasumbung & Pratama, 2022). The limited variety of media and technology use are also factors that cause students difficulties in understanding geometric transformation material (Bilqis, 2021). Other than that, Ananggih et al (2017) also stated the same thing, that learning methods by memorizing make learning meaningless and ineffective. Another factor is directly using practical formulas, the absence of a link between geometry transformation material and everyday life, and in learning rotation material students have not used a particular mathematical context (Sari & Putri, 2022). Thus, students need to have important abilities to learn rotation material.

Mathematical reasoning ability is one of the key skills associated with geometry transformation material (Evidiasari et al., 2019). In addition, Nur'Azizah and Zulkardi (2021) also stated that mathematical reasoning ability is a person's ability to draw a logical conclusion based on known statements or premises. Reasoning is an important ability to understand and work on problems, both mathematical and real-life problems (Jurnaidi & Zulkardi, 2014). Pupils with strong mathematical reasoning skills will have no trouble comprehending issues and making connections between the ideas they contain (Konita et al., 2019).

However, in reality, students' mathematical reasoning skills are still relatively low, one of which is that students make mistakes when facing real problems (Sukmawarti et al., 2022). Another thing Sofyana and Kusuma (2018) stated is that students still have difficulty reviewing or analyzing questions. In addition, Ningrum et al. (2021) stated that students' mathematical reasoning ability is still low with a reasoning domain of 3%, as seen from the End of Semester Assessment (PAS) 1 at MAN Se-Bekasi for class XII students. Based on the results of observations and interviews conducted by Izzah and Azizah (2019) at one of the Tambakrejo 01 Semarang State Elementary Schools, it was stated that students' reasoning skills in solving math problems were still relatively low. It is clear from the above description that pupils' abilities in mathematical reasoning are still comparatively low.

This is caused by several factors, namely the inactivity of students in the learning process, working on problems by the procedures taught by the teacher, and learning media that make students memorize more than understand (Nuralam & Maulidayani, 2020). In addition, learning does not support students in reasoning to connect real contexts with material in mathematics (Farida et al., 2021). Therefore, a more meaningful learning approach is needed to overcome these problems, for example, by contextually managing learning activities (Novrika et al., 2016).

One learning approach that emphasizes meaningful learning on geometric transformation material is the PMRI approach (Surgandini et al., 2019). This is because there is a relationship between mathematical concepts and real life so it serves as a source of learning and application of a concept obtained (Isamer, 2022). In PMRI there is one characteristic, namely using contextual problems related to situations that students have experienced (Meitrilova & Putri, 2020).PMRI approach can be developed in accordance with local cultural conditions and contexts that occur in Indonesia (Sembiring et. al., 2010). This research uses the context of Palembang *tanjak* as a starting point and innovation in mathematics learning on rotation material. The selection of this context is because *Tanjak* Palembang is one of the Malay cultures of South Sumatra in the form of a cover or headband that represents the struggle, resistance, and strength of Sriwijaya Malay (Rachmawati, 2021). Therefore, Palembang *tanjak* can be used as a context in learning rotation.

The PMRI approach can be developed according to local cultural conditions and contexts in Indonesia (Sembiring et al., 2010). According to Wulandari and Puspadewi (2016), there is a link between mathematics and culture, namely mathematics becomes part of culture so that it is applied and used to analyze something innovative. This research uses the context of Palembang *tanjak* as a starting point and innovation in mathematics learning on rotation material. This context is selected because it is close to students and can be encountered by students in everyday life. *Tanjak* Palembang is one of the Malay cultures of South Sumatra in the form of a cover or headband that represents the struggle, resistance, and strength of Sriwijaya Malay (Tarigan, 2009; Rachmawati, 2021). Palembang *tanjak* consists of three types, namely *tanjak* kepudang, *tanjak* meler, and *tanjak* bela mumbang (Ditwdb, 2019). Therefore, Palembang *tanjak* can be used as a context in rotational learning.

The development of the 21st century is characterized by many changes, especially in the field of education, where students do not only rely on knowledge, but skills also play a role (Mardhiyah, 2021). One of the important abilities that students must have in the development of the 21st century is collaboration, which requires students to help groupmates who are having difficulty doing their assignments; each student must also carry out individual responsibilities in their group (Maulidah, 2021). Collaborative learning activities can be utilized to apply this.

In addition to the PMRI approach and collaborative learning, learning media is also needed to help students learn rotation material. Learning media that appear in technological developments, one of which is a learning video can increase student learning motivation (Fita, 2022). Another opinion suggests that learning videos contain several things such as images, sounds, and several animations as illustrations (Salahudin & Yamin, 2021). In addition, Maryansumayeka (2018) states that learning videos featuring audio and visuals can also facilitate the delivery of material optimally.

There are several previous studies such as related to rotation material (Sari & Putri, 2022; (Nugroho & Munahefi, 2022; Ma'rifah & Qohar, 2020), learning videos (Meryansumayeka, 2018; Yanti, et al., 2019), related to Palembang *tanjak* (Syarifuddin, et al., 2022) and reasoning ability (Nur'Azizah & Zulkardi, 2022). However, in previous studies there has been no combined research between learning videos, rotation material, reasoning skills and the use of the Palembang *tanjak* context. This is considered important to be researched considering that learning videos need to be developed using the context of local culture, one of which is Palembang *Tanjak*.

In light of the foregoing explanation, the researcher wishes to carry out research on "Development of rotation learning videos using the Palembang *tanjak* context to determine students' mathematical reasoning". This research also uses the PMRI approach and collaborative learning which aims to produce a learning video on rotation material using the context of Palembang *tanjak* that is valid and practical, as well as knowing the potential effects in the use of videos on rotation material using the context of Palembang *tanjak* on students' mathematical reasoning skills.

