

Using demonstration: food



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Video resources

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What this unit is about

Teacher demonstration involves showing your students an experiment, process or phenomenon. It is a strategy that is often used in science teaching. This unit aims to help you to develop your understanding of how teacher demonstration can be used effectively, in this case when teaching about food.

You can use teacher demonstration for a variety of reasons. How you plan and conduct a demonstration will have a significant impact on how your students respond and learn from the experience. Effective demonstration is not simple to use effectively in teaching but the impact on students' learning can be immense. The unit looks at the different purposes of demonstration, the teacher's role in managing the demonstration and the implications for planning. It provides you with the opportunity to evaluate the impact of using demonstrations on your students' learning.

What you can learn in this unit

- To use demonstration for different purposes, for example, when teaching about food.
- To identify issues when managing demonstrations.
- To plan more effective demonstrations that engage students and support their learning.

Why this approach is important

When you are learning something new, such as cooking a dish or operating a machine, it can be helpful to watch someone demonstrating how to do the same task. Demonstration may appear to be a simple teaching strategy. However, the teacher plays a crucial role in involving students and maximising what they learn from it.

Teacher demonstrations are important because they:

- provide students with experiences of real events, phenomena and processes, helping them learn
- raise students' interest and motivation
- enable you to focus students on a particular phenomenon or event, such as the starch test for foods
- can be used to develop and challenge students' understanding
- can help students carry out their own practical work more effectively.



Pause for thought

Think of the demonstrations you do or have done when teaching. Why do you use them? How do your students react to them?

1 Why use demonstrations?

For your students to be fully involved and participating actively in lessons, you may think that they should always learn by doing. Certainly students should be given the opportunity to carry out practical work in science themselves. This gives them the opportunity to develop skills in handling and using equipment, making decisions, collecting data and actively thinking about what they are doing and learning.

Demonstrations offer useful opportunities for purposeful participation in learning that can enhance understanding of the concepts given in the textbook. Leading science educators make the point that there

is always a place for an 'interesting, sometimes unforgettable, demonstration that may form an important episode in a student's learning' (Wellington and Ireson, 2012).



Pause for thought

- What reasons might you have for choosing a demonstration rather than letting students do their own practical work?
- Think about the class practical work and demonstrations that you have done or do. What do you think are the advantages of each for the students?

A demonstration provides a shared experience that allows you to focus your students on particular aspects that they might otherwise miss. You can use demonstrations to support your explanations and scaffold your students' understanding. For example, when teaching about food, a demonstration could develop students' observations on how food changes when it is cooked.

There are other good reasons why students cannot do the practical work themselves. For example, with large numbers of students, the time, space and resources required may not be available. As a teacher, you have to use your professional judgment to decide when a demonstration is appropriate. You need to justify that decision in terms of your students' learning, rather than on what is easiest for you as the teacher. Not all processes and phenomena lend themselves to classroom demonstration; some may be too complicated or lengthy to be practical in the classroom environment.

For your students, demonstration has the potential advantage of being 'better, more visible, clearer and with more impact than a class experiment' (Wellington and Ireson, 2012, p. 165). However, it may mean that students are less actively involved, do not learn a great deal and get bored. The question is, then, how can you as the teacher maximise students' participation, support their learning and capture their interest?

Part of the answer is making sure that you are clear about the purpose of the demonstration and know what you want it to achieve.

Demonstrations have a number of possible purposes. These can be categorised into three broad types:

- to illustrate a phenomenon, concept, law, theory or process
- to motivate and stimulate, arousing students' curiosity prior to teaching
- to help students articulate and explore their existing ideas.

All of these are important and a single demonstration may achieve more than one. The purpose will affect how you plan and carry out the demonstration.

Case Study 1: Cooking food

Food is a topic that interests children. It is something that is part of their everyday lives and an important part of their cultural heritage. It is relatively easy to make teaching the topic of food relevant to students' experience and future lives. Younger children might be introduced to food in the context of the home. In this case study, Mrs Rawool teaches a class of young children about the changes that happen when food is cooked.

I included a demonstration of cooking different foods – for example, rice, spinach, roti and vegetables – to get them interested and observe more closely. First, I got the students to look at the foods before they were cooked and asked them to describe them. I wrote the words they used on the blackboard. During the demonstration of the cooking, I asked the students questions to keep them focused and interested. I also

let the two students who are visually impaired feel the foods. They gave some different words to describe them that I wrote on the blackboard.

