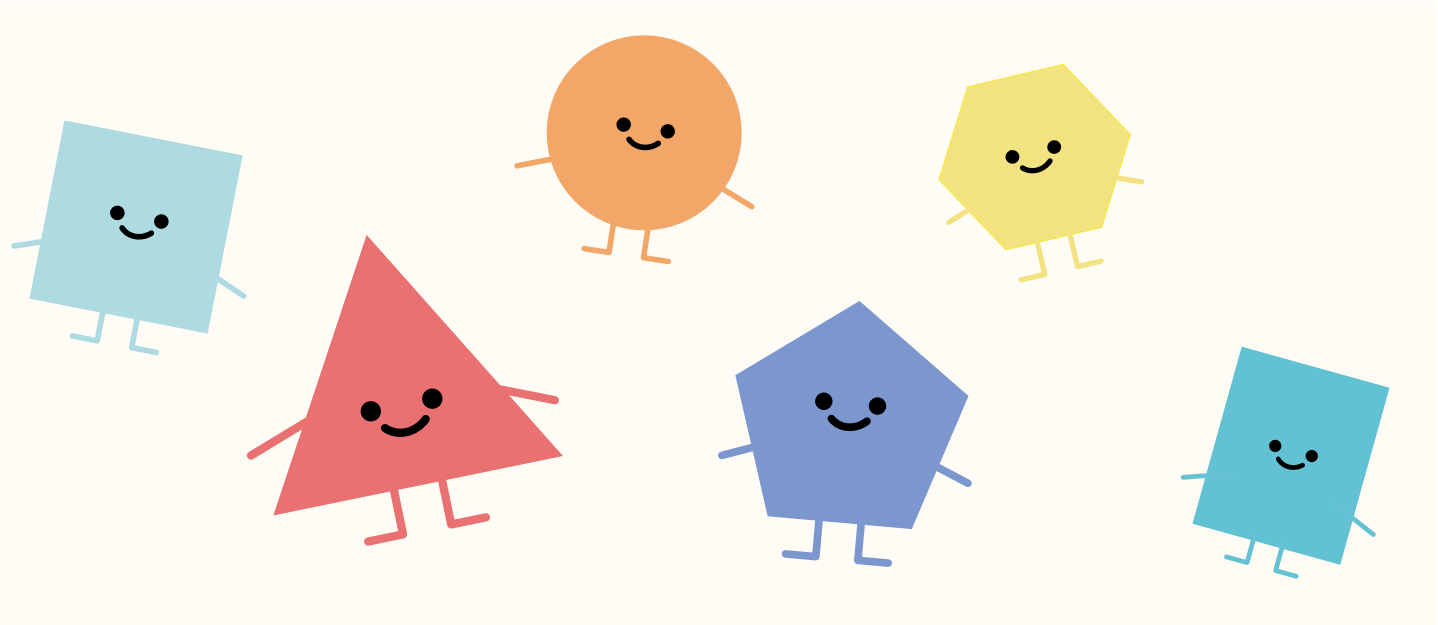
P1 2-D Shapes

by WK Cheng

(All the worksheets and videos can be found on the Resource webpage.)



BACKGROUND

The language gap in a class is huge. Some students do not understand Cantonese instruction while some other students do not understand English instruction fully. From teachers' experiences, non-Chinese speaking students sometimes could not recognise the terms of different shapes such as quadrilateral, hexagon and pentagon. In designing learning materials for students, visual images and animations accompanied with repeated key mathematical terminologies might help learners accommodate new knowledge.

The materials in this resource pack are used as online learning materials during the school suspension period in 2019-2020. Picture books about shapes are introduced as reading assignment. A video about 2-D shapes in our daily lives is produced as an online learning material that increases students' awareness of the shapes encountered in daily lives. Open-ended questions about 2-D shapes are asked.

BEYOND ALGORITHM

The design of the lesson is to help students recognise different 2-D shapes with lots of images and animations. Picture books are introduced so that students can acquire the concept of 2-D shapes in reading. Linguistically diverse learners can also follow the line in the picture books and learn about 2-D shapes with the visual support.

CULTURE MATTERS

As English is the second language of some Chinese and non-Chinese speaking students, some students do not understand simple basic instructions in English and/or in Cantonese. It makes it even more difficult for a teacher to deliver a lesson online with such linguistic diversity. Picture books are used and shapes encountered in daily lives are introduced to students as the features in picture books (Sutherland, 1997) help students develop concepts.

