Training of Luper Borubung (Surface Area of a Sphere, Cone, Cylinder) Demonstration Tools on the Surface Area of Curved Sided Template Figures (BRSL)

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Article Info	Abstract
	Mathematics learning on the topic BRSL, particularly the determination of surface area, is often hampered by the abstract nature of the concept and the lack of adequate visual representation. This condition has the potential to hinder students' conceptual understanding and mathematical reasoning abilities. We often find that students' understanding and learning outcomes are low on this material. This luper borubung teaching aid is based on the urgency of developing learning aids that can bridge the gap between theory and visual reality. The results of the application of the luper borubung teaching aid show that 71% of students' learning outcomes are in the good category, creating a more enjoyable and meaningful learning atmosphere because they construct knowledge together in groups. The results of the attitude assessment show a percentage of cooperative attitudes 85,29%, a responsible attitude 83,82%, a self-confident attitude 75%, and a meticulous attitude 75%.

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1. INTRODUCTION

BRSL geometry is one of the essential materials in mathematics learning in ninth-grade junior high schools (SMP). Although BRSL concepts are frequently encountered and relevant in everyday life, many students reportedly still experience significant difficulties in mastering this topic (Yusmin, 2017). These difficulties are suspected to stem from several factors, including a lack of student interest in the material, low focus during teacher explanations, and teaching methods that tend to be monotonous, such as lectures dominated by lectures without the support of effective teaching aids (Marasabessy et al., 2021; Oksagita et al., 2021).

Furthermore, research by Syaali et al. (2023) shows a diversity of students' mathematical literacy skills in solving problems involving BRSL (Edriati & Mardiyah, 2019). Specifically, some students face significant challenges when working on BRSL-themed mathematical literacy problems (Rudi Syaali, Witri Lestari, Irma Della Salsabila, 2023). A common phenomenon is students' tendency to seek instant solutions or quick fixes, rather than implementing proper procedural steps. This behavior is thought to arise from a lack of student interest and attention during the learning process, which ultimately

exacerbates their difficulty in understanding the mathematics presented (Santia, 2018).

To address the aforementioned issues, the use of teaching aids can be integrated to create a more enjoyable and meaningful learning environment. Mathematical teaching aids are important learning media that help students understand abstract mathematical concepts in a more concrete and understandable way (Sagita et al., 2019; Faustianus Luan et al., 2024). The use of teaching aids can increase student learning motivation, reduce verbal learning, and enhance teacher-student interaction (Sagita et al., 2019). Teaching aid training workshops also demonstrated an increase in teachers' knowledge and skills in designing and applying mathematical teaching aids (Hamidah et al., 2017).

However, the reality on the ground actually shows a different situation. Based on observations and interviews with mathematics teachers at SMP Negeri 1 Bonggo, it was discovered that the learning process at the school had never used teaching aids, resulting in many students' experiencing difficulty understanding the material and a lack of student engagement during the teaching and learning process. Based on the description above, it is necessary to conduct community service activities entitled: Teaching Aid Training. TUBE LUPER (surface area of a spherical cone tube) on the Surface Area Material of Curved-Sided Solid Shapes in Class IX of SMP Negeri 1 Bonggo.

Making Teaching Aids

The teaching aids used in BRSL Surface Area learning are nets of cylinders and cones in various sizes and colors, while for spheres, toy balls are used. The use of these teaching aids aims to make it easier for students to understand the concept of surface area of curved solid shapes in a more realistic and concrete way.

a. Tube

Figure 1. Tube Net

Tool:
1) Hot glue gun
2) Scissors
3) Grinding
4) Ruler
5) Term
6) Hospital
7) male cat
8) Okay.
9) Hooks shot

Material:
1)   Clear plastic with a thickness $0,4\ cm$
2)   Glue gun
3)   Plywood
4)   Double Tape

5) Noken Thread
6) Asturo Paper
7) Adhesive
8) Cat
9) Shooting hectare filling
10) Thinner