This is an excerpt from my lesson:

Mrs Rawool What is the rice like before it is cooked?

The students gave descriptive words and I put the words on the blackboard. I encouraged the students to consider colour, shape and texture and used questions to get them to look at the food more closely. For example:

Mrs Rawool What colour is it?

Student White.

Mrs Rawool Is it white like this? (*I pointed to a white object.*)

Student No, it's browner than that.

Mrs Rawool Good. Let's see what happens as the rice boils. (*I put rice into boiling water.*)
What do you think will happen?

Student It will get whiter.

Mrs Rawool How do you know?

Student Because my mother cooks rice at home.

Mrs Rawool Hands up if you like eating rice.

The students all put their hands.

Mrs Rawool Who likes to eat rice before it is cooked?

The students' hands all go down. They laughed and made faces, suggesting that this was a silly idea.

Mrs Rawool While the rice cooks, we will look at the spinach. What is spinach like before it is cooked?

I put the spinach into a bowl and students answered the question. I put their answers on the blackboard.

Mrs Rawool Who has eaten cooked spinach? What happens when it is cooked?

The students contributed their knowledge based on their experience at home. I cooked the spinach and the students watched intently as it changed. I kept them focused on what was happening by asking questions such as:

- 'How has the spinach changed?'
- 'How did the rice change?'
- 'What was it that made the food change?'
- 'Which food changed the most?'
- 'Why do we cook food?'



Video: Using questioning to promote thinking

<http://tinyurl.com/video-usingquestioning>

You may find it useful to now look at Resource 1, 'Using questioning to promote thinking'.



Pause for thought

- Think about Mrs Rawool's demonstration. What was/were the purpose or purposes of it? What did she do to achieve them?
- How were the students involved?
- What do you think the students learned from the demonstration that they would not have done if Mrs Rawool had relied on the textbook alone?

2 Students' engagement and learning

An important purpose of any demonstration is to help students to learn. In Case Study 1, Mrs Rawool's students learned about how different foods change when cooked, and it also helped them to develop their observation skills. Mrs Rawool used her skills in questioning to extend her students' thinking. For example, she asked the student how they knew the rice would go white, rather than just accepting the student's answer.

However, although demonstration may enable concepts and processes to be observed directly, you cannot assume that students will develop a scientific understanding from observation alone. As a teacher, you play a key role in helping your students understand and learn from a demonstration. Your role is as a mediator and interpreter (Monk and Osborne, 2000).

Students will not learn as passive observers; they need to be actively involved. Mrs Rawool did this by focusing the students on how the foods changed when cooked and encouraged the development of close observation skills by her questioning. She also related the topic to their experiences.

Another way to involve students is to give them a role or task to focus their observations. For example, older students could write down results and observations in their books as the demonstration proceeds.

One particular way of actively involving students in some demonstrations and encouraging them to think about what they observe is to use a technique described by White and Gunstone (1992) called Predict-Observe-Explain (POE):

- Students predict what they think will happen and justify their prediction. There should be a reasonable basis for the prediction, rather than a guess. The prediction should require them to apply their existing knowledge and understanding to the situation in question.
- Students observe and describe what they see happening.
- Students are asked to explain their observation and try to reconcile any differences between their prediction and observation.

Using POE is a way of challenging their ideas, but can only be used when there is a basis for students' predictions. This will give you a valuable insight into their understanding. Predictions based on guessing do not provide useful assessment information.



Pause for thought

The test for starch is a simple one that involves adding iodine solution to the food. If starch is not present, the iodine solution remains a yellow/orange colour. When starch is present, a blue/black colour is seen.

How could you use the POE technique to demonstrate this food test?

By using POE, you as the teacher are asking your students to apply their existing knowledge and understanding. Asking your students to justify their predictions allows you to find out what ideas the students already have. By asking students to observe what happens, you can assess and challenge their existing ideas. You will find out how one teacher, Mrs Mohanty, used POE in her demonstration of the starch test in Case Study 2.

