5th Grade Mathematics (CLIL Course)

1. Unit: Area of Figures (Let's Think About How to Find/Calculate the Area)

2. Evaluation Criteria based on Unit Goals and Perspectives

(1) Goals

- Students will be able to understand how to calculate the area of rectangles and triangles.
- Students will be able to think about how to do this using diagrams and mathematical expressions.
- In doing so, students will uncover the formulas for finding the area of different shapes.
- Students will build an attitude of continually looking for better methods of finding area by looking at the task in different ways.

(2) Evaluation Criteria based on Perspectives

Perspective	Knowledge and Skills	Thoughts, Judgments, and Expressions	An Attitude to Work on Autonomous Learning
Evaluation Criteria	Understand how to find the area of parallelograms and triangles and the meaning of area formulas and use these formulas to find the area of a basic figure.	Focus on the elements that make up a shape and apply methods for finding area that the students have previously learned. Think using concrete materials, figures, and formulas. Find new formulas.	Reflect on the area of rectangles and triangles and the associated mathematical expressions and processes. Consider these from various perspectives and think tenaciously about how to find the best solution. Try to make use of what has been learned in class so far. In doing so, notice the benefits of mathematics for daily life and for learning.

3. About the Unit

In the fourth grade, the students learned that 'area' is represented by a quantity of a particular unit, and they discovered area formulas through thinking about how to measure the area of a rectangle and of a square. In addition, students classified quadrilaterals by the positional relationship of the sides and diagonal lines and they learned about trapezoids, parallelograms, and rhombuses.

In this unit (in Grade 5), we started with considering how to find the area of a parallelogram, using as clues methods for finding area that the students had already learned. Through discussing various ideas, students understood that the area of a parallelogram is determined by the base and height, and finally calculated the area. Furthermore, students were able to realize that the ways of calculating area that they had already learned (such as for rectangles, squares, and parallelograms) could be utilized to find the area of triangles, trapezoids, rhombuses, and other generic quadrilaterals. In this way, students were able to grasp the importance of using knowledge acquired through previous learning to solve new problems. In order to avoid students simply being able to memorize and use different formulas, we put a strong focus on activities that encouraged them to think about the process of how to find the area of a shape using diagrams, mathematical expressions, and more – as well as observing and learning from each other's ideas.

4. About the Students

During class, there are many children who speak with confidence in English, and there are discussions during which various views come out. In addition, we (the teachers) make room for various ways of thinking by implementing language-based activities, such as having students express their thoughts in their notebooks, explore and explain each other's ideas in their notebooks, and discuss and present solutions in groups. However, because the range of understanding of both English and math is quite wide (among the students), and some children are not confident in their own thoughts, we try to create opportunities in class for everyone to be able to participate in activities, such as explaining first in English and then having someone else explain the same idea in Japanese.

5. Strategic Instruction

In this project-based demonstration lesson, students used authentic materials (land value data and maps) to investigate a request about a situation familiar to the children (ie. Building a park in Miyagi Prefecture). This unit on figures involves a large amount of English vocabulary and students could use various views and ways of thinking (by utilizing the knowledge and skills acquired so far). Thus, the students were able to determine the most appropriate solution for the request presented by their teacher. Each group presented the best idea with logical thoughts and reasons (not just based on a broad idea). After the presentations, students discussed altogether which group had proposed the best solution. Furthermore, students were allowed to use a calculator to calculate land price and to form a rough cost estimate to work with.

6. Focus of Study in this Lesson (through Communication in English)

While students are engaged in the process of solving problems, by expressing their thoughts in English or in Japanese and using diagrams and formulas, they can deepen their understanding.

7. Unit Structure and Evaluation Plan (16 Lessons)

Small Unit Title		Learning Objectives	Learning Activities	◎Points to keep in mind when teaching Evaluation perspectives
1 Area of Parallelograms (3)	1	・Convert parallelograms into rectangles to find the area.	・Students will share how to find the area of 3 shapes: a rectangle, a square, and a ninja star. ・Students will think about how to find the area of a parallelogram.	◎If students move parts of the parallelogram and attach them adjacently or perpendicular to the sides of the parallelogram, they will notice that it becomes a rectangle. ◎If students can not picture this, they can cut and rearrange the shape to make a rectangle. ・Students should try to find the area of a parallelogram by converting it to another shape.
	2	・Think about the lengths needed to determine the area of a parallelogram, know the terms 'base' and 'height', and discover the formula to find the area of a parallelogram. ・Measure the area of parallelograms.	・Student will present ideas for how to find the area, and find shared ideas through the discussion of formulas discovered and their ways of thinking. ・Students will summarize their findings on the lengths needed to determine the area of a parallelogram and confirm the area formula.	◎Students will focus on where the height of the parallelogram is when it is converted into a rectangle, so they can understand that the location of the height is needed to find the base. ・Students should use the idea of converting shapes in order to find the formula for the area of a new figure from the area formula of a shape they have already learned about.