Methods

This study aims to produce a learning video on rotation material using the context of Palembang *tanjak* that is valid and practical, and to determine the potential effect of using videos on rotation material using the context of Palembang *tanjak* on students' mathematical reasoning skills. PMRI and collaborative learning approaches were also used in this research. This kind of research is a development studies design research type. The subjects of this study involved 28 students of class IX.A at Srijaya Negara Junior High School Palembang. The instruments in this study have been validated with three lecturers and one mathematics teacher who teaches at Srijaya Negara Junior High School Palembang. Small-group and one-on-one experiments have also been carried out by researchers. This study used mathematical reasoning ability which consists of three indicators. The following is a table of indicators and descriptors of mathematical reasoning ability which can be seen in Table 1 below.

Table 1. Indicators and descriptors of students' mathematical reasoning ability

Indicator	Descriptor
Make a conjecture	Students are able to express the information obtained from the given problem
Mathematical manipulation	Students are able to solve problems by translating problems in sentence form into mathematical form
Draw a conclusion	Students are able to make conclusions that are in accordance with the problem and can be accepted by reasoning

Table 1 shows three indicators of mathematical reasoning ability used in the study, namely make a conjecture, mathematical manipulation and draw a conclusion. The procedure used in this research consists of two stages, namely the preliminary stage and the formative evaluation stage (Bakker, 2018). In the preliminary stage, there are three stages: preparation, analysis and design. The formative evaluation stage consists of self-evaluation, expert review, one to one, small group and field test (Zulkardi, 2002).

In order to collect data for this study, tests, interviews, and observation were used. Direct observation of student activities and video recordings were used to record observations made throughout the rotation material learning process. Two description questions were included in the test questions at the most recent meeting in order to ascertain the emergence of indicators of reasoning ability. Three students were interviewed in order to verify the responses to the exam questions.

Data analysis, specifically observation, interview, and test data analysis, was done in a descriptive manner. By summarizing the activities that students engaged in during the learning process, observation data analysis was performed. Making a transcript of the interview responses allowed for the analysis of the interview data. Examining the responses provided by students and assigning scores per evaluation predetermined by the guidelines comprised the analysis of test data. The following is a table of scoring guidelines which can be seen in Table 2 below.

Table 2. Student's mathematical reasoning ability scoring rubric

Score	Scoring Indicator
4	Perfect answer, solution given completely and correctly
3	Correct answer, but the solution has one significant error
2	Almost correct answer, but the solution contains more than one significant error/deficiency.
1	Incorrect answer, the solution is not fully resolved but contains at least one correct argument.
0	Incorrect answer, completion does not contain any response.

Table 2 outlines the scoring methodology for student responses. A student receives a score of 4 for a complete and accurate response, while a score of 0 is assigned for no response at all. Following the application of the scoring table, the score will be translated into a numerical value and utilized to ascertain the category of students' mathematical reasoning proficiency, as indicated in Table 3 below.

Table 3. Categories of qualitative scores for mathematical reasoning ability

Score	Category
81 – 100	Very Good
61 – 80	Good
41 – 60	Enough
21 – 40	Less
0 – 20	Very Less

Table 3 shows the categories of reasoning ability scores with each range, namely very good, good, quite less, and very less. Then find the average value using the group data average formula. The mean value shall be reverted to Table 3 in order to classify pupils' proficiency in mathematical reasoning.

Results

This research produces a learning video on rotation using the context of Palembang *tanjak* that is valid and practical and has a potential effect in using learning videos on students' mathematical reasoning ability. There are two stages in this research, namely preliminary and formative evaluation stages.

Preliminary stage

The preliminary stage consists of three stages, namely the preparation stage, analysis stage and design stage.

1. Preparation stage

In the preparation stage, researchers prepared drafts of research instruments and learning devices consisting of learning videos containing sharing task and jumping task problems, test questions along with grids and scoring rubrics, observation sheets, and lesson plans. Contacting the school and teacher of the research site. Observing the school, namely Srijaya Negara Junior High School Palembang. Taking care of research permits and other needs.

2. Analysis stage

There are five components that researchers analyzed in this study, namely students analysis, curriculum, content, media, and context. Student analysis aims to determine the characteristics of students who will be involved in the study and obtained students in class IX.A with heterogeneous abilities. Curriculum analysis aims to find out the curriculum used, namely the 2013 curriculum. Content analysis is rotation material because it is important material and related to real life and is found in class IX. Based on the results of interviews with mathematics teachers, suggest that students' ability to learn rotation material on geometric transformations would be better done in class IX.A. In addition, the initial reasoning ability of students in class IX.A is heterogeneous, and tends to be low. Media analysis is the media used in schools only using power point, so a learning video is needed. Context analysis is the context used in this research is the context of Palembang *tanjak*, the problems taken are through the motifs and shapes of each Palembang *tanjak*.

3. Design stage

In the design stage, researchers create an initial learning video design, called a prototype, which focuses on content, constructs and language. The following is a link to the initial prototype of the learning video on rotation material: https://bit.ly/470Nsih

Formative evaluation stage

There are five steps in the formative evaluation stage: the self-evaluation, expert review, one-on-one, small-group, and field test.

1. Self-evaluation

The researcher evaluates the product that has been designed at the self-evaluation stage. The revision results concluded that there were several improvements to the learning video, including: (1) there was a change in the background because it was less attractive, (2) adding the Sriwijaya University logo to all video displays, (3) adding video duration, (4) improving the question sentence, (5) improving the sentence size, (6) improving the location of the sentence writing. The results of the revision at this stage are called prototype 1. The following is a link to the prototype 1 learning video on rotation material revised from the self-evaluation stage: https://bit.ly/3u5xBAt

2. Expert review

The expert review stage is the stage where the product in the form of a learning video is validated to experts. There were four validators in this study. The first validator, the mathematics teacher, provided several comments and suggestions, namely: (1) adding the researcher's original voice to the learning video, (2) adding an explanation of the context in the learning video, (3) clarifying the images on the questions, (4) adding video duration. The second validator provided comments and suggestions related to the learning video, namely (1) adding duration to the learning video, (2) adding the researcher's voice, and (3) adding an explanation of the context for PMRI stages before the problem part of the question. The third validator, provided several comments and suggestions, namely (1) improve the writing of prepositional sentences in questions and videos, (2) the video is too fast, (3) add the researcher's voice. The fourth validator provided comments and suggestions, namely (1) the learning video would be better if a voice is added, (2) add a video related to the context as an introduction, (3) the video speed is adjusted, (4) improve the question sentence. From the results of the comments and suggestions of the four validators, it can be concluded that the learning video is suitable for use with revisions according to the suggestions.