Although students are likely to be familiar with different foods, they may find it difficult to make the link between the foods they eat and the nutrient groups. This is partly because things like 'carbohydrate', 'vitamin' or 'starch' are abstract concepts. You do not buy a bag of starch or eat a bowl of protein. The challenge in teaching this topic is to develop students' conceptual understanding of the nutrient groups and how these are found in different foods. Confusion can easily arise from the imprecise use of terms such as 'carbohydrate', 'starch' and 'sugar'. It is therefore important to make clear that sugar and starch are both carbohydrates, and when doing the food test for starch, use the term 'starch' rather than 'carbohydrate'.

Case Study 2: Mrs Mohanty's demonstration

In this case study, one teacher, Mrs Mohanty, describes her decisions when planning a demonstration she used when teaching food tests. Food tests may be difficult to carry out in class because of large class sizes or safety issues. Teacher demonstration is a useful strategy in these circumstances. The lesson was to 60 students in Class VI.

I wanted the students to learn that some foods contain starch and that the presence of starch in food can be detected through a simple test. I was worried that if every student was to carry out the test, a lot of food would be wasted. Also, there was not enough iodine. So I decided to use a demonstration to show them the test for starch in foods.

When I planned the demonstration, I decided to include foods with starch as well as foods without starch, to show the students the difference in the test result. I wanted to have lots of different foods to show them, so I needed a big space for the demonstration. In order that all students would be able to see, I decided to do the demonstration at floor level. Some students sat on the floor, some on chairs behind them and some stood at the back. I planned to have the less motivated students and those who found learning more difficult at the front, to give them the best chance of being involved. Also, to make sure that even those at the back could see, I decided to test foods on small plates rather than in test tubes, which are too small [Figure 1].

After explaining the test, I showed them the reaction of starch with iodine and then tested different foods. I wanted to capture the students' interest, but this is not a very exciting food test. So I thought I would get the students to make predictions. After a few foods had been tested, I asked them to predict whether the test would be negative or positive, recording the show of hands for each category. This also told me whether students had understood the idea of starchy foods.

On the blackboard I drew a table with four columns for the results: the first column for the food type, the second for the original colour of the food, the third for the change in colour and the fourth for drawing a

conclusion on the presence of starch [Figure 1]. I wrote the name of each food in the first column. I thought of asking a volunteer to write the results as each food was tested, but decided that students would be more involved if they wrote their own observations and inferences in their books.

Food type	Original colour of the food	Change in colour	Is starch present?

Figure 1 A table to record the presence of starch in foods.

I was impressed by how interested all my students were and the thoughtful answers they gave. I noticed how they talked with each other about what was happening because they were sitting differently and able to talk more easily.



Pause for thought

- What actions did Mrs Mohanty take that showed she was focused on the students' needs and their learning?
- How did her demonstration involve the students?
- What do you think the students learned from the demonstration?

As you can see from Mrs Mohanty's experience, planning and delivering a classroom demonstration while managing a large group of students is quite a complex teaching strategy. However, the fact that demonstrations can impact so positively on your students' learning makes the effort really worthwhile.

3 Managing demonstrations

Mrs Mohanty had to manage the resources and the students when she did her demonstration. She made sure that every student could see. Allowing your students to crowd around the demonstration will mean that some will not be able to see, so you will need to think about how close they need to be and check that all students are included. It is easy to overlook the students from marginalised groups at the back who are being disadvantaged or excluded – you have a duty to ensure that this does not happen. Mrs Mohanty made sure that the vulnerable students were at the front. She also included those who she knew had learning difficulties – these students were seated near the front so that she could give them more support. You also need to pay attention to students' comfort. For longer demonstration, students may be better seated, as it is hard to concentrate if you are uncomfortable. In some situations, students can stand. In all cases, you must ensure that students are able to watch in safety and take any precautions necessary. With large classes, you might want to do the demonstration twice so that everyone has the best chance to see what you are doing and what happens.

As you undertake the demonstration, you should explain what you are doing. It is important to carry out the demonstration systematically without cluttering the table. Not only is clutter distracting, but it provides a

bad example to your students if they are to complete the activity themselves. Be sure to draw your students' the attention to important aspects such as a perceptible change or a safety precaution that must be taken.

Questions will help you capture students' interest and develop their understanding (see Resource 1, 'Using questioning to promote thinking'). Using the blackboard skilfully is also important during demonstration. You can use it to highlight the main points of a process, record observations and note the responses made by students. Seeing their responses on the blackboard will also help motivate students and encourage continued interest in the lesson.