Making process:
1) First: Cut the triples to size $79\ cm \times 59\ cm$ as a base board, then cut 6 triples of size $79\ cm \times 3\ cm$ 6 $plywood\ measuring$ $59\ cm\ x\ 3\ cm$ as a frame.
2) Second: Paint the three large pieces of plywood in different colors, namely blue, black, and brown. Do the same steps, namely, paint the small pieces of plywood black.
3) Third: Glue the four pieces of plywood together $79\ cm \times 3cm$ on the sides of the baseboard using a shooting heater to form a frame.
4) Fourth: Picture 3 of a tube net pattern on green, purple, and blue asturo paper using a ruler, marker, and compass with the size of the tube cover. $43\ cm\ \times 24\ cm$ Next, draw the base and lid of the cylinder in the form of a circle with its radius $7\ cm$.
5) Fifth: Cover the net pattern of the tube with clear plastic, then cover the base and lid of the tube with yellow and blue cardboard so that you can distinguish the base and lid of the tube, and then cut according to the pattern neatly.
6) Sixth: Make holes in the edges of the blanket, base, and lid of the tube at equal distances using a soldering iron, then use noken thread to tie the holes so that when pulled, they can form a complete tube.
7) Seventh: Attach the tube nets using a hot glue gun and adhesive to the plywood board according to the base color that has been painted.
8) Eighth: Make sure all parts are attached firmly and do not come loose easily, so that when the teaching aids are used in learning, there are no loose parts.

b. Cone

Figure 2. Cone Net

Tool:
1) Hot glue gun
2) Scissors
3) Grinding
4) Ruler
5) Term
6) Hospital
7) male cat
8) Okay.
9) Hooks shot

Material:
1) Clear plastic with a thickness $0,4\ cm$
2) Glue gun

3) Plywood
4) Double Tape
5) Noken Thread
6) Asturo Paper
7) Adhesive
8) Cat
9) Shooting hectare filling
10) Thinner

Making process:

1) First: Cut the triples to size$60\ cm \times 58\ cm$ as a base board, then cut6 triples of size$60\ cm \times 3\ cm$ and 6 triples of size$58\ cm \times 3\ cm$ as a frame.
2) Second: Paint the three large plywood panels in a different color, namely brown2 and 1blue. Do the same steps, namely, paint the small plywood black.
3) Third: Glue the four pieces of plywood together$60\ cm \times 3cm$ and $58\ cm \times 3cm$ on the sides of the baseboard, using a shooting heater to form a frame.
4) Fourth: Picture 3 of the cone net pattern on green, purple, and blue asturo paper using a ruler, marker, and compass with the size of the cone base being the radius.$7,5\ cm$ and the painter's lines$15\ cm$
5) Fifth: Cover the cone net pattern with clear plastic, then cover the base of the cone with yellow cardboard, then cut it out neatly according to the pattern.
6) Sixth: Make a hole at each end of the net using a hot soldering iron to insert the noken thread so that the cone net can be pulled to form a cone-shaped geometric shape.
7) Seventh: Attach the cone nets using a hot glue gun and adhesive to the plywood board according to the base color that has been painted.
8) Eighth: Make sure all parts are attached firmly and do not come loose easily, so that when the teaching aids are used in learning, there are no loose parts.

c. She was

Picture 3. Toy Ball

2. METHOD

The method used in community service activities is training. The steps taken during community service include:

(1) Making teaching aids. Making teaching aids by the Chairperson and Community Service Members.
(2) Conduct training according to the specified schedule. Training activities are carried out by the Chairperson and Community Service Members at the target school.

(3) Conducting simulations for students who have been trained to use teaching aids in mathematics learning in accordance with the Worksheet (LTK). Simulation activities by the Chair and Community Service Members.

(4) At the conclusion of the community service program, a comprehensive written test is conducted to determine the program's success. The evaluation is conducted by Community Service Members.

3. RESULTS AND DISCUSSION

1. Attitude Assessment

During the learning process, students followed the learning process well. The following are the results of observations of the attitudes of class IX B students in learning the material on the surface area of curved-sided solid shapes.

Final score using a scale1 until 4
Calculation of the final score using the formula:

$$Final\ Score = \frac{score\ obtained}{Shoes} \times 4$$

Total shoes= 16

In accordance with Permendikbud No. 81A of 2013, students receive the following scores:

Very good   : when getting a score $3,33 < skor \leq 4,00$
Good   : when getting a score $2,33 < skor \leq 3,33$
Enough   : when getting a score $1,33 < skor \leq 2,33$
Not enough   : when getting a score $\leq 1,33$

Calculation of the percentage of attitude value for each indicator using the formula:

$$Percentage\ of\ attitude\ value = \frac{Total\ attitude\ scores\ obtained}{Total\ attitude\ scores} \times 100\%$$

