



SPACE[☆] awareness

WHAT IS TIME?

Build an hourglass to understand what time is and how to measure it.

NEMO Science Museum, ESERO NL / ESA



Temat z programu nauczania

basic concepts of time, instruments

Ważna koncepcja nauki

Earth is a system of systems which influences and is influenced by life on the planet.

Słowa kluczowe

Time, hourglass

Wiek

6 - 10

Poziom kształcenia

Primary School, Informal

Czas trwania

1h

Rozmiar grupy

Group

Nadzór ze względów bezpieczeństwa

Unsupervised

Koszt

Average (5 - 25 EUR)

Lokalizacja

Indoors (small, e.g. classroom)

Umiejętności kluczowe

Asking questions, Developing and using models, Planning and carrying out investigations

Rodzaj zajęć edukacyjnych

Full enquiry

KRÓTKI OPIS

In this activity, students discuss the notion of time and how time can be measured. They build an hourglass to measure time and test it. This activity will allow students to have a better understanding of time and the instruments that can be used to measure it.

CELE OGÓLNE

The goal of the activity is for students to understand what time is and how to measure it.

CELE OPERACYJNE

After implementing the activity, students will be able to:

- name instruments you can use to measure time;
- list different units of time;
- design and make an instrument to measure time and discuss its limitations.

EWALUACJA

- Have students fill in the worksheet provided with the activity. Look at students' hourglass designs.
- After the activity, ask students if and why they think it is important to be able to measure time accurately.
- Ask the students to list the units of time they know and the instruments that allow us to measure time.
- After performing experiments to measure time, ask students to suggest the advantages and disadvantages of using hourglasses to measure time.

MATERIAŁ

To make an hourglass per pair of students:

- Two small light bottles of the same size
- Stopwatch
- A piece of cardboard slightly larger than the mouth of the bottle
- Scissors
- Sticky tape
- Sand (enough to nearly fill a bottle)

Per student:

- Worksheet printout
- Pencil

PODSTAWOWE INFORMACJE

Time allows us to order events from the past to the present to the future. Time is also the measure of duration between two given events. Many instruments have been invented to measure time. One of the first instruments to give the time was the sundial, which used the sun's motion.

Another instrument is used in the activity. The hourglass measures the passage of time. An hourglass is made of two different compartments, often glass bulbs, connected by a narrow tube, allowing sand or other material to go from the upper to lower compartment at a constant speed—thus in a given time. An hourglass works by gravity pulling on the sand so that it falls downwards. Nowadays, we can use a stopwatch to measure the time between when it is activated and when it is deactivated.

PEŁNY OPIS ZAJĘĆ

Preparation

To make an hourglass you will need to make sure the sand is dry. The bottles also need to be dry and not too heavy. Make sure the mouths of each pair of bottles are the same size. Place the materials for the hourglass (bottles, pencils, pieces of card, scissors, sticky tape, and sand) ready at the front of the classroom.

Activity 1: How long does a minute last?

Step 1

Ask the question: What is time? Can you tell what time it is without agreeing on some things beforehand?

Step 2

Organise the students into pairs. Explain that they are going to see how long 1 minute takes. Give student 1 a stopwatch. Student 1 gives a signal when he/she starts the stopwatch. When student 2 thinks that 1 minute has passed, he/she gives a signal and student 1 stops the stopwatch. How much time does the stopwatch show?

Step 3

Explain that they are going to repeat the experiment. Now they have to think of a way to help them make a more accurate estimate of when 1 minute has passed. They could count, or draw lines. Encourage the students to try out their suggestions; then discuss how successful the experiment was. Were they able to make a better estimate the second time? What did they use to help them?

Step 4

The students complete Task 1 on the worksheet.

Step 5

Ask why they think it is important to know how much time has passed. And why is it important to make agreements about time? Come to the conclusion that it is important that everyone uses the same definition when they refer to time. This makes sure we arrive on time for an appointment, for example.

