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Meta The Use of Geometric Transformation Board (TRANSMET) Teaching Aids to Increase Students' Interest in Learning Reflection Material

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ABSTRACT. This study aims to describe the use of the geometry transformation board (TRANSMET) teaching aid to increase students' interest in reflection materials. This research employed a descriptive qualitative approach involving students who participated in geometry transformation learning. The researchers collected data through observation, interviews, and documentation. They analyzed the data using the Miles and Huberman model, which includes data reduction, data display, and conclusion drawing/verification. The findings indicate that the use of the TRANSMET teaching aid increases students' learning interest, as shown by improved activeness, attention, and enthusiasm during the learning process. Furthermore, the teaching aid helps students understand reflection concepts more easily by allowing them to observe the reflection of geometric figures directly. Therefore, the TRANSMET teaching aid is effective as a learning medium for enhancing students' interest in geometry transformation reflection materials.

Keywords: geometry transformation; learning interest; reflection; TRANSMET teaching aid

ABSTRAK. Penelitian ini bertujuan untuk mendeskripsikan penggunaan alat peraga papan transformasi geometri (TRANSMET) dalam meningkatkan minat belajar siswa pada materi refleksi. Penelitian ini menggunakan pendekatan deskriptif kualitatif dengan subjek penelitian siswa yang mengikuti pembelajaran transformasi geometri. Teknik pengumpulan data dilakukan melalui observasi, wawancara, dan dokumentasi. Analisis data menggunakan model Miles dan Huberman yang meliputi reduksi data, penyajian data, serta penarikan kesimpulan dan verifikasi. Hasil penelitian menunjukkan bahwa penggunaan alat peraga TRANSMET mampu meningkatkan minat belajar siswa, yang ditunjukkan oleh meningkatnya keaktifan, perhatian, dan antusiasme siswa selama proses pembelajaran. Selain itu, alat peraga TRANSMET membantu siswa memahami konsep refleksi dengan lebih mudah karena siswa dapat mengamati secara langsung proses pencerminan bangun geometri. Dengan demikian, alat peraga TRANSMET efektif digunakan sebagai media pembelajaran untuk meningkatkan minat belajar siswa pada materi transformasi geometri refleksi.

Kata kunci: alat peraga TRANSMET; minat belajar; refleksi; transformasi geometri

INTRODUCTION

Mathematics is one of the key lessons that plays an important role in developing students' ability to think logically, systematically, and critically (Astindari et al., 2023). Mathematics No only related with activity counting, but also involves the process of reasoning, analysis, and ability understand patterns and relationships between concept of Marfu'ah (2022) state that mathematics is science that discusses numbers, calculations, and various related issues with quantity, size, pattern, shape, and structure, so that mathematics can functioning as means systematic thinking in solve problem. Thus, learning mathematics should enable students to practice and develop their ability to think at a high level, such as analyzing, reasoning, and making logical decisions. However, in practice, the learning process in mathematics class still faces various obstacles that can affect students'

motivation and interest in studying. Many students think that mathematics is difficult to understand and less interesting, which affects their interest in studying (Astindari, Ambarsari, et al., 2023). Therefore, it is necessary to make an effort to increase understanding of mathematics through more effective learning strategies, one of which involves using tool props to help visualize abstract concepts more easily, making it easier for students to understand (Ningsih et al., 2022).

Teaching aids, in essence, are learning media that visualize a draft so that students can understand it more easily. In learning mathematics, tool props can help the teacher explain abstract concepts and make them more concrete. For example, when the teacher explains a draft, get up and move around, using objects around, like a cardboard box or a packaging product shaped beam. Use tool props to increase student involvement in the learning process and to grow interest in studying mathematics. One of the materials required for visualization is transformation geometry, because it concerns changing the position of objects through translation, reflection, rotation, and dilation, which people commonly encounter in everyday life. In the curriculum school, concept transformation geometry is taught to students in class IX of junior high school and requires students to understand concepts, remember formulas, and apply them in mathematical problem-solving (Hadi et al., 2025). However, in practice, Classroom learning and delivery materials are often still dominated by lecture-based methods, with the LKS book as the primary learning resource. The conventional approach to learning tends to position the student as a passive recipient of information, making the learning process less interactive and offering fewer opportunities to explore in depth. Condition: This can cause boredom among students and difficulty in understanding abstract material in transformation geometry. Therefore, it is necessary to innovate in the teaching of mathematics by using media or tools with more varied and interesting props, so that the learning process becomes more interactive, increases students' interest in studying, and helps them understand the draft transformation geometry more concretely.

