TI-AIE

Practical work and investigations: teaching gravitation to Class IX
Secondary Science

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What this unit is about

Practical work is an important aspect of science education. It includes a range of activities and is also used for a range of purposes, such as:

- illustrating a concept or idea to help students generate arguments from evidence in the process of knowledge construction
- developing practical, manipulative laboratory skills and learning how to use science equipment such as a microscope
- developing observational skills, such as the structure of a cell or observing changes on heating a chemical
- developing specific science enquiry skills, such as devising suitable tests or examining evidence critically (in science investigations)
- developing experience and understanding of ‘the nature of science’ and how scientists work.

The National Curriculum Framework (NCERT, 2005) for science says that the science curriculum should encourage inventiveness and creativity, and that ‘inquiry skills should be supported and strengthened’ (p. 49). Practical work, and in particular investigative approaches to science, can help your students to learn about how scientists work and to develop their own enquiry skills.

This unit is about using practical approaches – particularly investigative practical approaches – to help students to learn about gravitation. The strategies and techniques that you will learn in this unit will apply to other topics as well.

What you can learn in this unit

- How group practical work can support student learning about gravitation.
- The importance of investigative approaches to practical work.
- How to plan for effective investigative work.
- How to evaluate the effectiveness of practical work.

Why this approach is important

Science is a practical subject. Although practical activities can help students to learn, careful planning is required to make sure that they are effective. Some practical activities may provide opportunities for students to practise standard procedures, but do not require or promote much thinking about scientific concepts or understanding of the nature of science, for example. This unit will help you to make sure that your students use practical activities as an opportunity to think about scientific ideas and processes, as well as learning practical skills.
Investigative practical work poses questions: 'What factors affect ...?’, 'Is there a relationship between ...?’, 'What are the likely causes of ...?' In order to carry out an investigative task, students have to think about related science concepts and apply them, as well as using science skills and techniques.

The emphasis in this unit is on making sure that the practical work that you do is purposeful and supports learning about science and about how scientists work. It is important to plan practical work carefully so that it does not increase the time taken on a topic without increasing the learning.

1 What kind of practical work?

Effective practical work is practical work that leads to more effective learning. It is both ‘hands on’ and ‘minds on’. There are several broad types of practical work, each with its own benefits and planning issues:

- demonstration
- structured practical
- ‘rotating’ practical or ‘circus’ practical
- investigation
- problem solving.

With the exception of demonstrations, all the types of practical work involve students working in pairs or groups. Investigations and problem solving practicals give students the opportunity for independent, creative work, while structured practicals are good for becoming familiar with and practising standard techniques. Circus practicals can help reduce the need for equipment. You can find more about each type of practical work in Resource 1.

The choice of what kind of practical work to use depends on the purpose of the activity as well as on time and resource constraints. ‘Purpose’ or ‘what students should learn’ refers to the conceptual science knowledge or laboratory procedures. It also refers to investigative skills, presentation and communication skills, and group working skills: all skills need to be taught and practised.

It is useful to spend time teaching students a set of routines for carrying out group practical activities. This will enable students to spend relatively more time on the key purpose of the activity as they will know what is expected of them in a practical activity.

An effective group practical lesson depends on effective planning before the lesson; you need to select the best type of activity and also think about timing, organisation and what you will do during the practical activity.

For any activity, it is important to ask ‘What do I want students to learn?’ and ‘Where does the learning happen in this activity?’
1 What kind of practical work?