EXERCISE COUNTS

Exercises with different difficulties are used to cater for learners' linguistic diversity. Matching questions are included in Worksheet A that relieves the linguistic burden. It is suitable for learners who do not understand written instructions fully. Worksheet B is suitable for learners who start expressing meaning in English. Worksheet C is designed for learners who are competent in expressing ideas in English.

LEARNING TARGET

Recognise the basic concepts of triangles, quadrilaterals, pentagons, hexagons and circles.

LEARNING AND TEACHING STRATEGIES

Picture books

Features of picture books by Sutherland (1997) include: "The story line presented is in a brief and straightforward manner"; "contain a limited number of concepts"; "include concepts that children can understand"; "provide text that is written in a direct, simple style" and "provide illustrations that complement the text". Picture books are particularly helpful to second language learners in learning mathematics concepts.

Graham (2004) explains that picture books are the books from which teachers discover their own more imaginative ideas flow. From these books they can devise their most creative activities. It enhances children creativity.

Reading picture books to learn mathematical concepts is introduced during the pandemic period when students are learning at home. It is infeasible to use physical tools to learn about 2-D shapes in online lessons, which teachers usually do in classrooms. Picture books are recommended as learning materials in this topic. Reading picture books with many different shapes can arouse students' interest in shapes.

4 free picture books in the series of "*All About Shapes*" from *The Math Learning Center* are used as reading assignment. The books are *What is a Square?*, *What is a Triangle?*, *What is a Circle?* and *What is a Rectangle?*. Take the book *What is a Square?* as an example. In this picture book, there are lots of squares with different features such as squares with different colours, squares of different sizes, non-square shapes, important terms "4 straight sides" and "4 corners", etc. The terminologies in the picture books are simple and the colourful images can help linguistically diverse students learn the properties of different shapes. Although the shapes squares and rectangles are not in P1 mathematics curriculum, teachers find them relevant to students when they are learning the topics 2-D shapes and these concepts are not difficult to students.

Students have learnt different properties of a shape after reading the picture books.

Using daily life examples

A video about 2-D shapes in our daily lives is created (refer to this Resource page). It is an animation with different daily life 2-D shapes which guides students to learn the similarities of a certain shape. A worksheet about daily life 2-D shape is also prepared as a student assignment. These draw students' attention to different 2-D shapes in our daily lives. It is sometimes hard for P1 students to differentiate 3-D from 2-D shapes, but 2-D shapes are visual images that students perceive about real objects. Open-ended tasks in the worksheet allow students to draw or stick the pictures of daily life shapes. It shows students' perception about 2-D shapes and 3-D shapes and teachers would know more about students' perception of 2-D shapes. This is one of the essential elements to enhance teaching with Assessment for Learning.

Graded worksheets

Different worksheets, Worksheets A, B and C, are created to cater for learners' linguisitic diversity. Some students do not quite understand the meaning of the long instructions in the exercise. As a result, simple instructions in the worksheets like circling the answers, matching answers are included in the worksheet. On the other hand, another worksheet allows students to draw 2-D shapes and asks students to write down the name of the 2-D shapes. The language requirement is much higher than the other worksheet. Teachers can use these graded worksheets to cater for learners' diversity so as to give students suitable tasks to work on.

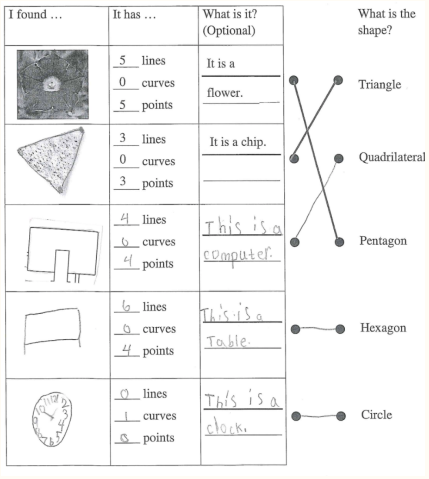
Open-ended questions

In the design of the worksheets about daily life shapes, open-ended questions are included. For example, students need to draw or stick some daily life 2-D shapes in the worksheets. This promotes student agency of learning and helps develop a sense of ownership. It would be a good practice if students can share among peers about their work, and explain and describe the shapes that they have. It would help students learn. However, due to the pandemic, peer communication may not be encouraged. Students can only complete the worksheet as an assignment.

In Worksheet D (Shape Riddles), students are required to guess the shapes with some given conditions, and they are required to draw the shape. This worksheet can be used after students have recognised different 2-D shapes and are able to draw basic 2-D shapes.