Geometry is one of the branches of mathematics that plays an important role because it serves as a basis for connecting various fields of mathematics (Sari et al., 2024). Through learning geometry, students not only learn form and space but also develop the ability to think visually and to understand the connections between mathematical objects. Munawwir et al. also emphasize the importance of learning geometry (Munawwir et al., 2025), stating that it plays several key roles: helping people understand and appreciate the world around them, developing problem-solving skills, supporting understanding in other mathematical fields, and providing an intellectually challenging experience for students. Thus, learning geometry not only serves as a material lesson but also helps students develop the ability to think mathematically. In line with the matter mentioned, learning geometry in school is expected to foster an attitude that helps students think systematically and understand the connection between geometry and its classification process (Robbaniyyah et al., 2023). To achieve the goal optimally, the learning process should give students opportunities to engage in direct exploration, observation, and experimentation. Provision means adequate tools that allow students to explore the concepts and principles of geometry through informal activities before finally understanding and drafting them formally in learning mathematics (Puspitasari et al., 2023).

The use of the Geometry Transformation Board teaching aid makes students more active, creative, and happy in participating in the learning process (Puspitasari et al., 2023) . Students are expected to show greater enthusiasm for learning transformations than simply working on problems and listening to the teacher's lectures. With this in mind, the author developed a learning medium that can assist students in the learning process. Therefore, the author conducted a study entitled "Use of Geometry Transformation Board Teaching Aids."

Several studies have previously discussed the use of the tool, the props board transformation geometry, in learning mathematics. One of them is research conducted by Hanipah et al. (2022) titled "Use of Transformation Board Teaching Aids: Geometry for Increasing Understanding and Drafting Students ' Mathematical Learning". This research focuses on how using the tool, props board, and transformation geometry can increase students' understanding of the material that they

are studying. In other words, research focuses more on students' cognitive aspects in understanding mathematics through different tools. According to the study, the researchers conducted the research. This study not only focuses on understanding draft mathematical concepts but also emphasizes developing interest in the study of material transformation geometry, especially the concept of reflection. Interest in learning is an important aspect of the learning process because it can influence students' engagement, attention, and motivation during an activity. Therefore, this research aims to determine how to use the tool, props board transformation geometry (TRANSMET), to increase interest in studying mathematics, thereby making the learning process more attractive, effective, and efficient.

METHOD

This study used a descriptive qualitative approach. This approach aims to describe in depth the learning process and students' learning interests after the application of the geometric transformation board (TRANSMET) teaching aid to reflection material (Hanyfah et al., 2022). The researchers chose qualitative research because it can naturally describe learning phenomena through students' experiences and responses during the learning process (Suherlan et al., 2022).

The research subjects were ninth-grade students at Darul Jannah Junior High School who were selected using a purposive sampling technique, as the class had studied the material on reflection geometric transformation in accordance with the applicable curriculum. The researchers conducted the research in the even semester of the 2025/2026 academic year.

The research instruments in this qualitative approach included observation sheets, interview guidelines, and documentation. The researchers used observation sheets to assess student activities and engagement during learning with TRANSMET teaching aids (Damayanti et al., 2023). The researchers used the interview guidelines to explore students' opinions, interests, and responses to the reflection material. They used documentation in the form of photographs of learning activities and field notes as supporting data (Setiawan et al., 2022).

To ensure data validity, the researchers used triangulation, a technique that assesses data quality by combining multiple sources or methods of data collection to obtain more accurate and trustworthy information. In this research, triangulation was used by comparing data obtained through observation, interviews, and documentation. Data results observation of activities and interests of students during learning using the tool TRANSMET, displayed, then strengthened with results of interviews with students and teachers, as well as supported by documentation in the form of Photo activity learning and field notes. Through triangulation, researchers can obtain reliable information from multiple sources, making the data more valid and accountable.

The researchers conducted the study in three stages: preparation, implementation, and evaluation. In the preparation stage, the researcher developed learning materials, prepared TRANSMET teaching aids, and developed research instruments. The implementation stage involved using TRANSMET teaching aids to deliver reflective learning materials, while the researcher observed students' learning activities and interests. The evaluation stage involved interviews with students and teachers to obtain more in-depth data regarding the effectiveness of using TRANSMET teaching aids in learning (Mahpuda Mappamiringi et al., 2024).