3. One-to-One

Three grade IX students participated in a one-on-one trial of the revised prototype 1 to learn about their challenges. After watching a learning video with problems, the three students made a number of remarks and recommendations, such as: (1) the video was interesting, but it went by too quickly, and (2) the text in the video could have been larger. A valid prototype 2 was produced in terms of content, construct, and language after the learning video underwent revisions following validation at the expert review and one-on-one stages. The following is a link to the prototype 2 learning video on rotation material: https://bit.ly/3FOgR33

4. Small group

At the small group stage, the revised prototype 2 was tested on a small group of six students in class IX who were divided into two groups with each group consisting of three students based on teacher recommendations. The results of students' comments and suggestions included: (1) there is still a display in the learning video section that is too fast, (2) the sound can be enlarged (3) there is no question writing on the questions (4) there are still confused sentences in the questions. After validation at the small group stage, the learning video was revised to produce a valid and practical prototype 3. The following is a link to the prototype 3 learning video on rotation material: https://bit.ly/3MwCEA1

5. Field test

There were two meetings during the field test phase. In the first, students were split up into nine groups, each with three to four members. Next, using the Palembang *Tanjak* context that the teacher had displayed, the students were instructed to focus on the rotation material learning video and work in groups to solve the sharing and jumping tasks that were included in it. Students were instructed to work individually on two questions from the test of mathematical reasoning ability during the second meeting.

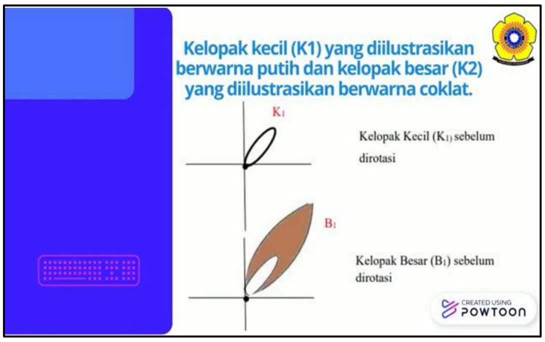
Sharing Task

The sharing task contained in this learning video uses the context of Palembang *tanjak* which aims to introduce students that learning mathematics is very much related to real life. In the sharing task problem, the questions presented are in the form of tiered questions that can help students use their understanding of rotation material, such as writing the information contained in the problem, making mathematical models and writing the conclusions obtained. The following is a sharing task problem that can be seen in Figure 1 below.

Translation

Note the illustration of one of Palembang's tanjak with the following jasmine flower motif:

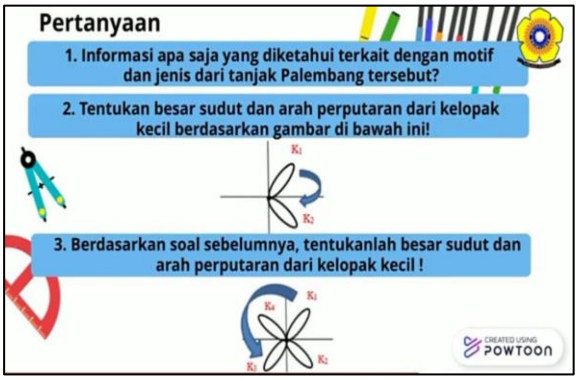
(a)



Translation

The small petals (k1) are illustrated in white and the large petals (b2) are illustrated in brown.

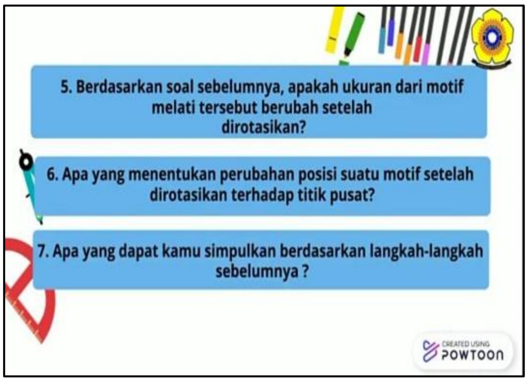
(b)



Translation

1. What information do you know about the motifs and types of Palembang tanjak?
2. Determine the angle and direction of rotation of the small petals based on the picture below!
3. Based on the previous question, determine the angle and direction of rotation of the small petal!

(c)



Translation

Assess each major petal based on the information below!

(d)

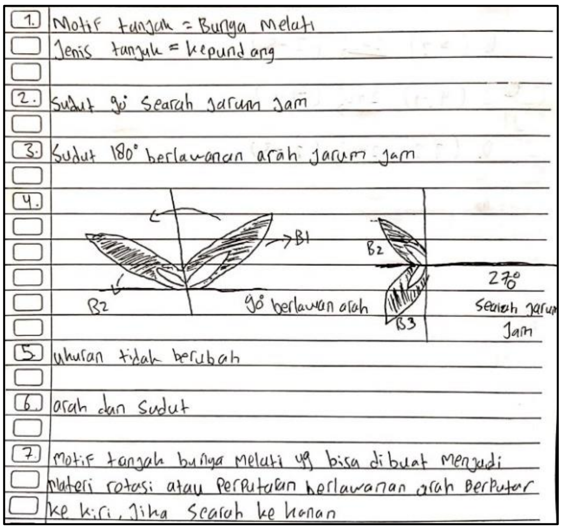
Translation

5. Based on the previous problem, does the size of the jasmine motif change after rotating?
6. What determines the change in position of a motif after it is rotated about the center point?
7. What can you conclude based on the previous steps?

