

Practical skills tracking

This resource accompanies the article **How to help students develop practical skills**, part of the **Teaching science skills** series from *Education in Chemistry*, which can be viewed at: rsc.li/3EDMvQP

Learning objectives

- 1 Obtain clear, meaningful feedback on competency in specific practical skills
- 2 Track progression through practical activities
- 3 Understand how to improve competency in a specific practical skill

This resource is based on the Common Practical Assessment Criteria (CPAC) used to assess practical skills across A-level specifications in England. The criteria may be a useful guide for other contexts, therefore a version without reference to the CPACs is included. Alternatively, you could amend the editable files to include practical skills specific to your curriculum or context.

Introduction

In order to improve learners' practical skills it is essential they

- appreciate what they are assessed on and how
- recognise what competency looks like
- understand how to improve
- are given multiple opportunities to practise these skills.

Using a model, feedback, reapply loop is a highly effective way to achieve this, you can find more information about this approach in the article linked above.

This resource will help you to ensure that feedback given to learners is meaningful. They can link that feedback to specific targets to help them improve practical skills when approaching similar investigations, as well as translate skills and targets into other types of practical work.

Scaffolding

Learners may need to receive additional guidance on some of the specific skills: producing results tables (4b), risk assessments (3a), structuring follow-up calculations (5a) and how to cite scientific research (5b). Resources to help you support these skills are linked here: rsc.li/3J1Ve1T. Support could be provided as step-wise instructions. Particularly effective is to show learners examples of work at different levels; for example, giving a results table which achieves 'P' rather than 'A' and exploring the reasons why.

How to use the resource

Many of the practical activities learners carry out as part of their A-level or equivalent course do not occur in isolation; they are integrated within each topic. For example, titrations are carried out throughout amount of substance topics, but are revisited in the contexts of redox and transition metals. This allows opportunities for learners to practise the skills within that group and to see progression of their competency within each skill.

Suggested sequence:

1. Give learners the target tracker for a group of practicals (slide 3 or 5) – for example, one tracker for titrations, one for calorimetry work etc.
2. **Model** the practical to learners and ask them to consider how they would assess your competency. This is an opportunity to show learners what the levels mean in practise – for example, failure to fill a burette at an appropriate height would result in 'N' for CPAC 3b. This allows you to discuss with learners how CPACs are applied.
3. Learners carry out the activity. **Assess** the relevant competencies and **feedback** using the target diagram. This works best if you circulate and mark their grid throughout the practical as you see them completing the task, as this allows 'live' feedback for learners. CPACs 4 and 5 focus primarily on recording and evaluating results, and so can be assessed after the completion of the task. Note: not all CPACs will be assessed at each practical select those that are most relevant.
4. After receiving their feedback, learners **reflect** on their learning and set themselves specific **targets** (slide 4 or 6). For example, they may only have had time to collect one set of results, so might set themselves the target, 'Achieve concordant results (within 0.10 cm³ of each other) and calculate a mean titre.' This is a good opportunity to display examples of work for learners to discuss and assess – for example, showing them the difference between an 'A' results table and a 'P'.
5. Before learners complete the next practical activity in a group, they **review** the target grid and reflection form to remind themselves of the targets they have set.
6. Feedback from the next practical is added to the target tracker.
7. Learners reflect on their **progression** across the practical activities in a group. This is an opportunity for them to make any key notes of the important aspects of the practical activity to help them scaffold answers for exam-style questions, eg how is a titration used to find an unknown concentration?
8. **Peer and self-assessment** (student sheet) - once learners have built an understanding of the CPACs and how they are applied to practical work, they can self- and peer assess work against using the assessment levels. For example, they could assess their peer's risk assessment, referencing and results tables.