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This journal aims to promote the teaching of science with a focus on classroom practice. It provides a means of communication between teachers, consultants and other science educators. Opinions expressed in this publication are those of the various authors and do not necessarily represent those of the Western Australian Science Teachers' Association or the editorial advisory committee.

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Christine Howitt and Elaine Blake (Science and Mathematics Education Centre)
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Introduction

This is the third of five early childhood science activities presented in SCIOS. The activities have been developed as part of the Collaborative Science Project, which was reported in SCIOS volume 45(3), 2009, page 5.

This activity occurs in the context of learning about day and night. Having explored the characteristics of day time and night time, and made a comparison between the two, children are then asked, "Is the grass still green at night?"

This question is very challenging for young children as they can hold many alternative conceptions within the conceptual areas of astronomy and light. This is usually a consequence of them developing their own explanations about everyday phenomena they observe. Many children believe that an object changes its colour once it gets dark. Such thinking is experiential and intuitive, as they can see that an object is a certain colour during day yet dark at night. Children do not tend to associate colour with light; rather, colour is seen as an intrinsic property of an object (Hubber & Kirkwood, 2008). Light is considered a state of being, with daylight existing within a 'sea of light' that includes electric light, fluorescent light and Sun light (Fleer, 1996). Darkness is not considered to be the absence of the Sun's rays, but rather the absence of any artificial light (Fleer, 1996). Many children also believe that light is 'normal', while darkness requires an explanation (Fleer, 2007).

Learning about light and dark provides the foundations for more sophisticated concepts such as transmission, reflection and vision. Exploring day time and night time presents children with an appropriate context to learn about their light and dark world. One major concept they should start to develop is an understanding that dark is the absence of light. To this effect, young children should experience dark places where they can control the light source and direction (Fleer, 1996).

Figure 1: Photo of equipment.

The 'Light and Dark Box' Activity

The following activity, called the 'Light and Dark Box', allows young children to experience darkness in safety, challenges children's ideas about what they can see during night time, and whether an object retains its original colour once it is dark.

This activity is presented in two stages (Determining Prior Knowledge and Challenging Ideas) as a pre-primary classroom conversation between a small group of children and their teacher. The only equipment required is a torch, box (open at the top) with a 10 cm square cut out of the bottom, and grass (or something similar) to observe.

Determining Prior Knowledge

Teacher: Think about night time. Is the grass green at night?

Child 1: It can never be green at night. It always has to be green in the day and it turns burnt when the Sun is shining.

Child 2: It's blue at night time because when it's almost over the stars go blue and they go on the grass. They are shining.

Child 3: I think the grass is dark green because it's night time and the sky is black.

Child 4: The grass is brown because the Moon changes colours.

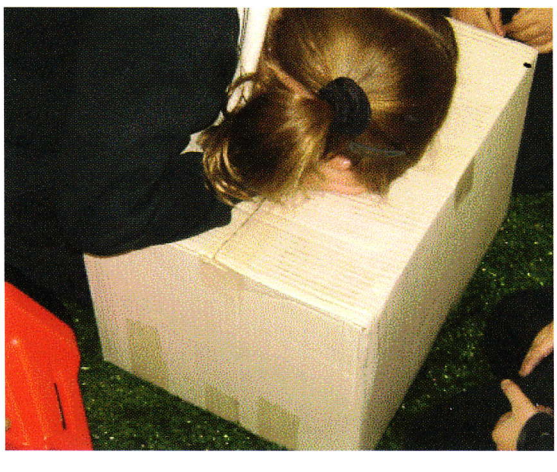

Figure 2: Looking at the 'grass' through the box, with no additional light.

Child 5: The grass is silver because the Moon shines on it.

Child 6: The grass is blue because the sky is blue.

Child 7: The grass is green because that's the colour of grass.

Child 8: The grass is blue because the Sun goes down and the Moon comes up. The Moon is bright and it turns it blue.

Child 9: At night the grass is green and in the morning it will be light green. It's because the Sun goes down and the Moon comes up.

Child 10: At night when the Moon is shining on the grass it is greenish black and it always has to stay black.

There is not only a wide range of colours of grass suggested by the children, but also a wide range of reasons for these different colours. Only a couple of children believe the grass is still green at night.

Challenging Ideas

The box is turned upside down and placed upon the grass. The children place their face tightly against the hole in the box, use their hands to stop any light from coming in, and describe what they see.

Teacher:
What do you see when you look into the box?

Child 1: It's sort of greenish black.

Child 2: A bit dark green.

Child 3: I see black.

Child 4: Dark and light green on there (sides) and dark blue.

The children then repeat this activity with one child shining the torch (to represent the Moon) through the hole while a second child looks through the hole.

Teacher: What do you see now?

Child 1: I can see some green where the 'Moon' is shining on the grass.

Figure 3: Looking at the 'grass' through the box, with additional light from a torch.

Child 2: Some bits around it are dark greenish and bits away are real dark.

Child 3: The Moon shines light at night.

Teacher: Where does the Moon get its light from?

Child 3: The Sun.

Teacher: Yes, you are right, it is the Sun. The Sun's light shines on the Moon at night...we call this reflection.

Child 1: Then the Moon shines so we can see it...but it can only make the grass shiny not green.

Teacher: But let's think...is the grass still green at night?

Child 1: Yes, but the Moon can't shine much more light.

The children are provided with a simple hands-on activity to challenge their ideas. They make a direct comparison of the grass without a torch and then with a torch, while describing what they observe. For some of the children, their idea that the grass turns a darker colour at night has been challenged. Child 1 still holds on to her beliefs that the Moon causes objects to shine at night, and only a certain amount of light comes from the Moon. With such young children their ideas probably will not change, however an activity like this is the first step in moving forward their conceptual development of light and dark and broadening their understanding of their world.

It is also interesting to note how the discussion moved to the Moon and how the Moon 'shines' light at night. The teacher purposefully reviewed a concept that had been covered in class to check the children's understanding on where the Moon gets its light. Thus, day time, night time, light, dark, the Moon and the Sun all became intertwined as the children develop a better understanding of the concepts of light and dark.

Conclusion

This article has shown that the use of an appropriate stimulus to elicit children's ideas (such as the question, "Is the grass still green at night?") followed by simple hands-on activities where the children themselves explore light and dark, establishes a learning environment conducive to challenging young children's thinking. This challenge to their previous ideas becomes the initial step in allowing them to develop a more scientific understanding of the world.

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