(e)

Figure 1. (a);(b);(c);(d);(e) Sharing task problem with rotation content

Figure 1 shows the sharing task problems with Palembang *tanjak* rotation content and context from the first to the seventh point. The first point students are asked to write down any information related to the type and motif of Palembang *tanjak*. In the second and third points, students are asked to determine the angle and direction of rotation of the small petals. In the fourth point, students were asked to sketch each of the large petals. The fifth point contains a question about whether the size of the motif changes after being rotated. The sixth point is about determining the position of a motif after being rotated. Lastly, students are asked to record their conclusions in writing in the seventh point. One of the student groups' responses is as follows, and it is shown in Figure 2 below.

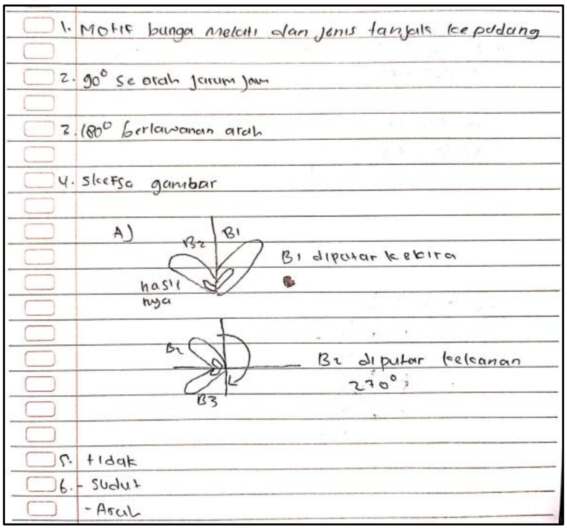


Translation

1. Motif: Jasmine Flower
   Tanjak Type: Kepudang
2. 90° clockwise angle
3. 180° counterclockwise angle
4.
5. Size does not change
6. Direction of the angle
7. Jasmine flower tanjak motif that can be made into rotation material, or rotation in the opposite direction rotates to the left, if in the right direction

Figure 2. Group 8's sharing task answer

Figure 2 shows the results obtained by group 8 from the first to the seventh points. It can be seen that the answer is correct and has raised the three indicators of mathematical reasoning ability. The indicator of making a conjectures, group 4 can write down the known information and get a score of 4. The indicator of mathematical manipulation, can sketch the petals and write the answer results get a score of 4, and the indicator of drawing conclusions, namely writing the conclusions obtained based on the previous steps and getting a score of 4, so that group 4 obtained a total score of 12. This is the same as the answer obtained by group 6, except that the sentence of each point and the use of the model are slightly different. This can be seen in Figure 3 below.



Translation

1. Jasmine flower motif and tanjak kepudang type
2. 90° clockwise angle
3. 180° counterclockwise angle
4. Sketch drawing
5. No
6. Angle, direction

Figure 3. Group 6's sharing task answer

Figure 3 shows the results of the sharing task problem obtained by group 6. It can be seen that group 6 has also raised three indicators of mathematical reasoning ability, namely make a conjecture when writing motifs and types of *tanjak*, mathematical manipulation when sketching petals and drawing conclusions with each indicator getting a score of 4, so that the total score is 12.

Jumping Task

The jumping task contained in this learning video uses the context of Palembang *tanjak*. In the jumping task problem, the question presented is one question that can help students use their reasoning on rotation material. The following is an image of the jumping task problem which can be seen in Figure 4 below.

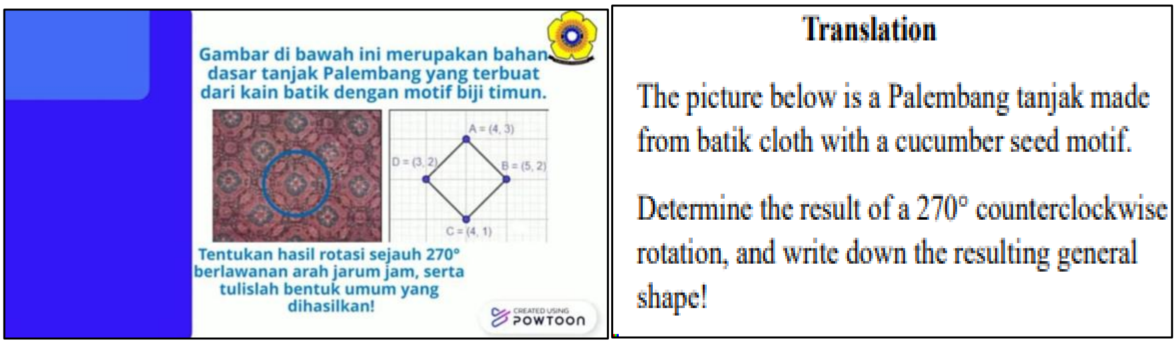
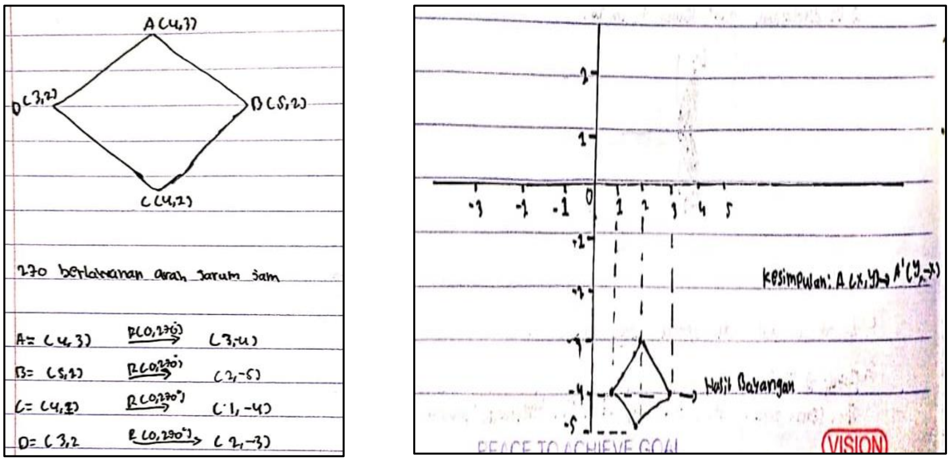


