Home, Sweet Comb

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CONNECTED
SCIENCE • TECHNOLOGY • MATHEMATICS
2012 LEVEL 2

Overview

"Home, Sweet Comb" describes a selection of beehives made by people living in different cultures and at different times across the world. It describes the materials the hives were made of, their shapes and structures, and how beekeepers collected the honey stored inside them.

Curriculum context

TECHNOLOGY

NATURE OF TECHNOLOGY

Characteristics of technology

Achievement objective(s)

L2: Students will understand that technology both reflects and changes society and the environment and increases people's capability.

Characteristics of technological outcomes

Achievement objective(s)

L2: Students will understand that technological outcomes are developed through technological practice and have related physical and functional natures.

Key ideas

- Technological outcomes have changed over time, and this can change how people do things.
- Society and the environment have an effect on the technological outcomes people develop.
- The technological outcomes people create have an impact (both positive and negative) on society and the environment.
- All technological outcomes have physical and functional attributes.
- Physical attributes describe what the outcome looks, feels, smells, and tastes like and what it is made from (for example, a drink bottle is made of transparent plastic, is light to carry, and has a lid).
- Functional attributes describe what it can be used for or what it does (for example, a drink bottle can hold water, provides grip, and can be used to drink from).
- Physical and functional attributes are related (for example, the rough plastic on the drink bottle provides something to grip).

MATHEMATICS

GEOMETRY AND MEASUREMENT

Measurement

Achievement objective(s)

L2: Students will create and use appropriate units and devices to measure length, area, volume and capacity, weight (mass), turn (angle), temperature and time.

Shape

Achievement objective(s)

L2: Students will identify and describe the plane shapes found in objects.

NUMBER AND ALGEBRA

Number knowledge

Achievement objective(s)

L2: Students will know simple fractions in everyday use.

Patterns and relationships

Achievement objective(s)

L2: Students will generalise that whole numbers can be partitioned in many ways.

Key ideas

- Some common words have a special meaning when used in mathematics.
- Looking for patterns is an important part of mathematical thinking.
- Some shapes have special properties that enable them to "tessellate".

ENGLISH

READING

Ideas

Achievement objective(s)

L2: Students will show some understanding of ideas within, across, and beyond texts.

Indicators

- Uses their personal experience and world and literacy knowledge to make meaning from texts.
- Makes meaning of increasingly complex texts by identifying main ideas.
- Makes and supports inferences from texts with some independence.

The Literacy Learning Progressions

The literacy knowledge, skills, and attitudes that students need to draw on by the end of year 4 are described in *The Literacy Learning Progressions*.

Meeting the literacy challenges

The following strategies will support students as they engage with the information and ideas in the text. Once they understand what the article is about ("the story"), they will be able to explore the key technology ideas outlined in the following pages.

The *Connected* series includes a range of texts that provide opportunities for students to locate, evaluate, integrate, and synthesise information and ideas.

It is expected that students will read across the range of texts in this *Connected* to develop their literacy skills and their understanding of the topic.

Text characteristics

- Clear structure with descriptive headings
- Some words or phrases that are unfamiliar to the reader, the meanings of which are supported by diagrams and written explanations
- Diagrams that clarify the text and require some interpretation
- A key that enables the reader to access information through symbols.

1. FINDING THE INFORMATION IN THE TEXT

This article begins with a description of a natural beehive and goes on to describe a range of hives built at different times and by different cultures.

The information in the text includes:

- People have been making beehives for a long time.
- People made and make beehives from materials available in their environments.
- Over time, beehives have become more sophisticated as a result of changing technologies and increased knowledge about bees.

PROMPT the students to notice that the types of beehive are introduced in chronological order.

I can see that the natural beehive was the first type and then people started to make hives. The Egyptian ones are the oldest we know about and then the Israeli ones.

PROMPT the students to make connections between the materials the hives are made of and the environments in which they were made.

