

## Appendix 6

### How to write questions for investigation

#### Introduction

Scientific inquiry and investigation are focused on and driven by questions. Some questions are open to scientific investigation, while others are not. Students often experience difficulty in developing their own questions for investigation.

This appendix explains the structure of questions and how they are related to variables in a scientific investigation. It describes an approach to developing questions for investigation in *Beneath our feet* and provides a guide for constructing investigable questions with your students. Developing their own questions for investigation helps students to have ownership of their investigation and is an important component of scientific literacy.

#### The structure of questions for investigation

The way that a question is posed in a scientific investigation affects the type of investigation that is carried out and the way information is collected. Examples of different types of questions for investigation include:

- How does/do...?
- What effect does...?
- Which type of...?
- What happens to...?

All science investigations involve **variables**. Variables are things that can be changed, measured or kept the same (controlled) in an investigation.

- The **independent variable** is the thing that is changed during the investigation.
- The **dependent variable** is the thing that is affected by the independent variable, and is measured or observed.
- **Controlled variables** are all the other things in an investigation that could change but are kept the same to make it a fair test.

An example of the way students can structure questions for investigation is:

What happens to \_\_\_\_\_ when we change \_\_\_\_\_?

dependent variable                      independent variable

The type of question for investigation in *Beneath our feet* refers to two variables and the relationship between them, for example, an investigation of the variables that affect the size of a model rock ball. The question for investigation might be:

#### Q1: What happens to the water erosion of soil when we change the angle of the slope?

In this question, *the water erosion of soil depends on the angle of the slope*. The *angle of the slope* is the thing that is **changed** (independent variable) and the *water erosion of soil* is the thing that is **measured or observed** (dependent variable).

#### Q2: What happens to the water erosion of soil when we change the type of soil?

In this question, *the water erosion of soil depends on the type of soil*. The *type of soil* is the thing that is **changed** (independent variable) and *water erosion of soil* is the thing that is **measured or observed** (dependent variable).

#### Developing questions for investigation

The process of developing questions for investigation in *Beneath our feet* is to:

- Provide a context and reason for investigating.
  - Pose a general focus question in the form of: 'What things might affect \_\_\_\_\_ (dependent variable)?'
- For example, 'What things might affect the water erosion of soil?'
- Use questioning to elicit the things (**independent variables**) students think could affect the (**dependent variable**). For example, the angle of the slope, the type of soil, the amount of soil, how the water falls on the slope, the presence of plants).
  - By using questions, elicit the things that students can investigate, such as the angle of the slope and the type of soil. These are the things that could be changed (**independent variables**), which students predict will affect the thing that is measured or observed (**dependent variable**).

Each of the independent variables can be developed into a question for investigation.

- Use the scaffold 'What happens to \_\_\_\_\_ when we change \_\_\_\_\_?' to help students develop specific questions for their investigation.
- Ask students to review their question for investigation after they have conducted their investigation and collected and analysed their information.
- Encouraging students to review their question will help them to understand the relationship between what was changed and what was measured in their investigation. It also helps students to see how the information they collected relates to their prediction.