$$Total\ attitude\ scores = 4 \times students$$
$$= 4 \times 17$$
$$= 68$$

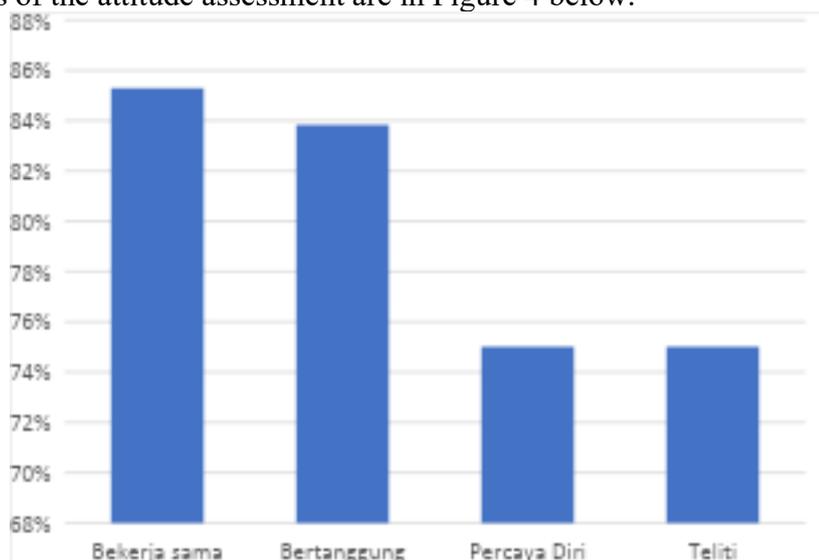The results of the attitude assessment are in Figure 4 below.

Figure 4 Percentage Diagram of Student Attitude Assessment

Based on Figure 4, the results of the percentage of student attitude assessment are as follows:

a) The percentage of cooperative attitudes is $85,29\%$.
b) The percentage of a responsible attitude is $83,82\%$.
c) The percentage of self-confidence is 75%.
d) The percentage of conscientious attitude is 75%.

Based on the observation results, it can be seen that class IX B students have good attitudes.

2. Knowledge Assessment

After the learning activities were completed, students were given three individual test questions. This test aimed to measure their understanding of the surface area of curved solids.

The final score uses a scale of 1 to 100.

Calculation of the final score using the formula:

$$Final\ Score = \frac{score\ obtained}{total\ shoes} \times 100$$

Shoes   : 100

Evaluation Criteria:

Very Good (A)   : when getting a score $80 < score \leq 100$
Good (B)   : when getting a score $60 < score \leq 80$
Enough (C)   : when getting a score $40 < score \leq 60$
Less (D)   : when getting a score $20 < score \leq 40$
Very Poor (E): when obtaining a score $0 \leq score < 20$

Table 1. List of Individual Test Score Results

No.	Student Initials	Mark	Criteria	Information
1.	ASR	75	B	Good
2.	LIVE	75	B	Good
3.	YES	70	B	Good
4.	DAB	70	B	Good
5.	EY	80	B	Good
6.	FFFD	70	B	Good
7.	FRR	65	C	Enough
8.	HMD	65	B	Good
9.	IDR	75	B	Good
10.	JBA	65	C	Enough
11.	MJMS	60	C	Enough
12.	SAP	75	B	Good
13.	WAS	60	C	Enough
14.	WRS	75	B	Good
15.	YSAM	70	B	Good
16	YWAS	60	C	Enough
17.	YFS	70	B	Good

From the data above, the following data was obtained:
1. There were no students who obtained very good (A) criteria.
2. Students who obtain good criteria (B) are there12people.
3. Students who obtained sufficient criteria (C) are there5people.
4. There were no students who obtained a grade of less than (D).
5. There were no students who obtained very poor (E) criteria.

Based on the data above, it can be seen that the learning outcomes of students are that out of 17 students, there are...12students who have fulfilled the KKM (Complete) in the individual test, and there are5Students who have not met the KKM (Not Completed) set by the school, namely70.This means that 71% of students meet the KKM

By using the results of the knowledge assessment of class IX B students from Permendikbud No. 81A of 2013 (Pendidikan et al., 2013)

Thus, the results of the individual test assessment show that the average student score is:

$$\frac{Total\ scores\ of\ all\ students}{Number\ of\ students} = \frac{1.180}{17} = 69{,}41$$

So, the knowledge assessment criteria are Good.

4. CONCLUSION

Based on the results of observations of student attitude assessments, it was found that the percentage of cooperative attitudes was85,29%, a responsible attitude of83,82%, a self-confident attitude of75%, and a meticulous attitude of75%.

Based on the results of the individual test assessment, it can be seen that the average student score is 69,41 in the good category, and 71% meet the KKM.

Teaching aids can help students understand concepts, attract students' attention, and make students actively involved.

5. SUGGESTION

Based on the results of community service activities, it shows that the application of the use of teaching aids as learning media can help teachers in teaching the material on the surface area of curved-sided solid shapes, so it is highly recommended for mathematics teachers to apply teaching aids in learning activities.

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