Conclusion Technique The data analysis in this study uses a qualitative descriptive approach to describe the process and results of learning geometric transformation on reflection material using geometric transformation board teaching aids (TRANSMET) (Samsudin et al., 2025). Data analysis was carried out interactively, following the Miles and Huberman model, which includes data reduction, data presentation, and drawing conclusions and verification. Data reduction involved selecting and focusing on data from observations, interviews, and documentation related to students' learning interests and their understanding of the concept of reflection. The reduced data were then presented as a narrative description to facilitate interpretation. Furthermore, conclusions were

drawn by verifying data from various sources to obtain accurate and accountable conclusions (Pencawan et al., 2024).

RESULTS AND DISCUSSION

The Geometry Transformation Board is a teaching aid that helps students understand the concept of transformation geometry. This teaching aid is made using a Cartesian diagram that covers four topics: translation, rotation, reflection, and dilation. The following is a discussion of the geometric concepts, the tools and materials required, the procedure for making them, and how to use them:

To make a Geometry Transformation Board teaching aid, there are several tools and materials that must be prepared, namely: Styrofoam, Paper Cardboard / HVS, Origami Paper, Double Tip, Scissors, Arc, Push Pin, Mica Plastic, Pencil, Eraser, Ruler, Whiteboard marker, Glue.

Procedure Making: 1) As for the steps to make it a tool prop, those are; 2) Prepare the tools and materials for making the Geometry Transformation Board: 3)Measure the cardboard and adjust it to fit the Styrofoam, then cut it out; 4) Then draw a Cartesian diagram on the measured cardboard; 5) After that, stick the cardboard to the Styrofoam using double-sided tape and glue; 6) Then create flat shapes for each of the following transformations: reflection, rotation, and dilation.

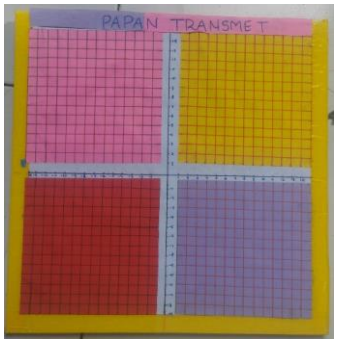

Figure 1. Appearance Tool Props Board Transformation Geometry (TRANSMET)

Use of Transformation Board Teaching Aids Geometry in Reflection Material

The teacher asks students to observe the movement of the thread marked with a push pin in Cartesian coordinates by assuming that upward movement is in the direction of the positive y-axis, downward movement is in the direction of the negative y-axis, movement to the right is in the direction of the positive x-axis, and movement to the left is in the direction of the negative x-axis.
Problems example 1:The teacher asks students to observe the movement of triangular shapes in Cartesian coordinates using a mica plastic.
Problems example 2: *Given triangle ABC whose vertices are at A (1,2), B (7,3), and C (4, 3).* Determine the image of triangle ABC after reflecting it over the y-axis.
The steps are as follows:
Place the triangular origami paper on the Cartesian coordinates.

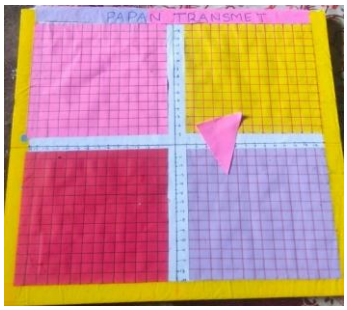

Figure 2. Position the Initial Triangle on a Cartesian Coordinate Plane Before Carrying Out The Reflection Process Using the TRANSMET Board

Then place the mica plastic on the triangle.

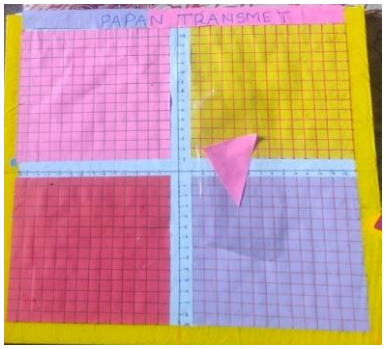

Figure 3. Observation Process Position Get Up Triangle on a Plane Coordinate as Stage Beginning in Determine Shadow Results Reflection

Then place the triangular origami paper on the mica plastic.

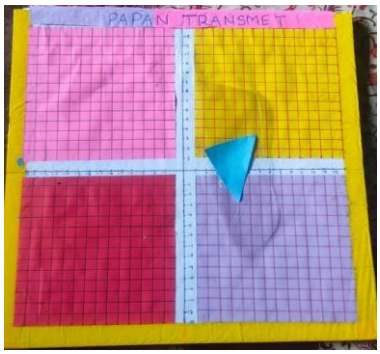

Figure 4. Mirroring Process Get Up Triangle Use Plastic Mica on the TRANSMET Board for Get Shadow Reflection

After that, turn the mica plastic over so that there is a shadow point.

