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Inquiry Based Science Education with ISTIC and LAMAP

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Summary : After having observed their shadows in the school yard, students record the changes in the height and shape of an object according to its position in relation to a source of light. This sequence aims at establishing connections to link an action to its consequences, and to use a model that serves as a pattern to study the parameters that can influence on natural phenomena.

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Objectives : -Position of the shadow with respect to light and the object; -Height and change of height of a shadow according to the relative positions of the source of light and the object; -Shape and change of shape of a shadow according to the relative positions of the source of light and the object; - Horizontality and verticality



Note :

No votes yet

Shadow in the courtyard, shadow in the classroom

List of materials:

Session 1:

- Chalk of different colours
- Strips of paper to compare lengths.

Sessions 2 and 3:

- A ping-pong or tennis ball for the sun;
- A cardboard figurine attached to modelling paste on the table;
- A figurine representing the shadow;
- Some objects of different shapes (cylinders, prisms, cardboard figurine);
- Video cassette box;
- A source of light;
- An A3 sheet pasted on the wall as a screen.

Session 4:

- scientific notebook (small size book of drawing),
- pencil, eraser.

The following people participated in the preparation of this sequence: Éric Ciaravolo, Laurence Etienne, Andrée Dumas-Carré and Sabine Laurent.

Photographs and illustrations: Maryse Garrigou.

Organisation: Each session lasts a little less than one hour. Students work in groups of four or five; the teacher monitors the work of the groups. The work of the groups is pooled under the direction of the teacher.

Session 1: shadows in the courtyard

Required material

- ○ chalk to draw shadows,
- Strips of paper or strings to compare lengths

Familiarisation and exploration activity

Observation of children's shadows (and of objects such as trees, benches) produced with the sun: Observation of the position of the shadow in relation to the sun and the shape of the shadow.

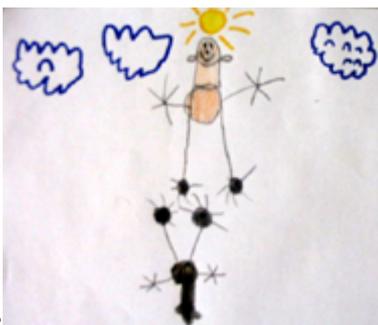
The teacher will draw students' attention to their shadow while standing, crouching and when their knees are bent



Games: running, walking on others' shadows and drawing students' shadows in chalk

It involves familiarisation with a shadow and its changes in shape and size. It is seen that the shadow touches the child, is larger or smaller than the child and it moves with him/her.

Possibility of completing the session with a drawing session: (MS class, Baulne, 91)





(MS class, Baulne)

Reaction: Saulx-les-Chartreux nursery school (91) MGS

Children found it difficult to represent what they had experienced. Most of the time, the shadow was not attached but drawn at the side as a double. Some coloured the shadow like the object or the body. The placement of the source of light on the drawing opposite the shadow was not always obvious. There was a discrepancy between what the child says "the shadow is attached to my feet" and what they draw.

To facilitate the drawing of the body's shadow, we asked the children to draw their bodies in a position of their choice and then draw their shadows on black paper and cut it out. All of them drew a shadow - which was a replica of their body, and most stuck it by the side, some attached it by hand ... This activity should undoubtedly be carried out later during children's education.



Session 2: simulating shadows in the classroom, making horizontal shadows in the classroom

- ○ Phase 1: Activity concerning modelling and reproduction of relative positions

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The instruction is to reproduce the respective positions of the Sun and the object allowing for the obtaining of a shadow with a ball and figurines.

Each group of students has:

- a ping-pong or tennis ball representing the sun,
- a cardboard figurine attached to the modelling paste on the table, representing the object
- a mobile figurine representing the shadow

They have to place the mobile figurine on the table according to the position given to the ball representing the sun.

The teacher then checks the work done and has it reproduced by many children in the group.

It may be useful to refer back to the expression of what was observed "on site" and to mimic this by positioning the student and not the figurine in relation to the position of the ball Sun.

- Phase 2: making shadows in the classroom

The room should be darkened as much as possible:

- a source of light from a 3.5 V lamp and a 4.5 V battery.
- a lamp holder
- a box of photograph film whose bottom has been removed to reduce the light beam (see the file "[artificially making shadows](#)", cycle 3, La Profondine school, Loire-Atlantique on the La Main à la pâte website),
- some objects of different shapes (cylinders, prisms, cardboard figurines)
- a large white sheet placed on the table

In this session, the beam of light is not horizontal, it is tilted downwards.

Note: To raise the source of light, we have fixed it on a video cassette case with modelling paste.

At first, since the lamp is fixed, students must make the shadows of different objects. The teacher shall ensure that students obtain several shadows for each object.

Session 3: Shadows in the class: vertical

shadows

This involves generalising the notion of shadow.

Each group has the same material as in the previous session, but this time the direction of the beam of light is horizontal.

An A3 sheet is pasted on the wall as a screen and a box permits the raising of the object to be in the light's axis.

This time, the shadows should be made on the screen fixed on the wall, and should therefore be vertical shadows. The source of light remains fixed.

The shadows should be modified (first their height then their shape) by moving the object. (It can be rotated, taken closer to the screen or the source of light or taken away from the axis "source of light - screen)

Session 4: graphical representation and written traces

A drawing or schematic representation on a single sheet, will help to review and determine the conditions for obtaining and modifying a shadow for each one.

The material from the previous two sessions is available for the tests required by the representation instruction, but in a single copy. Tests should be "planned". Students will draw in their scientific notebook, with pencils and eraser.

They must draw a horizontal shadow situation with representation of the source, the object and its shadow; then represent the modified situation for obtaining a bigger shadow and a shadow of different shape. They then draw a situation for obtaining vertical shadows.

The two shadows will be compared for the same object (one touches the object, the other does not)

Session 5: writing recipes for shadows

As was done for pancakes, the "recipe" for shadows shall be written in order to explain to another class how to make and modify shadows. The terms of the recipe will be discussed and then dictated to an adult who will take notes.

See also:

Questions for consultants

- [How to address the concept of shadows with nursery I students, based on observations made ??during projection of slides and in the yard? Are there any sequences and/or examples of research and implementation activities? Thank you for subsequent remarks!](#)

Find other questions and the answers given by consultants concerning this subject.

Scientific documentation:

- [Formation of shadows: document explaining the terms drop shadow, grey shadow and shadow cone \(Lighting up a tennis ball with a specific light source\)](#)

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