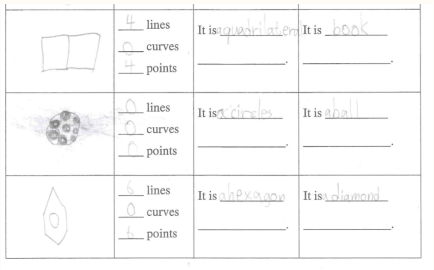
STUDENT WORK

(Shapes that students encounter in daily lives)

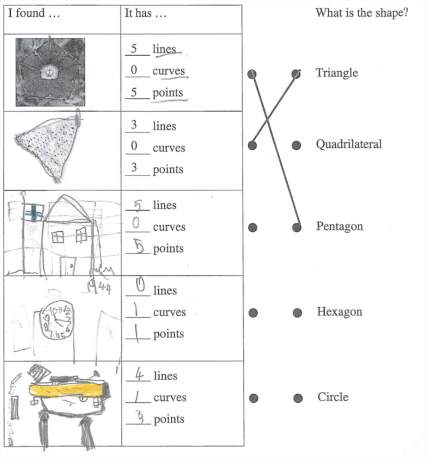


I found …	It has …	What is it? (Optional)
	5 lines, 0 curves, 5 points	It is a flower.
	3 lines, 0 curves, 3 points	It is a chip.
	4 lines, 6 curves, 4 points	This is a computer.
	6 lines, 0 curves, 4 points	This is a Table.
	0 lines, 1 curves, 0 points	This is a clock.

What is the shape?: Triangle, Quadrilateral, Pentagon, Hexagon, Circle

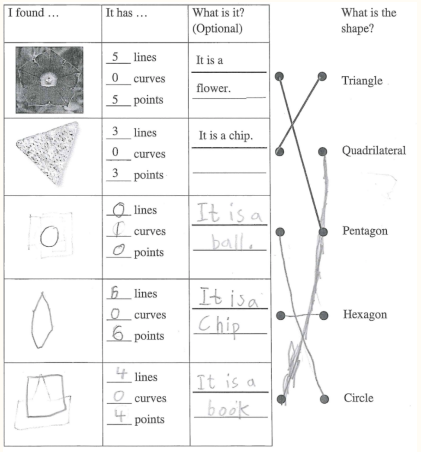


	4 lines, 0 curves, 4 points	It is quadrilatern	It is book
	0 lines, 0 curves, 0 points	It is circles	It is ball
	6 lines, 0 curves, 6 points	It is a hexagon	It is a diamond



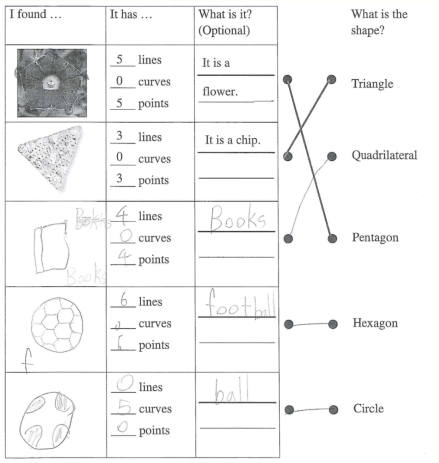
I found …	It has …
	5 lines, 0 curves, 5 points
	3 lines, 0 curves, 3 points
	5 lines, 0 curves, 5 points
	0 lines, 1 curves, 1 points
	4 lines, 1 curves, 3 points

What is the shape?: Triangle, Quadrilateral, Pentagon, Hexagon, Circle



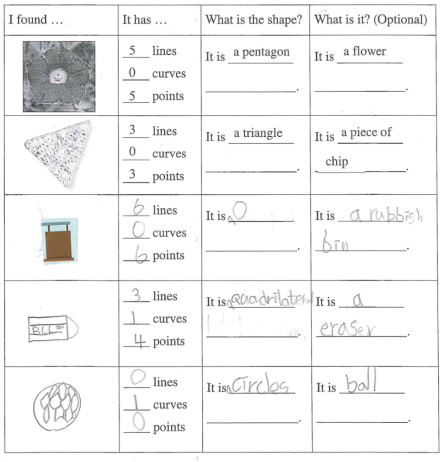
I found …	It has …	What is it? (Optional)
	5 lines, 0 curves, 5 points	It is a flower.
	3 lines, 0 curves, 3 points	It is a chip.
	0 lines, 1 curves, 0 points	It is a ball.
	6 lines, 0 curves, 6 points	It is a Chip
	4 lines, 0 curves, 4 points	It is a book

What is the shape?: Triangle, Quadrilateral, Pentagon, Hexagon, Circle



I found …	It has …	What is it? (Optional)
	5 lines, 0 curves, 5 points	It is a flower.
	3 lines, 0 curves, 3 points	It is a chip.
	4 lines, 0 curves, 4 points	Books
	6 lines, 0 curves, 6 points	football
	0 lines, 5 curves, 0 points	ball