	3	・Understand how to find the area of a parallelogram when the height is outside the shape. ・Understand the relationship between the base and height of a parallelogram.	・Students will think about how to measure the area when the height extends outside the figure. ・Students will present their ideas and discuss them. ・Students will look at many parallelograms that are equal in base and height and discuss the relationship between the base and the height.	◎Students will notice that parallelograms with equal base and height are equal in area: ・In any parallelogram, the same formula can be applied to find the area. ・With all parallelograms, it is understood that the area is equal if the base and height are equal.
2 Area of Triangles (3)	4	・Find the area of a triangle through converting it into another shape (rectangle or parallelogram).	・Students will think about how to find the area of a triangle by converting it into a familiar shape (rectangle or parallelogram).	◎Students will convert triangles into familiar shapes (rectangles and parallelograms) and will be made to think about how to measure the area of triangles. ・Students should think about how to convert a triangle into another shape and calculate the area.
	5	・Understand the relationship between the base and height of a triangle, know the formula for the area of a triangle, and use the formula to find the area.	・Students will present ideas for how to find the area, and find shared ideas through the discussion of formulas discovered and their ways of thinking. ・Students will understand what the numbers in the area formula represent and confirm the formula for the area of a triangle through using it.	◎Students are made aware that the formula for the area of a triangle is the same no matter which shape it is converted into. ・Students should discover the formula for the area of a triangle through knowing the formula for the area of another shape. ・Students should understand that the height of a triangle is determined by where the base is.

2 Area of Triangles (3)	6	・Understand how to find the area of a triangle when the height is outside the shape. ・Understand the relationship between the base and height of a triangle.	・Students will think about how to measure the area when the height extends outside the figure. ・Students will present their ideas and discuss them. ・Students will look at many triangles that are equal in base and height and discuss the relationship between the base and the height.	・Students should learn that, even if the height of a triangle is outside the figure, the height can still be found by extending the base and using the area formula (for a triangle). ・Students should understand that, if the base and height of a triangle are equal, the area will not change even if the shape changes.
3 Area of Trapezoids (2)	7	・Think about how to find the area of a trapezoid, a rhombus, and a generic quadrilateral.	・Students will consider how to find the area of various shapes using what they have learned through previous lessons.	◎Teachers will observe the students' understanding of how to find the area of various shapes and give students the opportunity to discuss the problem with friends (if needed). ・Students should try to find the area of these figures using previously-learned ideas.
	8	・Through ways of thinking to find the area of a trapezoid, discover the area formula (for a trapezoid) and use it to calculate the area.	・Students will present ideas for how to find the area and find shared ideas through the discussion of formulas discovered and their ways of thinking. ・Students will understand what the numbers in the area formula represent and confirm the formula for the area of a trapezoid through using it.	◎Students will convert the trapezoid into another shape and notice that they can find the area this way. ・Students should use ideas from previous lessons to find the area of a trapezoid. ・Students should convert the trapezoid into a shape with an area that can be found through a standard formula and think about how to calculate it.

4 Area of Rhombuses (2)	9 10	・Through ways of thinking to find the area of a rhombus, discover the area formula (for a rhombus) and use it to calculate the area.	・Students will present ideas for how to find the area and find shared ideas through the discussion of formulas discovered and their ways of thinking. ・Students will understand what the numbers in the area formula represent and confirm the formula for the area of a rhombus through using it.	◎Students will convert the rhombus into another shape (such as a parallelogram or rectangle) and notice that they can find the area this way. ・Students should think about how to find the area by changing the rhombus to a shape they are familiar with. ・Students should notice that the area of a rhombus can be calculated through a formular using perpendicular diagonal lines.
5 How to Find the Area (1)	11	・Understand that, if a generic quadrilateral or pentagon is divided into several shapes that the students have already learned about, the area can be found.	・Students will present ideas for how to find the area and find shared ideas through the discussion of formulas discovered and their ways of thinking. ・Students will find that, if divided into several familiar shapes, the area of a quadrilateral or pentagon can be found.	◎Students will notice that quadrilaterals and pentagons can be divided into triangles to find how to calculate the area. ・Students should learn to divide quadrilaterals and pentagons into shapes with an area that can be calculated using formulas they have already learned.
Review What We Have Learnt (5)	12 13	・Confirm students' understanding of the contents of this unit and firmly grasp the concepts learned.	・Students will understand the contents of this unit and know how to find the area of various shapes.	・Students should be able to understand the learning content of this unit and solve basic problems.