Figure 4. Jumping Task problem with rotation content

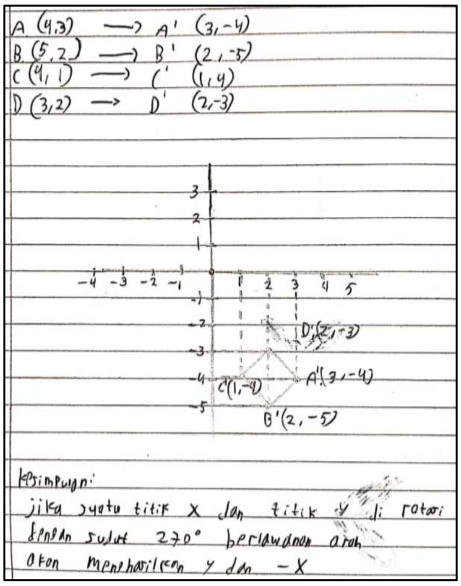
Figure 4 shows the jumping task problem with rotation content and the context of Palembang *tanjak* which consists of one question, namely determining 270° counterclockwise, as well as the resulting general form. Of the 9 groups, there were 3 groups that answered the jumping task correctly, namely groups 1, 2 and 7. The following is the jumping task answer of group 1 which can be seen in Figure 5 below.



(a) (b)

Figure 5. (a); (b) Jumping task answer Group 1

As seen in Figure 5, group 1's results have improved on all three measures of mathematical reasoning proficiency. Group 1 is able to record the known information from each coordinate in the first indicator, which is to make a conjecture. Indicators of mathematical manipulation, can make shadow results and sketch images, and indicators draw conclusions, namely writing the general form obtained related to rotation. So that group 1 obtained a total score of 12, with each indicator getting 4 points. This is the same as the answers obtained by group 2, except that the writing of sentences and the use of models are slightly different. The following is the answer of group 2 which can be seen in Figure 6 below.



Translation

Conclusion:

If a point x and a point y are rotated by an 270° in opposite directions will result in y, -x

Figure 6. Jumping task answer Group 2

Figure 6 shows the results obtained by group 2 on the jumping task problem. From the answer, it can be seen that group 2 has fulfilled all three indicators of mathematical reasoning ability, namely make a conjecture, mathematical manipulation and drawing conclusions with a total score of 12.

Test question number 1

Test question number 1 asks students to sketch the results of counterclockwise and clockwise rotations. In addition, question number 1 also asks students to determine what relationship results from the two sketches. The following is test question number 1 which can be seen in Figure 7 below.

Soal Tes Nomor 1

Perhatikan gambar bangunan beronamen tanjak Palembang di bawah ini!

Gambar 1. Ornamen Tanjak pada Bangunan Griya Agung di Palembang
Sumber : https://img.inews.co.id/media/822/files/inews_new/2021/05/18/tanjak.jpeg

Gambar tersebut merupakan bentuk dari Peraturan Daerah No. 2 tahun 2021 mengenai arsitektur bangunan gedung beronamen jati diri budaya di Sumatera Selatan. Salah satunya yaitu ornamen tanjak pada bangunan Griya Agung di Palembang. Perhatikan lingkaran yang berwarna biru! Jika diilustrasikan, Motif tersebut berbentuk segitiga.

Buatlah sketsa segitiga diatas jika dirotasikan sejauh 90° berlawanan arah jarum jam dan 270° searah jarum jam! Apa hubungan antara kedua hasil sketsa tersebut?

Translation

Test Question Number 1

Take a look at the picture below of a building with Palembang tanjak ornaments!

The picture is a form of Regional Regulation No. 2 of 2021 regarding the architecture of buildings with cultural identity ornaments in South Sumatra. One of them is the tanjak ornament on the Griya Agung building in Palembang. Look at the blue circle! If illustrated, the motif is triangular. Sketch the triangle above if it is rotated 90° counterclockwise and 270° clockwise! What is the relationship between the two sketches?

Figure 7. Student mathematical reasoning ability test question number 1

Test question number one using rotation content and Palembang *Tanjak* context is shown in Figure 7. Three representative students—high, medium, and low ability, respectively—were chosen based on the examination of the test takers' responses. The answers provided by TB students to test question number one are displayed in Figure 8 and are as follows.