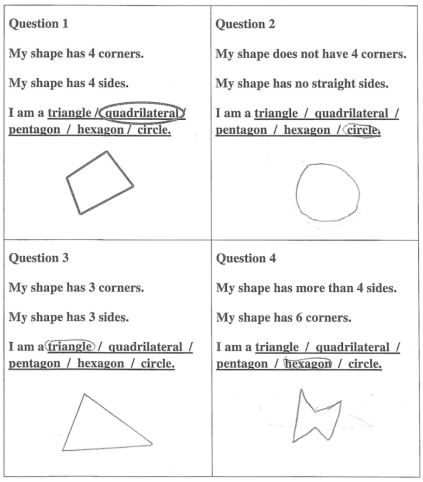
What is the shape?: Triangle, Quadrilateral, Pentagon, Hexagon, Circle



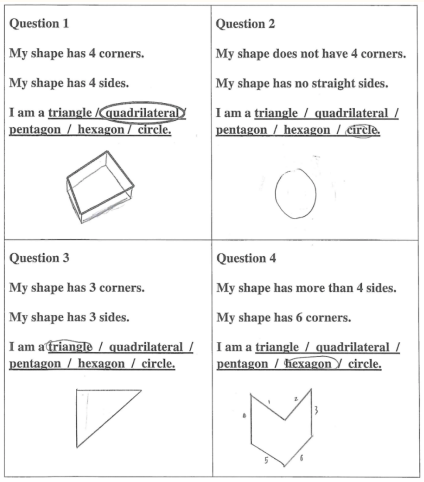
I found …	It has …	What is the shape?	What is it? (Optional)
	5 lines, 0 curves, 5 points	It is a pentagon	It is a flower
	3 lines, 0 curves, 3 points	It is a triangle	It is a piece of chip
	6 lines, 0 curves, 6 points	It is 0	It is a rubbish bin
	3 lines, 1 curves, 4 points	It is quadrilatern	It is a eraser
	0 lines, 1 curves, 0 points	It is circles	It is ball

STUDENT WORK

(Students' work on Shape Riddles)



Question 1	Question 2
My shape has 4 corners. My shape has 4 sides. I am a triangle / quadrilateral / pentagon / hexagon / circle.	My shape does not have 4 corners. My shape has no straight sides. I am a triangle / quadrilateral / pentagon / hexagon / circle.
Question 3	**Question 4**
My shape has 3 corners. My shape has 3 sides. I am a triangle / quadrilateral / pentagon / hexagon / circle.	My shape has more than 4 sides. My shape has 6 corners. I am a triangle / quadrilateral / pentagon / hexagon / circle.



Question 1	Question 2
My shape has 4 corners. My shape has 4 sides. I am a triangle / quadrilateral / pentagon / hexagon / circle.	My shape does not have 4 corners. My shape has no straight sides. I am a triangle / quadrilateral / pentagon / hexagon / circle.
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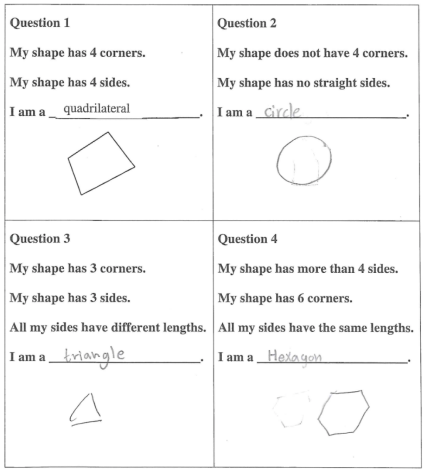
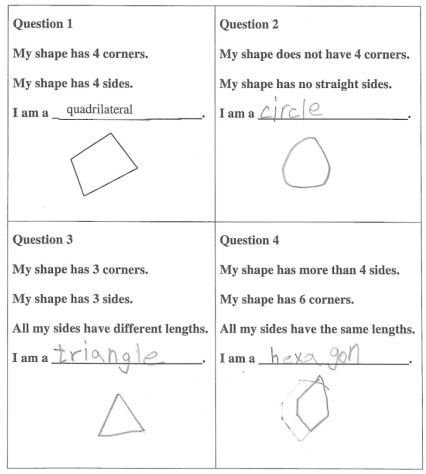
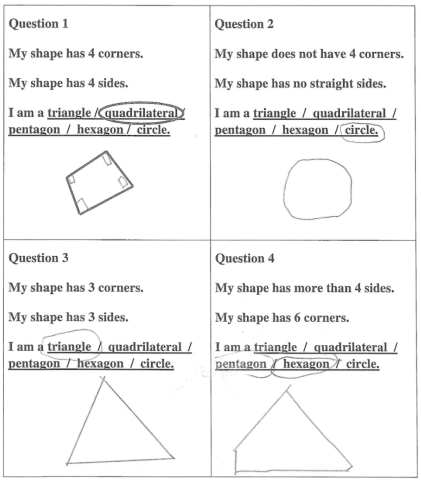


