

## 6.2 How to Differentiate Experiments and Investigations

Experiments and investigations form an extremely valuable component of learning about science. Experiments and investigations offer students concrete learning experiences, opportunities to develop manipulative skills and safe work practices, while also encouraging the development of skills in observing, measuring, recording, calculating, analysing, testing and presenting information.

The **Skills Pathways** approach outlined here enables students to record their experiments and investigations at whatever level they are working at. This approach can be used with individuals, groups or whole-classes within special settings and within mainstream schools.

All students are provided with one of four templates (available in the *Experiments* section of this resource pack). The first template is suitable for introducing students to experiments and investigations. As a student becomes proficient, they can progress onto the next sheet when carrying out experiments. This stepped approach gradually introduces scientific terms to students and finally culminates with template D, which prepares students for carrying out and completing coursework B of the syllabus.

On the four templates, there are spaces in which students can enter their answers. You will have to decide on the best way for your students to fill out the template, which allows your students to work at a range of levels.

Students can be provided with typed answers and diagrams, which they can stick onto the template. An extension of this approach is to offer your students a range of possible answers for each question. This supports students who are not ready to offer their own ideas. It also supports students that may experience problems with writing. Students who experience difficulties with reading could have the answer choices read to them. Alternatively, your students may write or word-process their answers as appropriate. These approaches can also be used to support students to complete the worksheets in this resource pack.

This gradual skills pathways approach of introducing the four templates to students, as appropriate, and providing alternative formats for students to complete the templates, enables every student to progress to a stage where they require less support and are encouraged to generate their own ideas and answers.

The learning outcomes outlined in the syllabus cannot be achieved by students all at once. This is particularly true in the case of experiments and investigations, which rely on students developing a range of specific skills. The use of the four experiment templates (and use of alternative formats for template completion) acknowledges the progression in skill acquisition that students may experience. Table 1 below identifies the skills pathways that students may follow as they learn to investigate.

A skills pathway is an approach to student development that identifies key skill areas for carrying out investigations. The pathway is designed to help teachers to support students at various stages of the pathway. The essence of using this approach is that all students are encouraged and supported to extend their skills and knowledge by being provided with opportunities to progress along the various skills pathway as appropriate. A skills pathway may form a focus for creating student roles during co-operative learning or could even be used for target setting or formative assessment with individual students.

**Table 1: Skills Pathways in Investigations**

<b>Skills</b>	<b>→ Progression →</b>			
<b>Planning</b>	Respond to questions  Brainstorm  Use concrete experience	Use some scientific terms  Ask questions  Identify hazards  Make predictions	Turn ideas into questions that can be investigated  Suggest variables  Use various sources to find information	Use scientific terms regularly  Realise the limitations of investigations  Produce a detailed plan of an investigation
<b>Obtaining Evidence</b>	Use equipment with support  Use everyday terms	Use equipment safely  Attempt fair testing  Make simple measurements and observations	Identify variables  Keep fixed variables constant  Take accurate measurements	Use fair testing  Decide on the number of measurements  Use equipment appropriately
<b>Analysing Evidence</b>	Draw/discuss work in everyday terms  Record (with support) in tables provided by the teacher	Compare results  Record independently in tables provided by the teacher	Use different ways to display results  Make statements about what the results show	Present results clearly  Explain results clearly
<b>Evaluating Evidence</b>	Make comments about the results	Suggest how to improve an investigation  Recognise fair tests  Use some scientific terms	Describe observations  Draw conclusions from results  Suggest further investigations	Give reasons for improving an investigation or conducting further investigations  Evaluate results appropriately