Both the Egyptian and the Israeli hives were made of clay. Can you locate these countries on the globe or world map? What do you notice about them? (Location, climate, environment)

2. USING THE DIAGRAMS TO CLARIFY THE TEXT

Tell the students that diagrams help to clarify the meaning of the text.

MODEL by thinking aloud about how the diagram on page 11 (top right) provides visual support for the text.

I can see the cylindrical shape of the beehive. If the bees went in and out at this end, the beekeepers must have removed the slab at the other end to get the honeycomb.

ASK QUESTIONS to support the students to use the diagram and integrate information as they are reading.

How does the traditional Ethiopian hive hang on the tree?

Can you see the major difference between the top bar hives and the Langstroth hive?

3. USING THE KEY TO MAKE CONNECTIONS WITHIN THE TEXT

TELL the students that the key provides visual information and **MODEL** reading the key.

This key uses symbols to tell me what materials the hives were made of and whether they were bee-friendly.

I can see that both the ancient Egyptian hives and the Israeli hives were made of clay.

ASK QUESTIONS to prompt students to use the key to make connections between the information about the different hives.

How many of the beehives described on page 11 were bee-friendly? Which types of hives were made of straw?

Exploring the technology

The following activities and suggestions are designed as a guide for supporting students to develop understandings about the nature of technology and technological outcomes.

Key ideas

- Technological outcomes have changed over time, and this can change how people do things.
- Society and the environment have an effect on the technological outcomes people develop.
- The technological outcomes people create have an impact (both positive and negative) on society and the environment.
- All technological outcomes have physical and functional attributes.
- Physical attributes describe what the outcome looks, feels, smells, and tastes like and what it is made from (for example, a drink bottle is made of transparent plastic, is light to carry, and has a lid).
- Functional attributes describe what it can be used for or what it does (for example, a drink bottle can hold water, provides grip, and can be used to drink from).
- Physical and functional attributes are related (for example, the rough plastic on the drink bottle provides something to grip).

Activity 1: *Showing how technological outcomes have developed over time*

Human-created beehives have changed over time. Create a timeline that shows the different kinds of human-created beehives described in "Home, Sweet Comb".

Brainstorm ways that these beehives changed how people looked after bees and collected honey.

Select an everyday technological outcome and develop a timeline showing how it has changed over time. For each stage in the timeline, describe how that version of the technological outcome changed how people lived.

Choose a modern-day technological outcome and compare it with a similar item from the past (for example, MP3 player and record player, car and horse-drawn buggy, computer and typewriter). Use a Venn diagram to show the similarities and differences between these two technological outcomes.

Have the students discuss in groups:

How has the modern day technological outcome changed how people do things?

Describe how these changes are good, bad, or both.

Activity 2: *Exploring the positive and negative impacts of technological outcomes*

Brainstorm the impacts of human-created beehives, completing a table similar to that below, which lists positive and negative impacts on society and the environment.

Brainstorm technological outcomes that have had a major impact on society or the environment (for example, weapons, cars, computers, cellphones).

Have students select a technological outcome from the brainstorm and, in small groups, discuss its impacts on society and the environment, completing a table similar to that below.

Cellphones	Materials used	Performance properties of the materials
Impact on society	People can call friends and family more often.	People call or text instead of spending time together.
Impact on the environment	We save paper and petrol by not communicating by letter. [This is often the most difficult section.]	Cellphones are often not recycled and end up in rubbish.

Activity 3: *Functional and physical attributes*

Explain that all technological outcomes have physical and functional attributes. The physical attributes describe what it looks like and what it is made of (for example, a drink bottle is made of transparent plastic, is light to carry, and has a lid). The functional attributes describe what the outcome can be used for (for example, a drink bottle can hold water, be used to drink from and provides grip).

Have the students select an everyday technological outcome that they are very familiar with, for example, a ballpoint pen.

Ask them to list the physical and functional attributes of that outcome (by completing a table similar to the one below).