Step 6

Ask the question: 'What ways of measuring time do you know?' If necessary, add the following to their ideas: stopwatch, looking at the position of the sun, or using an hourglass (egg-timer).

Activity 2: Make an hourglass

Step 1

Explain that an hourglass works by gravity pulling on the sand so that it falls downwards. Gravity pulls objects towards the centre of the Earth. This happens at a constant speed when we consider a small distance like in an hourglass, so an hourglass is a reliable way to measure time.

Good to know: long ago sailors used an hourglass to ring the ship's bell every hour and half hour. Doctors used a 15-second hourglass to measure their patients' pulse.

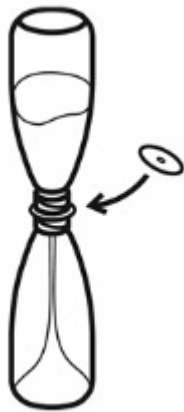
Step 2

Organise the students into pairs. The students examine the materials you have prepared at the front of the classroom and decide how they will use these to make their hourglass. Give each pair of students a pencil. Assist them by asking what an hourglass looks like. What is inside it? And how can this 'flow'? The students complete Task 2 on the worksheet, up to step 5.

Step 3

An example of how you could make an hourglass: cut out a cardboard circle that fits between the mouths of the two bottles.

Make a small hole in the centre of the card. Pour some sand in one of the bottles. Place the card on the mouth of the bottle, and place the second bottle upside down on the first. Stick them together at the middle using sticky tape. Make sure that the bottles used for the hourglass are light to make a stable assembly.



Step 4

Look at the drawings showing the students' ideas. Do they look like they will work? Ask the students how much sand they will use, how large will they make the hole in the card, and how will they fix the bottles together. Note: the larger the hole, the less time it takes for all the sand to run through it. The more sand there is in the bottle, the more time it takes to all pass through the hole. This experiment will only work if the bottles and the sand are perfectly dry.

Step 5

Once the students have created a good picture of their design, they can make their hourglass.

Step 6

The students test their hourglasses to see if they work properly. The worksheet contains some tips on how they can improve their design. Now they complete step 5 of Task 2 on the worksheet. Each hourglass will take a different length of time to empty. Explain that this has to do with the size of their hole and the amount of sand they used.

Activity 3: Use your hourglass

Step 1

Take the students to the playground and encourage them to use their own hourglass to measure how long it takes them to run a certain distance. Mark a start and finish line. One student from each pair gets ready to run. The other student waits for the starting signal, and then turns over their hourglass.

Step 2

How long did it take for the student to cross the finish line? Could they measure it with their hourglass? Was there enough sand to measure the time? Ask the students to swap places and repeat the task.

Step 3

The students return to the classroom to complete Task 3 on the worksheet.

Step 4

Discuss these tasks. Come to the conclusion that it is difficult to measure the exact time with an hourglass. If the hourglass is only partially empty, you can only guess how much time has passed.

PROGRAM NAUCZANIA

Space Awareness curricula topics (EU and South Africa)

Navigation through the ages, basic concepts of time, instruments

National Curricula UK

KS1, science, working scientifically: using their observations and ideas to suggest answers to questions KS1: Year 2, science, use of everyday materials: identify and compare the suitability of a variety of everyday materials. KS2: Years 3 and 4, science, working scientifically: using results to draw simple conclusions, make predictions for new values, suggesting improvements and raising further questions. KS1: Year 1, maths, measurement: compare, describe and solve practical problems for time; measure and begin to record time. KS1: Year 2, maths, measurement: compare and sequence intervals of time. KS2: Year 3, maths, measurement: record and compare time in terms of hours, minutes, seconds; compare duration of tasks.

ZAKOŃCZENIE

After implementing this activity, students acquire an understanding of what causes day and night and comprehend time difference. Students will learn about different units of time and about which instruments can be used to measure time. Students will understand that it is difficult to tell the time without an instrument and will build and test an hourglass to measure time.



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