

## **LESSON PLAN**

**Subject** (physics)

**TOPIC of the module** (shadows)

**Age of students** (11)

**Number of students** (25)

**Objectives** →the ss:

- To be able to characterize an object as transparent, semi-transparent or non-transparent (opaque), according to the amount of light that passes through it.
- To be able to classify various objects into transparent, semi-transparent or non-transparent (opaque).
- To be able to explain that the creation of shadows is due to straight diffusion of light.
- To be able to experimentally discover that the size of a shadow depends on the distance the object has from the light source.

**Arts involved:** (art)

ART: perspective drawing, creation of a painting with the use of tonal gradients and motifs

**Resources** : worksheets, pencils, projector, motifs/patterns

**Time frame** : Two 45' lessons

**Methods of work:** group work

**Procedure / steps**

Initially, using a light source the students capture the shadow of an object on the wall. They experiment with its distance from the light and keep notes regarding the changes of the shadow size.

Then, working in groups and being presented with a number of cross-curricular and experiential activities, the students try to understand the difference regarding the transparency of bodies, as well as to realize through which bodies light can pass by classifying objects of our daily life into the above-mentioned categories.

With the same light source they try to create shadows using materials such as glass, plastic bottles, books, transparent plasticizer film, erasers and thin, light fabric.

A further aim was to help them discover on their own, through action and interaction that the formation/shape of a shadow is due to light's straight diffusion.

More specifically, each group was provided with a variety of figures- cut into equal size- representing trees, houses, children, animals, the sun, rivers, mountains, etc. Then sticking white papers on the board and placing a light source pointing at it, the team members were asked to work together to make their own painting by tracing the shadows on the paper (i.e., drawing on a translucent paper) "playing" with the figures and the light source. It was made clear to them that the result should have a perspective form of design, therefore they had to pay particular attention to the size of the items they added up each time.

It is important to stress here that, awareness of the straight diffusion of light actually takes place when the paper used to draw with the tracing technique is placed far to the right of the light beam of the projector.

The lesson ended with an interactive game in the school yard using the sunlight as a light source. Students, divided into groups again, were challenged to create various 'works of art' with their bodies. More specifically, they were given topics on cards in order to represent 'a work of art'. The winners were the groups that managed to produce the 'painting' within the time- limit allotted.

Sources:

- <https://www.newsbeast.gr/world/arthro/440427/anthropines-skies-zodaneuoun-ston-toiho>
- [https://www.huffingtonpost.gr/triantafyllos-vaitsis/-\\_13529\\_b\\_18136886.html](https://www.huffingtonpost.gr/triantafyllos-vaitsis/-_13529_b_18136886.html)
- <https://www.lifo.gr/team/u13557/37630>

## **Evaluation**

Before the module started, a pre-test was given as a warm-up activity to see the students' basic knowledge on the topic. A brainstorming activity followed, which helped familiarize them with the notions to be taught.

The creation of the painting was quite demanding at the beginning, as the students found it difficult to handle the sizes and the distance of the motifs from the light source. Eventually, however, it proved to be quite challenging, interesting & entertaining because, as time went by, they started becoming more and more familiar with these matters. They also seemed to really enjoy the outdoor activity. In their effort to be the winners they tried hard to excel themselves.

Concluding, it should be pointed out that although the learners were almost unaware of the topic at the beginning, after the above-mentioned teaching/learning process and especially through the interactive 'game-like' activities, they seemed to have consolidated the notions taught, as the post-test also revealed.

PRE-TEST

1. Do you know how the light is diffused from a light source to other objects?  
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2. Can you describe how shadows are created?  
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3. Do you know which factors determine the size and the shape of a shadow?  
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4. Have you ever heard of the following terms: refraction, reflection, diffusion of light?  
Do you know what they mean?  
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5. Do you believe you possess the appropriate knowledge, so as to answer questions  
that can be posed by younger students regarding the above-mentioned  
terms/phenomena?  
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POST-TEST

1. Do you now know how the light is diffused from a light source to other  
objects? Explain.  
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2. Can you now describe how shadows are created? Explain.  
.....
3. Are you now aware of the factors that determine the size and the shape of a  
shadow? Explain.  
.....
4. Can you now explain the following terms: refraction, reflection, diffusion of  
light?  
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5. Do you now believe you possess the appropriate knowledge, so as to answer questions that can be posed by younger students regarding the above-mentioned terms/phenomena?

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