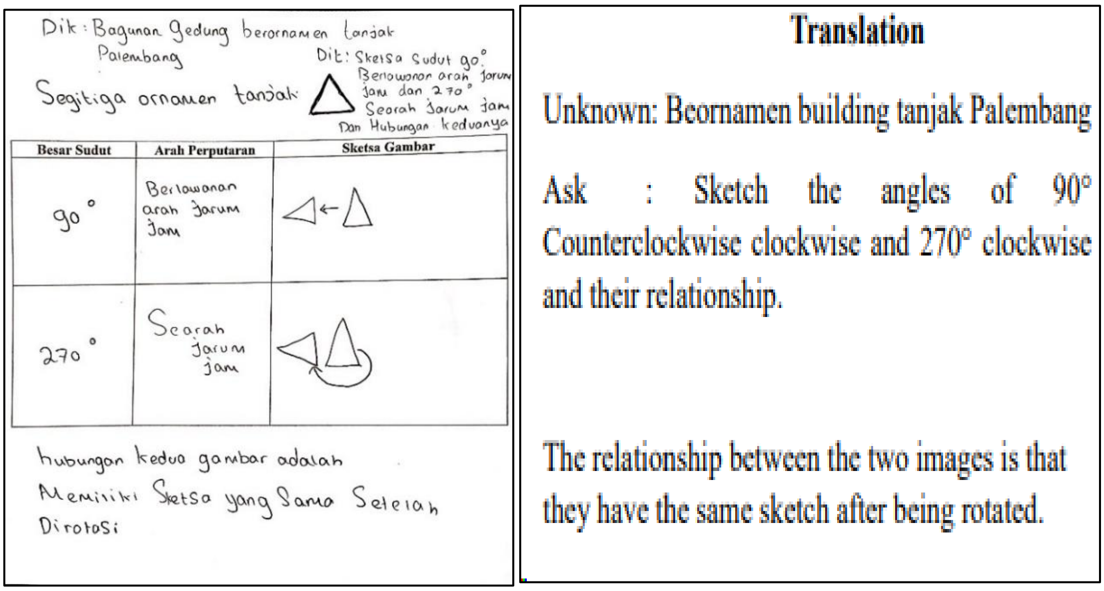


Figure 8. Results of test answer number 1 student TB

Figure 8 shows that TB students have met all indicators of mathematical reasoning ability and are included in the category of students with high ability, namely meeting the indicators of make a conjecture, mathematical manipulation and drawing conclusions so that they get a total score of 12. In addition, there are also the results of answers that have been completed by RA students which can be seen in Figure 9 below.

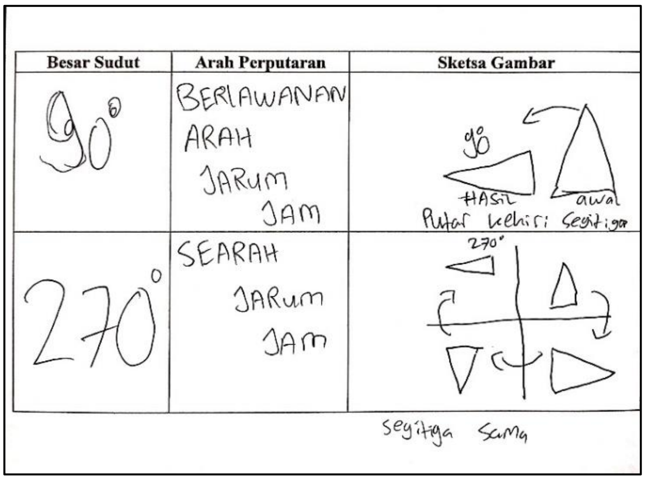
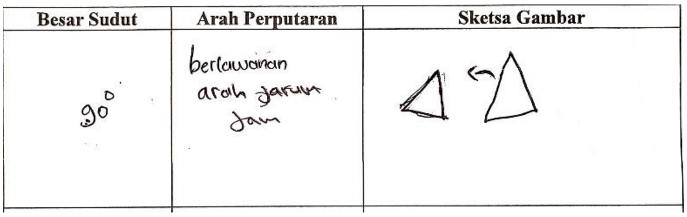


Figure 9. Results of test answer number 1 student RA

Figure 9 shows that RA students have also met the indicators of mathematical reasoning ability, namely make a conjecture, mathematical manipulation and drawing conclusions with a total score of 12 and each indicator gets 4 points. There is also the answer to test number 1 that has been completed by VO students which can be seen in Figure 10 below.



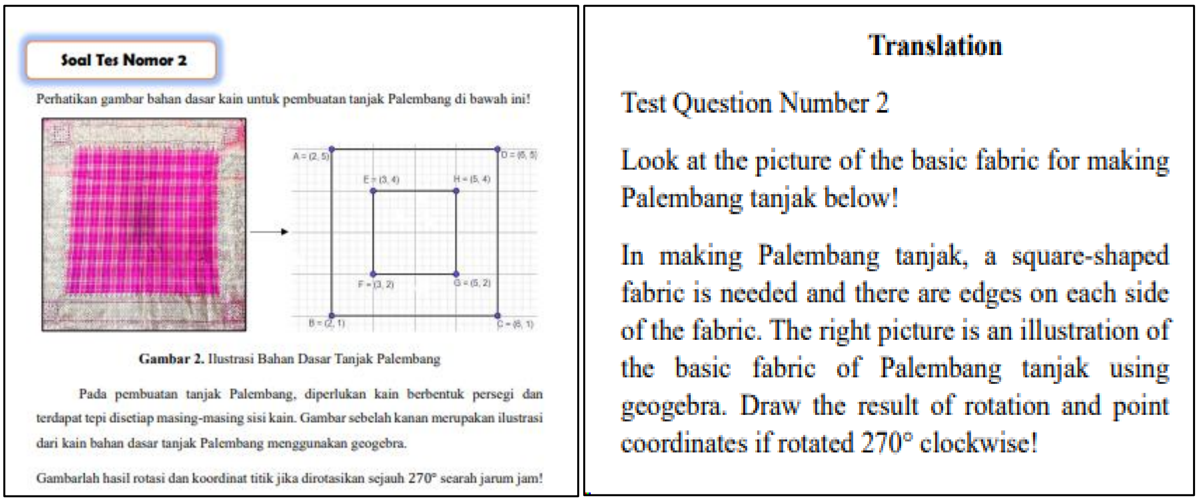
Besar Sudut	Arah Perputaran	Sketsa Gambar
90°	berlawanan arah jarum jam	

Figure 10. Results of test answer number 1 student VO

Figure 10 shows that VO can fulfill two indicators of mathematical reasoning ability. In the first indicator, namely make a conjecture, VO can write down information but is incomplete, so he gets a score of 2. In the second indicator, VO can also solve problems but also incomplete by drawing a sketch, so he gets a score of 3. In the third indicator, namely drawing conclusions, VO did not write down the conclusion of the relationship he obtained and got a score of 0, so VO's total score is 5.