Question 1	Question 2
My shape has 4 corners. My shape has 4 sides. I am a quadrilateral.	My shape does not have 4 corners. My shape has no straight sides. I am a circle.
Question 3	**Question 4**
My shape has 3 corners. My shape has 3 sides. All my sides have different lengths. I am a triangle.	My shape has more than 4 sides. My shape has 6 corners. All my sides have the same lengths. I am a Hexagon.



Question 1	Question 2
My shape has 4 corners. My shape has 4 sides. I am a quadrilateral.	My shape does not have 4 corners. My shape has no straight sides. I am a circle.
Question 3	**Question 4**
My shape has 3 corners. My shape has 3 sides. All my sides have different lengths. I am a triangle.	My shape has more than 4 sides. My shape has 6 corners. All my sides have the same lengths. I am a hexagon.



Question 1	Question 2
My shape has 4 corners. My shape has 4 sides. I am a triangle / quadrilateral / pentagon / hexagon / circle.	My shape does not have 4 corners. My shape has no straight sides. I am a triangle / quadrilateral / pentagon / hexagon / circle.
Question 3	**Question 4**
My shape has 3 corners. My shape has 3 sides. I am a triangle / quadrilateral / pentagon / hexagon / circle.	My shape has more than 4 sides. My shape has 6 corners. I am a triangle / quadrilateral / pentagon / hexagon / circle.

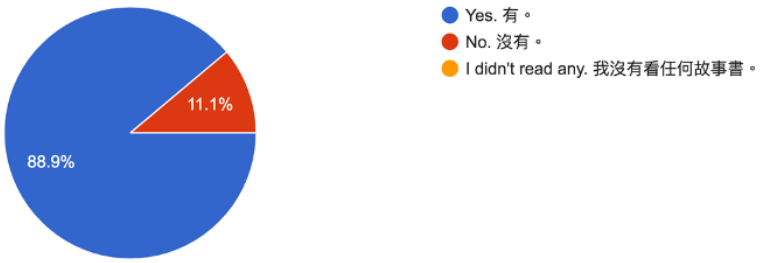
EVALUATION

Less than half of the non-Chinese speaking students were able to learn in an online mode and some students did not know how to answer the questionnaire without teachers' and/or parents' explanation. The response rate to the questionnaire was low.

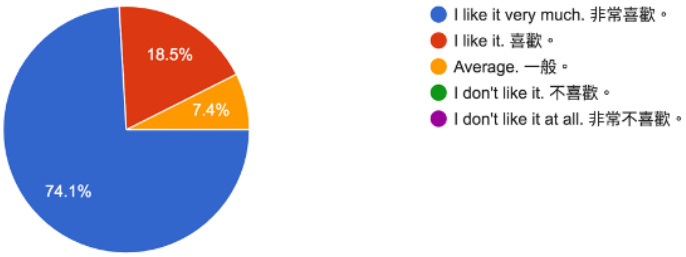
A questionnaire was given to all the students. 27 students responded to the questionnaire and the result is as follows:

No. of respondents (non-Chinese speaking students): 20

After reading the books, do you understand more about 2-D shapes?
看過故事書後，你對平面圖形有更多認識嗎？
27 responses



How much do you like reading mathematics storybooks? 你有多喜歡閱讀數學故事書？
27 responses



A teacher described a conversation with a parent. She said that the parent thought that an oval is a circle before reading the picture book as the parent followed the feature of a circle in the textbook, in which it describes a circle as containing one curve line. In the picture book, it gives non-examples of circles, one of which is an oval. That parent had a conceptual conflict on the meaning of a circle. In this incident, multiple resources and multiple references can also be used as a way in assessment.

RESOURCE

The picture book series 'All About Shapes'
https://www.mathlearningcenter.org/resources/lessons/pre-k-story-collections

REFERENCES

Graham. J. (2004). Creativity and picture books. In P. Goodwin (Eds.), *Literacy through creativity.* London: David Fulton.

Sutherland, Z. (1997). *Children and books (8th ed.).* New York: HarperCollins.