Pause for thought

What evidence was there that Mrs Rawool and Mrs Mohanty succeeded in keeping their students' attention and interest?

Asking your students about their experience at home, what they feel and think, and focusing their observation are all important ways of gaining their interest. How your students react also tells you as a teacher whether they are interested or not. Bored students are more likely to misbehave than interested ones. Focused students will be quiet in concentration, but there may be more talk when questions are answered. Uninterested students will not be motivated to ask questions or contribute answers.

Activity 1: Planning a classroom demonstration

Planning your demonstration carefully will contribute to its success. Mrs Mohanty's plan (Resource 2) will help you plan your own demonstration and think about the steps as a guide. When you plan, include the learning objectives of the demonstration:

- what you want the demonstration to achieve
- how you will introduce the demonstration
- the equipment and materials needed
- the steps you will take when carrying it out
- the key questions you might ask at each stage
- how you will arrange your students so all can see
- how you will support those with special educational needs
- any teaching aids such as charts, pictures and models to highlight any key learning points
- the safety precautions you will take
- ways of involving the students at each stage of the demonstration
- how you will know what the students have learnt.

Write out your plan and any questions you might ask so that you have them ready to use. If you have another science teacher at your school, share your plans with them to help you clarify any questions you may still have.



Video: Planning lessons

<http://tinyurl.com/video-planninglessons>

The importance of good planning cannot be overstated if you want your students to achieve their potential. As you become more expert at planning demonstrations and identifying the learning intentions, this process will be much quicker. Sometimes it is helpful if you practise doing a general demonstration on your own first. To help you with your planning and to understand the process better, read Resource 3, 'Planning lessons'.

Activity 2: Practising demonstrating

One of the most challenging tasks is combining useful questioning techniques and appropriate explanations while demonstrating a concept or process.

A fun way of building your confidence with combining these skills is to practise them informally in relation to a relatively familiar task at home.

1. Choose a suitable activity to practise the demonstration. You can start with demonstrating something quite simple, such as sweeping a room or peeling a particular fruit, and then move onto more complex activities such as making roti, cooking a particular dish or fixing a bicycle puncture, or even doing the food test demonstration. Try to do the demonstration in front of a small audience, such as members of your family.
2. Collect together the tools and materials that you will need.
3. Talking out loud, explain what you plan to do and the intended learning outcomes.
4. Start by asking some initial questions to ascertain what your audience – imaginary or real – already knows about the process.
5. Give the demonstration, providing explanations as required, asking questions to check their comprehension and mentioning any precautions as necessary.
6. End the demonstration by briefly recapping the main points or inviting your audience to provide these.
7. Finally, ask for feedback if it is available. List the ways in which your demonstration went well and what you could have improved.

Having tried a demonstration in a safe environment, it is now time for you to teach your lesson.

Activity 3: Using demonstration in your teaching

You are now going to teach your lesson with your class.

On the day of the lesson, check that you have all of the equipment and materials you will need. You could prepare the chemicals beforehand if necessary to save time.

Introduce the topic, relating it to what has been covered previously and establishing the students' prior knowledge of the subject by asking them questions. Explain the purpose of the demonstration to the class.

As you conduct the demonstration, explain any key points, check that they understand and encourage your students to ask you questions. Involve them in POE, where relevant.

After completing the demonstration, think about and make notes on the following questions:

- How much planning time did you need to prepare the demonstration? How does this compare with your other lessons, such as those whose content is based primarily on the textbook?
- Did you find practising the demonstration useful? How practical is this for you?
- What went well with your demonstration?
- How did the students respond to your demonstration?
- What do you think your students learned from the demonstration? How do you know this?

What could have been improved? How would change it?

Demonstration is a strategy that can be used in the teaching of many science topics and in many contexts. Demonstrations can be used with all ages of student, from very young children to adults. The Predict-Observe-Explain technique is particularly useful when you are teaching challenging concepts such as forces, electricity, photosynthesis or pressure. By using demonstrating and POE, you can find out what ideas your students already have about these science concepts and provide an experience that will extend or challenge the non-scientific ideas they may have.

4 Summary

Ideally, learning science should be based on evidence. Demonstration helps students learn through observation and is suitable when a school cannot afford either the resources or the time that might be required if all students were to carry out an investigation. It can provide more opportunities to engage students than teacher or textbook explanations alone.