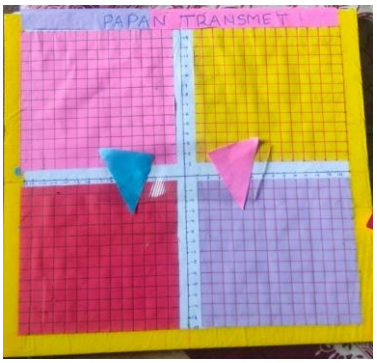

Figure 5. Reflection Results Get Up Triangle on a Plane Coordinate Cartesian After the Reflection Process Is Carried Out Use TRANSMET Board

When put into the formula (x,y) → (-x,y) it is
Point A = (1,2) = (-1,2)
Point B = (7,3) = (-7,3)
Point C = (4,-3) = (-4,-3)

This research data analysis used the Miles and Huberman model, which includes data reduction, data presentation, and conclusion drawing and verification. Data were obtained through observation, interviews, and documentation during the learning of geometric transformations on

reflection material using the geometric transformation board (TRANSMET) teaching aid (Pramesti & Sulistyani, 2024). In the data reduction stage, researchers focused on aspects of students' interest in learning and their understanding of the concept of reflection (Murni & Ruqoyyah, 2025). Observations show that students appear more enthusiastic and active when learning uses teaching aids. One student stated: "Learning reflection is more fun, because you can directly see the reflection of the shape, not just imagine it in your head" (Student A). Furthermore, students demonstrated increased confidence in asking questions and in practicing with teaching aids. Another student reinforced this by saying: "Usually reflection is confusing, but if you use this tool, it becomes easier to understand" (Student B).

At the data presentation stage, the researchers organized the data into a descriptive narrative based on observations and interviews (Habibah et al., 2022). The teacher stated that the use of TRANSMET teaching aids helped students focus and engage with the learning process. The teacher stated, "When using TRANSMET, students appear more active and don't get bored quickly. They find it easier to understand the position of a shape's shadow." (Mathematics Teacher). Learning documentation also shows that most students are directly involved in learning activities, such as moving shapes and observing the results of reflections on mirror lines.

The results of this study indicate that the use of geometric transformation board (TRANSMET) teaching aids can increase students' interest in learning reflection (Mufti & Aziz, 2024). Based on student interviews, learning becomes more engaging because students can directly observe and practice the process of reflecting shapes. The results of this study indicate that teaching aids play an important role in concretizing abstract mathematical concepts. Increased interest in learning was also evident in student engagement during the lesson. Students were more willing to ask questions, discuss topics, and attempt to solve reflective problems. Teachers' statements that students did not get bored easily indicate that the use of teaching aids can create a more enjoyable and interactive learning environment (Hanipah et al., 2022).

In addition, students' understanding of reflection improves as they can directly observe the relationship between the original shape and its shadow. This process helps students build conceptual understanding through learning experiences aligned with the constructivist learning approach. Thus, data analysis using the Miles and Huberman model provides a clear picture that the TRANSMET teaching aid is effective in increasing students' interest in learning and their understanding of the material on reflection geometric transformations (Harahap et al., 2024). The researchers conducted the conclusion-drawing and verification stages by comparing the results of observations, interviews, and documentation. All three data sources showed consistent results, indicating an increase in students' interest in learning and their understanding of the reflection material. Thus, the researchers can conclude that the use of TRANSMET teaching aids has a positive impact on learning geometric transformations.

Based on the results of the research and discussion, the researchers can conclude that the use of geometric transformation board (TRANSMET) teaching aids in learning geometric transformation on reflection material can increase students' interest in learning. The increase in learning interest is evident in students' activity, attention, and enthusiasm during the learning process. In addition, TRANSMET teaching aids help students better understand the concept of reflection by allowing them to directly observe the process of reflecting geometric shapes across mirror lines. Data analysis using a qualitative descriptive approach, guided by the Miles and Huberman model, shows consistent results across observation, interview, and documentation data. Thus, teachers effectively use TRANSMET teaching aids as learning media to create more interesting, meaningful, and student-centered mathematics learning, especially in the material of geometric transformation reflection.

CONCLUSION

The use of the geometric transformation board teaching aid (TRANSMET) in learning reflection materials can increase students' interest in learning and their understanding of geometric transformation concepts. This media makes learning more interactive, concrete, and meaningful, and encourages active student involvement through observation and hands-on practice. Therefore, teachers effectively use TRANSMET as an alternative mathematics learning medium, especially for topics that require visualization of abstract concepts.

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