Lesson planning template

Education in Chemistry
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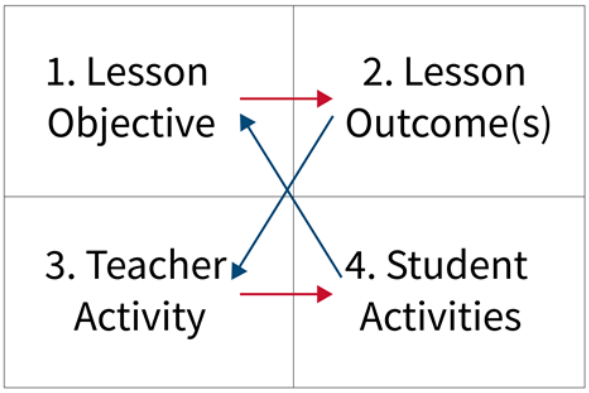
Create lessons with a logical flow and improve your students' learning outcomes

> Use this template alongside the *EiC* articles 'How to plan a brilliant lesson as a trainee teacher' and 'Remember how we learn'.

This template encourages you to plan a lesson by starting with an objective and translating it into the subject knowledge and skills students need to know to be able to fulfil the objective before planning your teacher and student activities. This means working backwards from the end of the lesson and trying to break the objective down into its constituent parts. When each activity is finished, you should check for understanding by referring back to the relevant lesson objective before moving on to the next transition in the lesson.

Use the flow from objective, outcome, teacher activity and student activity to create a logical sequence through the lesson.



Each part of the template feeds into the rest: the lesson objective informs the lesson outcome, which in turn informs the lesson activities. When checking for understanding after a student activity, you should refer back to the lesson objectives.

How does it help you?

This approach ensures that you are focusing on what the pupils are going to learn as opposed to what they are going to do. It also helps to break the lesson down into chunks and identify a sensible sequence through the lesson so that each transition builds on the identified learning outcomes.

The subject knowledge of the lesson outcomes is the only constant among all the variables within the classroom and identifying this explicitly not only helps chunk and sequence the lesson, but can also be used as the focus point for discussion after a lesson observation. This allows more subject-specific discussion, which can develop your conceptual understanding and may promote further improvements in the following lessons, especially if teaching outside of specialism. This means the impact is immediate because it can inform planning of the next lesson.

It is something that you might use at the start of your training as you get to grips with the lesson planning process, but, as with all scaffolds, it should be faded out over time as your skills improve.

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Lesson Objective Sentence to state what the students will learn:	**Lesson Outcome(s)** The learning objective broken down into discrete chunks: 1. 2. 3. <u>Misconceptions:</u>
Teacher Activity	**Student Activity** **Check understanding:**
Teacher Activity	**Student Activity**
Teacher Activity	**Student Activity**

Instructions for using the template

Fill in the template with the following:

1. **Lesson Objective:** A sentence to state what the students will learn. It could be a question or a statement of intent.

   What do you want the students to learn? Avoid multiple objectives to prevent overwhelming students' working memory. One sentence is often enough to state your intentions, but it needs to be specific to the topic you are teaching and not generic.

2. **Lesson Outcome(s):** The learning objective broken down into discrete chunks.

   What should students specifically be able to do/know by the end of the lesson? Identify and number the required knowledge and skills needed to meet the lesson objective. These should be specific and identify the knowledge that the students will be exposed to during the lesson.

3. **Teacher Activities:** Teacher activities related to each lesson outcome.

   The teacher activities should relate to the learning outcomes. What will you do in order to achieve the desired outcome? How you choose to translate the subject knowledge in the outcomes is down to you, but use the principles of cognitive science to underpin your decision making. For example, more teacher-led instruction might be beneficial at the beginning of a topic to reduce demand on students' working memory.

4. **Student Activities:** Student activity related to each lesson outcome.

   What will students do to achieve the outcome? This should reflect the teacher activity and be designed to encourage students to develop an understanding of the lesson objective.

   Once the activity is complete, check students' understanding against the learning objective. Then either move on to the next outcome or adapt to the needs of your students (eg, re-explain).

   Continue with the same approach for the following outcomes and activities.

Example

With this partially completed lesson plan for an 11–14 science lesson on chromatography, you see how the flow through the lesson has been structured, maintaining a focus on the lesson objective and the explicit nature of the lesson outcomes.

Please note, this is not THE way to carry out this lesson, but a way that models the importance of writing the objective and outcomes first to demonstrate that your subject knowledge is secure before planning the activities. Each activity follows a logical sequence, there are opportunities to check for understanding and of course it should be tweaked to match the students in your own setting.