Planning for demonstration is as important as for any other teaching strategy. It is also helpful to rehearse the demonstration before carrying it out in the classroom. While carrying out a demonstration, if tests are involved that require you to use chemicals and apparatus that need to be handled with care, you need to alert your students about the precautions to be taken.

When a teacher arrives in the classroom with the materials for demonstration, students become much more interested and look forward to the lesson. Sustaining their interest is important and requires you to ask questions and adopt other strategies to keep them focused. Managing the classroom during demonstration is also important to ensure that no student, including those sitting at the back, is excluded from the learning process.

Demonstrations can make a substantial difference to students' learning. It is clearly very worthwhile incorporating them into your teaching repertoire.

Resources

Resource 1: Using questioning to promote thinking

Teachers question their students all the time; questions mean that teachers can help their students to learn, and learn more. On average, a teacher spends one-third of their time questioning students (Hastings, 2003). Of the questions posed, 60 per cent recalled facts and 20 per cent were procedural (Hattie, 2012),

with most answers being either right or wrong. But does simply asking questions that are either right or wrong promote learning?

There are many different types of questions that students can be asked. The responses and outcomes that the teacher wants dictates the type of question that the teacher should utilise. Teachers generally ask students questions in order to:

- guide students toward understanding when a new topic or material is introduced
- push students to do a greater share of their thinking
- remediate an error
- stretch students
- check for understanding.

Questioning is generally used to find out what students know, so it is important in assessing their progress. Questions can also be used to inspire, extend students' thinking skills and develop enquiring minds. They can be divided into two broad categories:

- **Lower-order questions**, which involve the recall of facts and knowledge previously taught, often involving closed questions (a yes or no answer).
- **Higher-order questions**, which require more thinking. They may ask the students to put together information previously learnt to form an answer or to support an argument in a logical manner. Higher-order questions are often more open-ended.

Open-ended questions encourage students to think beyond textbook-based, literal answers, thus eliciting a range of responses. They also help the teacher to assess the students' understanding of content.

Encouraging students to respond

Many teachers allow less than one second before requiring a response to a question and therefore often answer the question themselves or rephrase the question (Hastings, 2003). The students only have time to react – they do not have time to think! If you wait for a few seconds before expecting answers, the students will have time to think. This has a positive effect on students' achievement. By waiting after posing a question, there is an increase in:

- the length of students' responses
- the number of students offering responses
- the frequency of students' questions
- the number of responses from less capable students
- positive interactions between students.

Your response matters

The more positively you receive all answers that are given, the more students will continue to think and try. There are many ways to ensure that wrong answers and misconceptions are corrected, and if one student has the wrong idea, you can be sure that many more have as well. You could try the following:

- Pick out the parts of the answers that are correct and ask the student in a supportive way to think a bit more about their answer. This encourages more active participation and helps your students to learn from their mistakes. The following comment shows how you might respond to an incorrect answer in a supportive way: 'You were right about evaporation forming clouds, but I think we need to explore a bit more about what you said about rain. Can anyone else offer some ideas?'

- Write on the blackboard all the answers that the students give, and then ask the students to think about them all. What answers do they think are right? What might have led to another answer being given? This gives you an opportunity to understand the way that your students are thinking and also gives your students an unthreatening way to correct any misconceptions that they may have.

Value all responses by listening carefully and asking the student to explain further. If you ask for further explanation for all answers, right or wrong, students will often correct any mistakes for themselves, you will develop a thinking classroom and you will really know what learning your students have done and how to proceed. If wrong answers result in humiliation or punishment, then your students will stop trying for fear of further embarrassment or ridicule.

Improving the quality of responses

It is important that you try to adopt a sequence of questioning that doesn't end with the right answer. Right answers should be rewarded with follow-up questions that extend the knowledge and provide students with an opportunity to engage with the teacher. You can do this by asking for:

- a *how* or a *why*
- another way to answer
- a better word
- evidence to substantiate an answer
- integration of a related skill
- application of the same skill or logic in a new setting.