	Physical attributes	Functional attributes
Ballpoint pen	- coloured blue	- shows us this has blue ink in it
	- made of plastic	- makes it light to hold
	- has a clip on the end	- to clip onto papers or on a pocket
	- ink comes out over the ball	- makes the ink flow evenly
	- has ridges on it	- for better grip
	- is cylindrical and 120 mm long	- makes it easy to hold.

	Physical attributes	Functional attributes
Top bar beehive	- hole at end	- allows bees to get in and out
	- vertical bars	- allow honeycomb to be lifted out
		- mimic the shape of a natural comb.

MINISTRY OF EDUCATION RESOURCES

www.techlink.org.nz/teaching-snapshot/Y07-10-Middle/Curriculum-activities-Selina-Paul.htm

FURTHER RESOURCES

www.technologystudent.com/joints/hisbike1.htm

www.technologystudent.com/prddes1/hisclk1.html

Exploring the mathematics

Designer Homes takes the shape of honeycomb as a basis for exploring regular polygons, including the relationship between the number of sides and area for regular shapes that have a common perimeter. Students view an example of a tessellation and discuss the benefits of honeycomb cells being hexagonal. It introduces students to understanding mathematical terms, finding patterns of numbers, and exploring tessellations.

Key ideas

- Some common words have a special meaning when used in mathematics.
- Looking for patterns is an important part of mathematical thinking.
- Some shapes have special properties that enable them to "tessellate".

Activity 1: *Exploring the mathematical language*

Discuss the mathematical language in the text. Explain that some common words carry a different or more specific meaning when used in mathematics. In everyday language, "regular" means normal, usual, or average. In mathematics, a "regular" shape is a shape in which all sides are the same length and all angles the same size.

Designer Homes uses a number of other mathematical terms. These include:

- the names of polygons, such as hexagon, octagon
- measurement terms, such as length, angle, perimeter, area
- terms for mathematical processes, such as estimate.

Discuss these terms with the students and clarify them where necessary.

Activity 2: *Exploring the patterns*

The five regular polygons illustrated on page 28 all have the same perimeter. Students can estimate the area of the shapes by counting squares. It doesn't matter whether they count whole squares only or include "half or more squares"; either method will show that shapes with the same perimeter can vary in area.

Looking for patterns is an important part of mathematical thinking. As the students work out the area of each shape, they should see a pattern emerging: the greater the number of sides, the greater the area.

In theory, there is no upper limit to the number of sides a polygon can have. The more sides the polygon has, the more circular the shape will be and the greater its area becomes. Discussing the maximum number of sides that a polygon can have points students towards the concept of infinity (a tricky concept for anyone to grasp!).

A polygon with an infinite number of sides would be a circle.

Activity 3: *Exploring tessellations*

If the same amount of wax is used to create a circular cell and a hexagonal cell, the circular cell will have a greater volume. Why then do bees use hexagonal cells?

Explain that hexagons can be placed together with other hexagons without gaps or overlaps. Patterns like this are called tessellations. It is this tessellating property that makes the hexagon the optimal shape for a honeycomb. By using a shape that tessellates, no space is wasted. More importantly, each cell wall the bees make becomes a wall for two cells simultaneously, which is both economical and efficient.

Not all regular shapes tessellate, although some can be combined with other regular shapes to make tessellations. (See http://nrich.maths.org/4832 for an interactive activity exploring the tessellating properties of regular polygons.) Of the regular polygons that tessellate, the hexagon has the most sides. This means that bees get the maximum cell volume from the wax they produce. If honeycombs had triangular cells, more wax would be needed.

Students can use their knowledge of fractions to explore the efficiency of the honeycomb design.

Give each student four 24 cm strips of paper or light card. Ask the students to partition one strip into 3 parts, one into 4 parts, one into 6 parts, and one into 8 parts. Have the students carefully fold the strips along the partitioning lines. If they tape the ends of each strip together, each student will have a set of regular shapes (triangle, square, hexagon, octagon). Have groups of 4 or 5 students combine their shapes to see which shapes tessellate. Of those that tessellate, which shape creates a tessellation with the greatest area?

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