

Mathematics lesson plan Grade 6

Research Lesson Instructor Takao Seiyama

Lecture Hall

Theme	To think writing and reading communication of mathematics through application problem of the area of circle
-------	---

1. Title of the lesson: How much does chocolate weigh?

2. About the research theme

(1) Writing and reading communication of mathematics

According to new curriculum standard, improving communication activity is needed. If you consider not only language but number, formula, and figure as writing and reading communication of mathematics, following works become one communication activity. For example, using figure made by tape and area diagram, summarizing own idea to notebook using symbol representation of formula and number, and explaining own idea to friends.

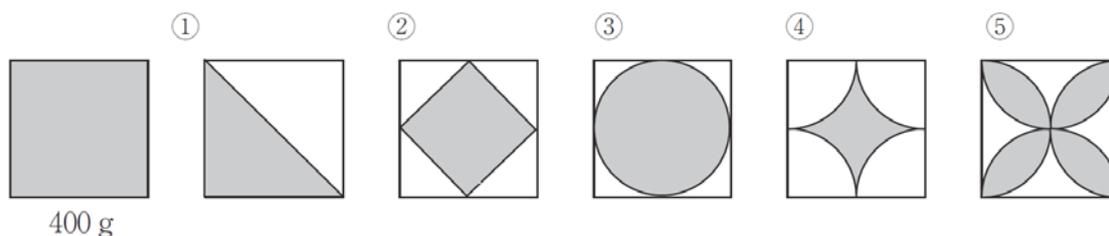
The important thing for communication activity is that showing children the necessity of representation by figure and symbol and encouraging them to do it voluntary. If teachers always force children to represent their idea by saying “Make expression” or “Make figure,” children can’t understand voluntary the merit of using expression and figure. Therefore encouraging them to do these things by teachers’ intentional question is crucial in situations like problem solving and students’ explanation.

I think the process of making mathematical representation like number, formula, and figure as crucial communication for mathematics, which bases on childish ambiguous and sensuous representation or common linguistic representation.

In addition, it is also important for mathematical communication to move between common linguistic representation and mathematical representation such as number, figure, and formula. Here I mean activities like explaining meanings of figure and expression or reading rules and characteristic of chart and figure.

(2) Application problem of area of a circle

There is chocolate packed in a square box and it weighs 400g. The problem is “How much does chocolate weighs which is packed in a square box like following way?” (I suggest figures which show top surfaces of square boxes. In my lesson, I present these figures in order.)



As for ① and ②, since they are half of each squares($1/2$), you can see they weigh 200g.

As for ③ or ④, there may be following approaches.

First approach is to think $1\text{cm}^2 = 1\text{g}$. If each side of square = 20cm, the area of this square is 400cm^2 ($20 \times 20 = 400$). The chocolate weight is 400g and you can think $1\text{cm}^2 = 1\text{g}$. Therefore, as for ③, its area is 314cm^2 ($10 \times 10 \times 3.14 = 314$) and it weighs 314g.

Second approach is to use fraction. If each side of square = a, the area of circle is $0.785a^2$ ($a/2 \times a/2 \times 3.14 = a \times a \times 0.785$). From this expression, you can see 78.5% of the area of square is the area of circle. The weight of chocolate is proportional to the area and the weight is 314g ($400 \times 0.785 = 314$).

When you can understand these approach, you work with ④ and ⑤ which looks little complicated. As for the area of ④, it equals ③ white colored parts. As for the area of ⑤, you can get answer through several approaches which relate to the area of circle like ③.

According to new curriculum standard, 5th grade learns circumference of circle and 6th grade learns the area of circle. Since new curriculum standard changed 5th grade's contents which had included the area of circle before, we have to define the differences between 5th grade's contents and 6th grade's contents. Therefore, in this class, I chose application problem of the area of circle which relates to fraction and proportion, and then I suggest a different approach of the lesson for the area of circle.

3. Objective

- By using the lesson of the area of circle, children can solve problems.

4. Lesson plan (3 classes)

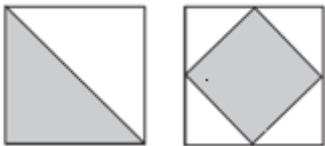
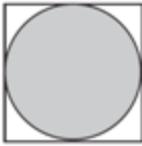
Primary; Application problem of area of a circle (First class of three class hours)

5. Plan of today's lesson

(1) Objective of today's lesson

- To get the weight of chocolate by using the idea of replacement and fraction.
- To explain own approach and interpret friends' approach by using number, formula, and figure.

(2)Lesson plan

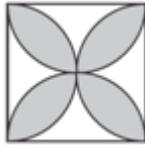
Learning activity	Teacher's facilitation
<p>1. Understanding problems</p> <p>T. "The weight of chocolate packed in a square box is 400g. How much does it weigh which is packed in like following way?"</p>  <p>C. "They are half of each square and 200g."</p>  <p>2. Thinking about circular chocolate</p> <p>T. "Then how about this design?"</p> <p>C1. "I don't have any ideas."</p> <p>C2. "If each side of square = 20cm, the area of this square is 400cm² (20 × 20 = 400). If you think 1cm³ = 1g, its area is 314cm² (10 × 10 × 3.14 = 314) and it weighs 314g."</p>  <p>C3. "If each side of square = a, the area of circle is 0.785a² (a/2 × a/2 × 3.14 = a × a × 0.785). This means 78.5% of the area of square is the area of circle. The weight is also 78.5% of 400g, so the weight is 314g (400 × 0.785 = 314)."</p> <p>3. Thinking other designs using upper approach</p> <p>T. "Let's think about this design!"</p> <p>C1. "If you collect four 1/4 of circle, it becomes one circle. Therefore its area equals white colored part of former one. It is 86cm² and 86g (400-314 = 86)."</p>  <p>C2. "Then you mean its area is 21.5% of square (1-0.785=0.215)."</p>	<p>◆ Preparing figure to display</p> <p>◆ Starting from easy problem which everyone can understand</p> <p>◆ If there are children who can't solve this, teachers should advice them to suppose length of side properly.</p> <p>I expect that many children try to use fraction because when they do first question, they think half of square is 200g.</p> <p>◆ If there are children who can't solve this, teachers should advice them to use that circular chocolate is 314g.</p>

T. "How about this one?"

C. "It looks difficult."

T. "Why don't you use area of circle?"

C. "I see. $400 - 314 = 86$, $86 \times 2 = 172$,
 $400 - 172 = 228$, therefore it is 228cm^2 and 228g ."



◆ When children think this design, teacher should encourage them to use first and second one.

