



TI-AIE

Observing patterns: shadows and night day

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What this unit is about

All scientific inquiry begins with the skill of observation. Observation is a fundamental part of the scientific method: it is involved in analysing, interpreting and concluding.

This unit looks at ways to help students observe more carefully and systematically so that they can see patterns emerge. The context for the unit is shadows and night & day. This topic is one that students will have formed ideas about prior to coming to school. They will have experienced day and night, observed the sky, and noticed shadows. This unit examines how you as a teacher can build on students' informal learning in the school context.

Safety warning!

Students must be advised never to look at the Sun directly or through a mirror. Sunlight can damage their eyes even if they are wearing sunglasses.

Students need to know the dangers of hazards that they might encounter outside the classroom, and should never investigate electrical equipment, telephones or communications equipment, or play or work in areas where machinery or vehicles are likely to operate.

What you can learn in this unit

- How to develop your students' observation skills and ability to see patterns in data.
- How to plan, organise and manage observational activities to develop a range of observational skills in the context of shadows and night & day.
- How to plan and use opportunities for your students to discuss and question what they see

Why this approach is important

Developing students' ability to observe closely is a fundamental part of effective science education. Children are naturally curious and want to know how the world works, so observing is a natural activity for them. For example, many children (and adults) judge the passing of time and the day by looking at the sky – but what patterns do they notice through their observations? How do they make sense of how day and night happen, or how shadows are formed? How can you organise your students to maximise their learning?

Observing patterns over time is important because it:

- utilises the students' natural curiosity and observational skills, promoting deeper curiosity and engagement

- supports a more scientific approach to observation, looking beyond the obvious features
- can help to develop students' scientific understanding of phenomena over time, such as shadows and night & day
- helps students to recognise the regular patterns of change that occur though a day, a month and a year
- provides opportunities for discussion and questioning, which helps to develop students' understanding.

1 Developing observation skills

Encouraging your students to look more closely and accurately will take time and involves giving them opportunities to observe and investigate their world. However, it is a worthwhile investment as it will make them more interested and enthusiastic about their world and in science as a subject.



Figure 1 Developing students' observation skills will improve their learning.

There are a number of activities that you can use to help your students observe and learn about shadows. These include shadow puppets, a shadow game where students have to catch someone by stepping on their shadow as well as more methodical investigations of shadows. For younger students, encouraging them to play with such ideas is important before they meet the more accepted ideas of how shadows are formed and change shape.

Through playing, students begin to construct their own ideas about what is happening – these will not all be the same for each student. Your role is to develop, extend and challenge their thinking to accept what really happens. To do this, you will also need to provide opportunities for them to talk together about their ideas.

Case Study 1: Observing shadows during the day.

Mrs Latika, a Class V science teacher, tried this activity with her students. Here she explains what she did

At first, I wanted to find out if my students understood how shadows are formed. I started by asking them a riddle: 'What follows you around all day, but sometimes disappears?' They guessed it was a shadow. I asked them what made their shadow. I used a torch and showed them how a shadow is made when an object blocks a light source. They then made their own shadows in the playground using the sun, and in the classroom using a torch. The students really enjoyed making funny shapes and animal shadows using their hands and seeing how they could change the shape of the shadow by moving the torch.

In the next lesson, I asked the students 'Does the shadow stay the same through the day?' Some of them had noticed they change, but some students had not. I asked 'How do they change?' They weren't too sure exactly how they changed, so I asked them to work in small groups to discuss how we could investigate whether shadows changed and how they did change. The discussion was very lively and they had lots of ideas as to how we could observe the shadows. In the end, we decided it was easiest to observe the shadow of an object in the playground at different times of the day to confirm our ideas.

The groups chose their object and took a piece of chalk and a notebook and pencil out, as well as a ruler. In the playground they made their shadows and marked the spot where they did the measuring (so that they could go back to the same spot each time) and drew the shadow on the ground with their chalk [Figure 2]. Some students did their shadows on the hard ground where the chalk didn't work. They decided to use a stick to draw the shadow on the ground and then did their measurements. The students measured the length and width of their shadows and noted down the time of day. They also noted where the sun was in the sky, although I made sure to tell them not to look at the sun directly. One person in each group drew the shadow in their notebook and put in the observations they had made. During the day, we went out another three times to do more measurements. I noticed how much they talked about what they were doing and shared their ideas about what would happen over the day. I also took photos of them at work and of their shadows over the day for them to see later in order to compare and identify the changes.



Figure 2 Drawing shadows with chalk.

At the end, I asked the students to look at their drawings and observations and discuss what they could deduce. Most of the students understood that the shadows changed and also moved around, and that it was the position of the sun in the sky that caused changes to shadows. Others found it easier to see the difference from the photos on my phone.