Helping students to think more deeply about (and therefore improve the quality of) their answer is a crucial part of your role. The following skills will help students achieve more:

- **Prompting** requires appropriate hints to be given – ones that help students develop and improve their answers. You might first choose to say what is right in the answer and then offer information, further questions and other clues. ('So what would happen if you added a weight to the end of your paper aeroplane?')
- **Probing** is about trying to find out more, helping students to clarify what they are trying to say to improve a disorganised answer or one that is partly right. ('So what more can you tell me about how this fits together?')
- **Refocusing** is about building on correct answers to link students' knowledge to the knowledge that they have previously learnt. This broadens their understanding. ('What you have said is correct, but how does it link with what we were looking at last week in our local environment topic?')
- **Sequencing** questions means asking questions in an order designed to extend thinking. Questions should lead students to summarise, compare, explain or analyse. Prepare questions that stretch students, but do not challenge them so far that they lose the meaning of the questions. ('Explain how you overcame your earlier problem. What difference did that make? What do you think you need to tackle next?')
- **Listening** enables you to not just look for the answer you are expecting, but to alert you to unusual or innovative answers that you may not have expected. It also shows that you value the students' thinking and therefore they are more likely to give thoughtful responses. Such answers could highlight misconceptions that need correcting, or they may show a new approach that you had not considered. ('I hadn't thought of that. Tell me more about why you think that way.')

As a teacher, you need to ask questions that inspire and challenge if you are to generate interesting and inventive answers from your students. You need to give them time to think and you will be amazed how much your students know and how well you can help them progress their learning.

Remember, questioning is not about what the teacher knows, but about what the students know. It is important to remember that you should never answer your own questions! After all, if the students know you will give them the answers after a few seconds of silence, what is their incentive to answer?

Resource 2: Mrs Mohanty's plan for a demonstration

Topic: Test for starch

Class: VII

Duration: 40 minutes

General aim: The students will be able to understand that the presence of starch in food can be tested.

Instructional objectives: After this lesson, the students will be able to:

- list some commonly available food items that contain starch
- describe the test for starch in food items.

Introduction: The interest and curiosity of the students will be aroused and their previous knowledge in the area will also be tested by asking them simple questions such as 'What is the necessity for food containing carbohydrates?' and 'How is carbohydrate stored in plants?' Thereafter the responses will be noted on the blackboard. and use it to announce to detect the presence of starch in food a simple test can be carried out, they would see how it is done.

Equipment and materials: A test tube rack with clean test tubes, a dropper, food items of various types, tincture iodine and water.

Teaching aid: A chart with pictures of energy-giving food, and the blackboard.

The seating arrangement is planned to enable every student to view the demonstration.

Table R1.1 A plan to demonstrate the presence of starch in food.

Purpose of demonstration	To generate students' interest To show students the test for starch
Learning objectives	By the end of the demonstration the students will be able to: <ul style="list-style-type: none">• describe the test for starch• identify starchy foods
Resources needed	Different foods, e.g. roti, rice, fruits, seeds, spinach, cheese, etc. Iodine and pipette Small plates Waste bucket

Plan of demonstration		
Safety	Students will have come across the word 'energy' in many different contexts. This will help them to draw together what they have learnt in Physics (energy transfer), Chemistry (how to generate energy) and Biology (how living things get their energy).	
Position of students	Have (insert names) seated on the floor at the front, with some on chairs and taller students stand at the back.	
Introduction	Review work on nutrients in food Food tests identify which foods contain which nutrients	
Stage 1	Test a starchy food to show positive reaction Test non-starchy food to show negative reaction	Ask students to describe reactions Ask student to write reactions on blackboard
Stage 2	Test a few different foods. Put name of food in a results table drawn on blackboard	Students copy table and write their result and own inference(s)
Stage 3	Test four more (two starchy and two not starchy)	Ask student to predict result to reinforce starchy foods
Stage 4	Finish demonstration by summarising with questions	What is the test for starch? What sorts of foods are starchy? Which types of food are not starchy?

Table R1.2 An example of how to do the test: what the teacher said and did.