| 14 15 16 | ・Make use of the lessons learned to make a plan for solving a problem by thinking in a logical way and expressing these thoughts mathematically. ・Organize various conditions and work collaboratively. | ・Based on the request of the client, students will read various materials and consider the location and shape of the park they want to build. ・The group will present their ideas. ・Students will work collaboratively within a group. In addition, children will evaluate each other's ideas. | ◎Students will calculate approximate land value using a calculator, and round off the amount. ◎ Teachers will consider English and math ability of students when deciding on groups. ・Students should look at various data from multiple perspectives and consider this data by utilizing learning from previous lessons. ・Students should express their thoughts by using what they have already learned to solve problems using words and math expressions. |

"Active Learning Attitude" is evaluated throughout the whole unit.

8. About the Project Lesson

(1) Lesson Goals（Lessons 14, 15, 16）

- Students will be able to utilize what they learned during this unit to make a plan for solving a given problem, think in a logical way, and express their ideas mathematically.
- Students will be able to organize ideas based on several conditions and collaborate on them.

(2) Relationship Between the Lesson and the 4Cs

【Content】

◎From land value (price) data and maps, the group will determine the location and shape for an area of land in order to meet the request of the client (Ms. Motoki).

◎Students will use what they have learned in previous lessons to solve problems. (Previous learning includes area size, approximate numbers, calculating area, calculating measure per unit quantity).

【Communication】[Cooperation]

◎Students will use materials (data) provided and prior learning to communicate their ideas to their friends and think about the location and shape of the land that best meets the wishes of their client. (Collaborative activities)

◎Students will present their group's thoughts in English. They will also provide feedback on each other's presentations.

- From among the four proposals, the students will together discuss and decide on the best proposal according to:

(1) Price

(2) The shape of the land

(3) Overall assessment (on which idea best matches the request put forward by Ms. Motoki).

【Cognition】

◎Based on the request presented and materials provided, students will use the data given to calculate the area and price of the land, and then express the group's ideas in an easy-to-understand manner by representing the shape of the land in a diagram.

◎In order to solve problems (to achieve the task), students will develop their logical thinking skills.

【Community/ Culture】

◎Students will recognize that the price of land in each area of their prefecture is different, depending on the surrounding environment.

(3) Lesson Flow (3 lessons)

Learning Steps	Students Activities	★Evaluation ◎Role of Teachers・What Teachers Need to Keep in Mind (When Teaching)
Grasp the Problem	1. Listen to the presented problem and grasp the subject. → Read out the "Request Statement" 2. Check the meaning of the words, how to read the materials, and the rules.	Land price → per 1 ㎡ Document 1 - Map showing land price points (locations) Document 2 - Land price information ◎Use real public notice data about land prices.
Group Activities	3. Discuss in their groups. (4 groups) Consider these 4 points: (1) Where do you want to put the park? (2) The price of the land (3) The shape of the park (4) Reasons for your recommendation Summarize the above on two whiteboards.	◎Allow students to use a calculator and round off the amount when calculating approximate land value. ◎Consider English and math ability of students when making groups. ★ Work with friends, considering various data from multiple perspectives, and try to make use of the lessons they have already learned.

		★ Consider the data from different perspectives by utilizing what they have learned so far during lessons.
		★ Express their thoughts by using prior knowledge, words, and math expressions.
Presentations	4. Group Presentations (5 minutes or less)	◎Give students time to practice their presentations.
		★Students should make sure everyone has a role in their presentation.
	5. Compare the four proposals and discuss which is the best in terms of:	◎After the presentations, ask students to provide feedback for each group.
	(1) Price	★ Share their own thoughts in accordance with the evaluation criteria.
	(2) Shape of land (for the park)	
	(3) The request of the client (Ms. Motoki)	
Summary /Review	6. Look Back on Learning	