Test question number 2

Test question number 2 asks students to draw the results of rotation and the coordinates of the point if it is rotated 270° clockwise. The following is test question number 2 which can be seen in Figure 11 below.



Soal Tes Nomor 2

Perhatikan gambar bahan dasar kain untuk pembuatan tanjak Palembang di bawah ini!

Gambar 2. Ilustrasi Bahan Dasar Tanjak Palembang

Pada pembuatan tanjak Palembang, diperlukan kain berbentuk persegi dan terdapat tepi disetiap masing-masing sisi kain. Gambar sebelah kanan merupakan ilustrasi dari kain bahan dasar tanjak Palembang menggunakan geogebra.

Gambarlah hasil rotasi dan koordinat titik jika dirotasikan sejauh 270° searah jarum jam!

Translation

Test Question Number 2

Look at the picture of the basic fabric for making Palembang tanjak below!

In making Palembang tanjak, a square-shaped fabric is needed and there are edges on each side of the fabric. The right picture is an illustration of the basic fabric of Palembang tanjak using geogebra. Draw the result of rotation and point coordinates if rotated 270° clockwise!

Figure 11. Student mathematical reasoning ability test question number 2

Test question number two on the subject of rotation and the background of Palembang *Tanjak* is depicted in Figure 11. Three representative students—high, medium, and low ability, respectively—were chosen based on the examination of the test takers' responses. The answers provided by TB students to test question number two are displayed in Figure 12 and are as follows:

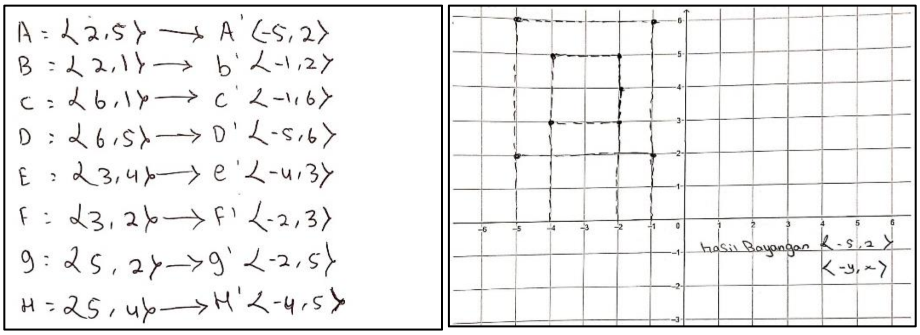


Figure 12. Results of test answer number 2 student TB

Figure 12 shows the results of TB students' answers to test question number 2. Based on the results obtained, TB has fulfilled three indicators of reasoning ability, namely make a conjecture, mathematical manipulation and drawing conclusions so that he gets a total score of 12. In addition, there are also the results of answers that have been completed by RA students for test question number 2 which can be seen in Figure 13 below.

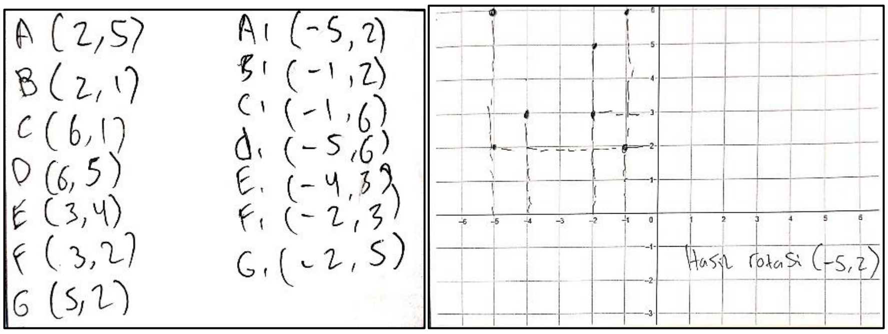


Figure 13. Results of test answer number 2 student RA

Figure 13 shows the results of RA students' answers to test question number 2, it can be seen that RA can fulfill three indicators of mathematical reasoning ability. In the first indicator, namely make a conjecture, RA can write information but is incomplete, so he gets a score of 3. In the second indicator, RA can also solve the problem, but forgets to write the initial coordinates and the shadow results of the H coordinates so that he gets a score of 3. In the third indicator, namely drawing conclusions, RA writes the conclusions he gets but not in general, so he gets a score of 3, so RA gets a total of 9 points. There are also the results of test number 2 answers that have been done by VO students which can be seen in Figure 14 below.

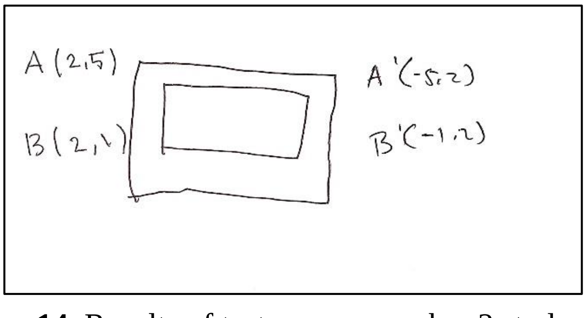


Figure 14. Results of test answer number 2 student VO

Figure 14 shows the results of student VO's answer to test question number 2. Based on the answers VO has written, it can be seen that VO can fulfill two indicators of mathematical reasoning ability. In the first indicator, namely make a conjecture, VO can write down information but only the first two coordinates, so he gets a score of 2. In the second indicator, VO can also solve problems, but does not draw coordinates, so he gets a score of 2. In the third indicator, namely drawing conclusions, VO does not write down the conclusions he gets and gets 0 points, so VO gets a total of 4 points.

After the description of the occurrence of indicators of mathematical reasoning ability of each student, then the analysis and calculation of students' mathematical reasoning ability is carried out. The following is a table of the emergence of indicators of students' mathematical reasoning ability during the test which can be seen in Table 4 below.