Content	Teacher activity	Student activity	Teaching aid	Blackboard summary
Some foods that are rich in carbohydrates give us energy and are known as energy-giving food. Carbohydrates, an important nutrient, are stored in plants as starch and sugars	Points to the pictures of 'energy-giving food' and says, 'Some food gives us energy, but tell me, will holding a bowl of rice or potatoes in our hand make this possible?'	Respond that it is necessary to eat it	Chart with pictures of energy-giving food	Students' responses

Content	Teacher activity	Student activity	Teaching aid	Blackboard summary
The presence of starch can be detected by testing the food with iodine	Prepares a dilute solution of iodine and says that putting iodine into starch makes it blue-black	Observe the demonstration		To test the presence of starch in food Putting iodine to starch makes it blue-black
Starch turns to a blue-black colour when iodine is added to it, so food that contains starch will only turn into blue-black colour	Puts a little food of each type in a test tube and asks the children to note the colour before and after adding iodine to them. Then adds a few (two to three) drops of iodine to the food	Respond about colour before and after adding iodine		Table indicating food and colour change
	Tells the students the precautions to be taken while carrying out the test			Briefly note the precautions

Resource 3: Planning lessons

Why planning and preparing are important

Good lessons have to be planned. Planning helps to make your lessons clear and well-timed, meaning that students can be active and interested. Effective planning also includes some in-built flexibility so that teachers can respond to what they find out about their students' learning as they teach. Working on a plan for a series of lessons involves knowing the students and their prior learning, what it means to progress through the curriculum, and finding the best resources and activities to help students learn.

Planning is a continual process to help you prepare both individual lessons as well as series of lessons, each one building on the last. The stages of lesson planning are:

- being clear about what your students need in order to make progress
- deciding how you are going to teach in a way that students will understand and how to maintain flexibility to respond to what you find
- looking back on how well the lesson went and what your students have learnt in order to plan for the future.

Planning a series of lessons

When you are following a curriculum, the first part of planning is working out how best to break up subjects and topics in the curriculum into sections or chunks. You need to consider the time available as well as ways for students to make progress and build up skills and knowledge gradually. Your experience or discussions

with colleagues may tell you that one topic will take up four lessons, but another topic will only take two. You may be aware that you will want to return to that learning in different ways and at different times in future lessons, when other topics are covered or the subject is extended.

In all lesson plans you will need to be clear about:

- what you want the students to learn
- how you will introduce that learning
- what students will have to do and why.

You will want to make learning active and interesting so that students feel comfortable and curious. Consider what the students will be asked to do across the series of lessons so that you build in variety and interest, but also flexibility. Plan how you can check your students' understanding as they progress through the series of lessons. Be prepared to be flexible if some areas take longer or are grasped quickly.

Preparing individual lessons

After you have planned the series of lessons, each individual lesson will have to be planned **based on the progress that students have made up to that point**. You know what the students should have learnt or should be able to do at the end of the series of lessons, but you may have needed to re-cap something unexpected or move on more quickly. Therefore each individual lesson must be planned so that all your students make progress and feel successful and included.

Within the lesson plan you should make sure that there is enough time for each of the activities and that any resources are ready, such as those for practical work or active groupwork. As part of planning materials for large classes you may need to plan different questions and activities for different groups.

When you are teaching new topics, you may need to make time to practise and talk through the ideas with other teachers so that you are confident.

Think of preparing your lessons in three parts. These parts are discussed below.

1 The introduction

At the start of a lesson, explain to the students what they will learn and do, so that everyone knows what is expected of them. Get the students interested in what they are about to learn by allowing them to share what they know already.

2 The main part of the lesson

Outline the content based on what students already know. You may decide to use local resources, new information or active methods including groupwork or problem solving. Identify the resources to use and the way that you will make use of your classroom space. Using a variety of activities, resources, and timings is an important part of lesson planning. If you use various methods and activities, you will reach more students, because they will learn in different ways.

3 The end of the lesson to check on learning

Always allow time (either during or at the end of the lesson) to find out how much progress has been made. Checking does not always mean a test. Usually it will be quick and on the spot – such as planned questions or observing students presenting what they have learnt – but you must plan to be flexible and to make changes according to what you find out from the students' responses.

A good way to end the lesson can be to return to the goals at the start and allowing time for the students to tell each other and you about their progress with that learning. Listening to the students will make sure you know what to plan for the next lesson.

Reviewing lessons

Look back over each lesson and keep a record of what you did, what your students learnt, what resources were used and how well it went so that you can make improvements or adjustments to your plans for subsequent lessons. For example, you may decide to:

- change or vary the activities
- prepare a range of open and closed questions
- have a follow-up session with students who need extra support.

Think about what you could have planned or done even better to help students learn.

Your lesson plans will inevitably change as you go through each lesson, because you cannot predict everything that will happen. Good planning will mean that you know what learning you want to happen and therefore you will be ready to respond flexibly to what you find out about your students' actual learning.

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