

3-5
years

pri-sci-net



inquire
investigate
evaluate
connect

Science Content:

Physical Sciences: Light and Shadows

Target Concepts/Skills:

Acquisition of experiences with shadows, formulation of an operational definition for shadow

Target Age group:

3-5 years

Duration of activity:

95 minutes

Summary:

Children observe and make comparisons between different kinds of shadows. They work in groups and explore how they can create different shadows with the use of a screen, a light source and objects of different shapes. Then they are asked to explain to the rest of the class what they did and they all formulate an operational definition of how to create the shadow of an object.

Objective:

By the end of the activity children should be able to:

- Observe that a shadow of an object has the same shape as the corresponding object
- Formulate an operational definition for shadows (that is, a sequence of instructions that could be followed by someone so as to form the shadow of an object)
- Conduct observations

Resources:

Opaque and transparent figures, illuminated white backdrop, a light source, a piece of screen and the object for each group, big pieces of paper and markers (to draw their diagrams)

Playing with Shadows

Authors: *Initial Version*

C. P. Constantinou, G. Feronymou, E. Kyriakidou and Chr. Nicolaou
Science in the Kindergarten: a resource for the pre-school educator.

2nd edition

Ministry of Education and Culture, Nicosia, Cyprus, 2004.

Adaptation:

M. Kambouri, N. Papadouris, C. P. Constantinou

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Lesson plan

(with inclusion of teacher notes) - Description of activity

Activity 1 (5-10 minutes): The activity begins with a brief shadow theatre prepared by the teacher by moving opaque figures against an illuminated white backdrop. The story involves two animals playing with their shadows, which appeared when one of these animals accidentally switched on the light.

Activity 2 (15-20 minutes): Children are engaged in a brief discussion on whether it is possible to use any object in a shadow theater or whether there are certain criteria that need to be satisfied. The children are allowed to test certain figures and they are guided to appreciate that shadows can only be formed by opaque objects. Children are then asked to predict what kind of shadows they would find in their school yard. What objects would form a shadow? Children express their ideas and the teacher makes a list of children's ideas.

Activity 3 (15-20 minutes): Then children are taken outside to explore and observe shadows formed by various objects e.g. in the school yard. They play games with their shadows (e.g. shake hands without touching each other, chase each others shadow). At the end they are asked to form pairs. One child in each pair stays still while the other draws a diagram of his/her shadow. They then switch roles.

Activity 4 (5-10 minutes): Children return to the class. All children diagrams are put together and children are asked to match diagrams with individual children (to whom does each shadow belong to?). They realize that it is hard to do this and they try to come up with possible reasons for this (e.g., shadows are not colored; therefore, it is not possible to draw inferences based on the color of the clothes or shoes of the children – shadows indicate the shape of the object; they do not portray details about the characteristics of the object.)

1. Engage (Forming Hypotheses)

Decide which question to investigate (=the challenge)

What do children already know? What are their ideas? (ensure that the question to be investigated is meaningful for the children): Children know what a shadow is, they have already seen and talked about shadows in the past days. E.g. Shadow puppets can be used as a game that will give to children the opportunity

to talk about shadows and experience the creation of a shadow in a playful way (video for teacher available below). Children at this point are identifying possible objects to form a shadow and are encouraged to test them.

2. Inquiry (Designing and running experiments and observations) Plan and conduct investigations in order to collect data

Activity 5 (20 minutes): Children work in groups; they are given a screen, a light bulb (children can use a torch) and various opaque objects and are asked to use these materials so as to form the shadow of the objects. In doing so, they are encouraged to make observations about the shadows (e.g., identify that the shadow has the same shape as the corresponding object). The

children are asked to guide the teacher so as to use the various materials (light source, a piece of screen and the object) so as to form the shadow of a given object. The teacher seeks to misinterpret children's instructions with the intention to help them refine them.

3. Evaluation (evaluating evidence)

Conclusion: use data to construct knowledge and generate evidence.

Demonstrate understanding of concepts and/or ability to use inquiry skills

Activity 5 (15-20 minutes): Based on their experience with the activities they engaged with, children are encouraged to identify the necessary materials for creating the shadow of a given object. The teacher writes (with the children), in a form that could be understood by the children (e.g. using symbols), the instructions (operational definition) to be followed for forming the shadow of a given object.

Ideas for games with shadows: Moving a light source closer to an object can make its shadow grow larger while moving the light source away can have the opposite effect. Experiment and see what happens to the shadows of different objects when you tilt the light source or change its brightness, what happens to the shadow if the light source is dim? Head outside and see how sunlight creates shadows with various objects such as trees, houses and cars.

Video for teacher: **How to make shadow puppets** http://www.youtube.com/watch?v=Fo_pU6GUPHE

Shadow puppets can be used as a game that will give to children the opportunity to talk about shadows and experience the creation of a shadow in a playful way.