Table 4. Occurrence of student mathematical reasoning ability indicators

	Total fulfilment of test results	
Indicator	**Test Number 1**	**Test Number 2**
Conjecture	28	26
Mathematical Manipulation	28	23
Drawing Conclusions	22	18

The percentage of students who meet each mathematical reasoning ability indicator is displayed in Table 4. With 28 students for question number 1 and 26 students for question number 2, the conjecture indicator is the one that shows up the most from the two test questions. Concluding is the indicator that shows up the least in the meantime. Table 5 also shows a range of scores for mathematical reasoning abilities:

Table 5. Qualitative value of students' mathematical reasoning ability

Score	**F_1**	**F_2**	**Ftotal**
81-100	8	7	15
61-80	13	14	27
41-60	4	3	7
21-40	2	3	5
0-20	1	1	2
	28	28	56

Description:

F1 : Number of students who fulfill question number 1

F2 : Number of students who fulfill question number 2

$\mathbf{F_{total} = F_1 + F_2}$

Table 5 shows the number of students who fulfill each score range. In the 80-100 score range there were 8 students on test question number 1 and 7 students on test question number 2. After grouping students into score ranges, the next step is to calculate the average which can be seen in Table 6 below.

Tabel 6. Average mathematical reasoning ability of students

Score	F1	F2	Ftotal	Xi	Ftotal. Xi	On average
81-100	8	7	15	90.5	1357.5	**67.625**
61-80	13	14	27	70.5	1903.5	
41-60	4	3	7	50.5	353.5	
21-40	2	3	5	30.5	152.5	
0-20	1	1	2	10	20	
	28	28	56		3787	

Table 6 shows the average value of students' mathematical reasoning ability from the test questions. based on the table above, the average value of students is obtained with a good category.

Discussion

This research focuses on developing a learning video on rotation material using the context of Palembang *tanjak* that is valid and practical. The characteristics of the learning video developed are using the context of Palembang *tanjak*, rotation content, sharing task and jumping task problems, assisted by the researcher's voice. The learning video developed in this study contains several things such as images, sounds, and several animations as illustrations (Isamer, et al., 2022). The material studied in this study is rotation which is one of the important materials that students must master. This is reinforced by the opinion stating that rotation material is one type of geometric transformation and is important material because it is related to everyday life, such as a circular motorcycle wheel that rotates about the center point (Feriyanto & Oktaviana, 2020). This research uses the context of Palembang's distinctive culture, namely Palembang *tanjak*. This is in line with the opinion of Wulandari and Puspadewi (2016), which states that the PMRI approach can be developed in accordance with local cultural conditions and contexts that occur in Indonesia.

Valid and practical learning video

After being put to the test by three students one-on-one and approved by three math lecturers and math subject teachers, the learning video is deemed valid. After making changes in response to the validator's remarks and recommendations, the expert validation results indicate that the learning video is deemed valid. This is in line with the opinion of Ismawati and Mustika (2021) which states that comments and suggestions on the product to update prepositions that are written separately. Linguists provide comments and suggestions on the product to update prepositions written separately, for example 'into' which should be written separately. In addition, in Ismawati and Mustika's research (2021), it states that one of the comments and suggestions for the product is to add image transitions and use standard fonts that are not too small.

Potential effects of using learning videos

After the learning video was declared valid, the learning video was tested with six students at the small group stage to determine the practicality of the learning video that had been developed. Based on comments and suggestions from the six students, overall students have given positive comments on the learning video developed, it's just that there are still some parts that must be revised. From the students' comments, the researcher revised the learning video, one of which was by reconsidering the sentences used and simplifying the sentences used in the learning video. This is in line with the opinion of Arina, et al., (2021), stating that presenting material with learning videos containing text, and images will be more interesting and can foster learning motivation.

Conjecturing

The first measure of one's capacity for mathematical reasoning is the indicator of conjecture. This indicator appears when students fill in the table with the large angle and rotational direction in number 1 and the initial coordinates of each point in number 2. Alternatively, students can write down the known information in the problem. 28 students satisfy the conjecture indicators in number 1 and 26 students meet the conjecture indicators in number 2, according to the student analysis results.

Mathematical manipulation

The second measure of mathematical reasoning ability is the indicator of mathematical manipulation. This indicator appears when students write the image of the rotation result in number 1 and the coordinates of the shadow and image in number 2. Twenty-eight students meet the indicators of mathematical manipulation in number 1, and 23 students meet the indicators of mathematical manipulation in number 2, according to the student analysis results. This is consistent with the assertion made by Kusumaningtyas et al. (2022) that manipulating things allows one to solve problems more quickly.

Draw a conclusion

The third measure of mathematical reasoning proficiency is drawing a conclusion. This indicator appears when students write the conclusion of the relationship found in problem number 1 and the conclusion of the shadow results in problem number 2. 22 students met the indicators of drawing conclusions in number 1 and 18 students met the indicators of drawing conclusions in number 2, according to the student analysis results. The ability to draw conclusions is the least common of the three reasoning ability indicators. This is a result of the students' inability to record their findings and conclusions in writing. Research by Nur'azizah and Zulkardi (2022) is consistent with these findings; it reveals that many students tend to underline two in the answer section on mathematical manipulation as if indicating that that is the conclusion, rather than writing the conclusion of the problem that has been solved in the indicator of drawing conclusions.

Conclusion

This study's learning video on rotation material uses the Palembang *tanjak* context to assess students' reasoning abilities in class IX.A. It also uses PMRI and collaborative learning. It can be concluded that the results obtained have been in the good category is 67,625 with the most frequently occurring indicator being make a conjectures and have a potential effect on students' mathematical reasoning ability. The characteristics of the learning video that has been developed are that it contains the original voice of the researcher and there are sharing task and jumping task problems.

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Conflicts of Interest

The authors declare no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies, have been completed by the authors.

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Author Contributions

Uswatun Hasanah: Developing learning video, collect and analyze data; **Ratu Ilma Indra Putri:** Advisor and director of the learning video; **Zulkardi:** Advisor and director of the learning video.

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