Checking the National Curriculum for prior learning, separating is identified in the Year 5 programme of study in the topic Properties and changes of materials: 'use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating'. However, as chromatography is not mentioned here, it is possible that your lesson might be the first time students will have come across it.

Lesson Objective **Sentence to state what the students will learn:** Explain the separation of the dyes in a black felt tip pen using chromatography. Next lesson: Carry out further investigations on colours of other inks, food dyes or leaves (Smarties, M&Ms or Skittles are good for this)	**Lesson Outcome(s)** **The learning objective broken down into discrete chunks:** **1.** Chromatography is a separation technique used to separate mixtures into their components (separating more than one solute from a solution – ink and paint are two good examples). Chromatography can be used to test to see if a substance is made up of what the manufacturer states. **2.** A water-soluble black felt tip pen ink is made up of different coloured dyes. The water (solvent) dissolves the dyes, which will travel at different rates up the chromatography paper. The paper can be called the stationary phase and the water is called the mobile phase (it moves through the paper). Some dyes will travel through the stationary phase faster because they are more soluble and so the dyes separate and become visible. **3.** Experiment using paper and a black felt tip pen to show the different dyes. The paper is called a chromatogram. Analysis of the chromatogram. **<u>Misconceptions</u>** Distillation is another way of separating solutes but is not appropriate for this activity.
Teacher Activity Activate prior knowledge – have a beaker of water and tip some sand into it. Ask students how they would separate the sand and water. Now do the same again with sugar and water.	**Student Activity** Discussion about water and sand with ideas put on the board – might come up with the terms insoluble, solution, filtration or evaporation.
Teacher Activity **1)** Show the students a black felt tip pen and tell them that the black ink is made up of more than one dye. Explain that the students will be doing a separating technique called chromatography, using examples of ink and paint (can mention pigments in leaves if you want to). We can use chromatography to see if more than one solute has been used to make an ink dye (good to keep the focus narrow at the moment).	**Student Activity** **1)** Students listen to the teacher's introduction. **Check understanding:** After explanation, teacher asks students some questions: What is the process called? Can anyone spell chromatography? What types of substance can be separated in this way?
Teacher Activity **2)** Call the students to gather round and model how to set up the chromatogram and show them what is meant by the stationary and mobile phases.	**Student Activity** **2)** Students watch teacher demo.

(In advance teacher could make a chromatogram with a black dot of permanent ink which is not soluble in water and ask one group to do this one instead.) - Using a **pencil** draw a baseline on the paper about 2cm from the base. (Ask students why you need to use a pencil.) - Transfer a small dot of the felt tip pen ink to the middle of the baseline. Blow on the dot until it is dry and add another dot. Do this 3 times (but this depends on what ink you are using so practice it). - Collect a beaker and add water up to a depth of about 1 cm. - Attach the chromatogram to a splint with a paper clip and suspend in the beaker. Make sure the chromatogram is not touching the bottom of the beaker. - Wait until the solvent has risen up the paper to about 1 cm from the top (students need to look carefully to judge this so be explicit). Keep reminding students about the steps; maybe have them on the board as well in a clear font and same images as you have used in the practical.	Students discuss why you use a pencil to draw the baseline. After watching demo, either in pairs or by themselves, students carry out each step. Teacher can get students to do it one step at a time (but it does depend on the group). **Check understanding:** Walk around the room as the students carry out the experiment asking questions like: What is the baseline? Show me the solvent? What is the stationary phase? What is the mobile phase?
Teacher Activity **3)** If you have a visualiser or are able to take photos of the students' work, project the images onto the board and use these to ask questions about what happened. Compare students' chromatograms to the one with the permanent ink to generate discussion. Outcome should be that if the ink is soluble in water it will move up the paper. The more soluble the dye the quicker it will move up the paper.	**Student Activity** **3)** Students are answering questions so that you can confirm that they have noticed that the black felt tip pen ink is made up of more than one dye. **Check understanding:** Check understanding of how to do the practical by asking students to sequence the steps which have been muddled up / ask them how they would now plan to investigate food dyes of smarties, M&Ms etc / do a forged cheque or forensic science investigation.
Teacher Activity End the lesson – either ask questions relevant to the outcomes or if the students are preparing an investigation just collect the books in. Every lesson does not have to be taught in exactly the same way.	**Student Activity** Answer questions using whatever method the teacher has decided.