



Guidance

Curriculum and
Standards

Key Stage 3

National Strategy

Strengthening teaching and learning in science through using different pedagogies

Unit 3: Improving the learning climate

Science subject
leaders,
KS3 science
coordinators and
science teachers

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Strengthening teaching and learning in science through using different pedagogies

Unit 3 Improving the learning climate

How to use this study unit

This study unit offers practical suggestions for you to use in the classroom when considering the climate for learning in your laboratory. All the strategies suggested have been tried and tested by teachers in their classrooms. They draw upon both academic research and the experience of practising teachers. You may have looked at *Teaching and learning in secondary school materials* (DfES 0423-2004). While there are similarities with these materials you will find that this unit gives science specific advice that will be immediately relevant for use in your laboratory.

Your science consultant can help you work through this unit but it would be better to twin up with a colleague who also wishes to enhance the quality of the classroom climate for pupils. The unit is structured so that the tasks listed towards the beginning are simple and quick to implement. More challenging activities come towards the end. The unit contains case studies and tasks for you to undertake. It also contains 'reflections' which will help you revisit an idea or change your own practice. It includes practical tips and tasks, which will help you consider the advice or try out new techniques in the classroom. The summary of research is contained towards the back of the unit and will offer some suggestions for further reading. The final page invites you to reflect on the experience of having tried out new materials and set some personal targets for the future. You can work through the materials in a number of ways:

- Start small; choose one class to work with. Ask another teacher or your subject leader to help by providing a sounding board for your ideas.
- Work with your science consultant on developing and planning your classroom climate with one class. After three weeks meet together to review how it is going. Discuss which strategies have been the most effective with one class and plan to use these with other classes.
- Find another science teacher to pair with and team teach. Design the activities together and divide the teacher's role between you.
- Work with a group of teachers in the department. Use the unit as a focus for joint working, meet regularly to share ideas and then review progress after a few weeks.
- Identify the sections of the unit that are the most appropriate for you and focus on those.

There is space provided in the unit for you to write notes and make comments about the activities. You may find it helpful to keep a journal of events. For some tasks you may want to make a video recording of yourself in action so you can make a realistic appraisal of your performance. You could add this, along with any other notes and planning that you do as you work your way through the unit, to your CPD portfolio.

You will need access to video sequence 3 when working through this unit.

Improving the learning climate

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Introduction

There have been several Key Stage 3 Strategy materials produced on the subject of learning climate over the last two years. In science training materials the subject has been discussed during the training units *Effective teaching and learning in science* and *Increasing pupils' rates of progress*. By undertaking this unit of work you will have the opportunity to study the subject in more depth and make changes to the learning climate in your department.

So what constitutes a good climate for learning?

Task 1

What makes a good learning climate?

20 minutes

If you are working on this unit with another teacher, produce a joint map of what you already think makes up or influences the climate for learning. If you are working alone you will have to rely on your own imagination.

Put the words *climate for learning* in the centre of a piece of paper then allow your mind to produce a map of all the connected parts of the subject. Write all these on the paper, use colours and diagrams to help your train of thought.

Please do not turn the page until you have thought about this.

Give yourself about 15 minutes for this. Now take two different coloured highlighter pens and mark all the features associated with the physical environment and those which are concerned with teaching and learning.

Keep your map safely as we will refer to it again at the end.

The following grid pulls together some statements about learning climate from two sources: *Key messages: Pedagogy and practice* (DfES0125/2003) and *Improving the climate for learning (Unit 17: Teaching and learning in secondary schools)*: (DfES 0423-2004). Compare your map with the list given below and consider whether you have reflected all the aspects of learning climate that you could. This list should not replace your map, but complement it.

Pupils recognise that the teacher treats them fairly	Classroom and laboratory routines are consistent and effective
There are departmental strategies in place for making learning dynamic, interesting and challenging	Pupils feel secure, both physically and emotionally
Science classroom displays support learning	Displays in the science classroom are up-to-date and attractive
Seating arrangements are varied to suit different teaching strategies	Different pupil groupings are used to enhance learning
Pupils have regular opportunities to work within their own preferred learning style	Pupils are appropriately challenged to reach beyond their existing development level
Lesson design and classroom routines make effective use of beginnings and endings	Teaching and learning builds explicitly from pupils' prior attainment and knowledge
Teachers use language positively to influence pupils' security, motivation and learning	The science classroom is clean, attractive and safe
Pupils are encouraged to take responsibility for their own actions as learners	The teacher is the 'lead learner'
Pupils are encouraged to take responsibility for their own actions as individuals	Science displays demonstrate the best achievements of all pupils
Homework is used to 'set the mind' and to inform assessment of understanding	Teacher and pupils share a common understanding about what is being learned and what needs to be done to show that learning has taken place

It can be seen from your maps and the above list that learning climate covers a vast amount of the job of a science teacher. The following sections require you to reflect on what happens currently and give some practical examples of how the learning climate in your laboratory or department can be improved.

Improving the physical climate in the laboratory

The physical climate and make up of your laboratory or classroom has a significant impact on how your pupils feel about their learning. In laboratories that are effective, teachers work hard to create a room where it is evident that learning is at the heart of its purpose. Teachers attempt to make the appearance exciting and interesting so that pupils want to learn there. As pupils enter the room they are given very clear messages about the importance of learning and the expectation the teacher has of them. Within the room there is information and other support that they might need, for example, colourful periodic tables displayed. The benches may not always be in the same place, although this is difficult if they are the fixed type! But the important thing is that the furniture is organised in such a way as to support the learning.

If you teach in several rooms, such as biology in one laboratory and chemistry in another, it is desirable to work with the teacher who shares the room with you to create an effective learning environment. This can have advantages as there is someone to share ideas and tasks with. If the department has a policy of lots of shared space then there is a need for corporate responsibility for the rooms. Pupils appreciate some consistency in approach, so it may be possible for artefacts like 'word walls' to be in a similar place in each room. Wherever possible teachers should share their ideas and all be involved in the process helping the enthusiasm sustain their efforts.

Display

Research has shown that an important component of the classroom climate is the use and quality of the display contained within it. Display is intended to support pupils' learning and not simply to be attractive. Often it will reflect your enthusiasm for science and make a dull laboratory more fun to be in. Some research also states that there may well be some subconscious learning undertaken, as pupils are attracted to display that is not directly designed for them. Planning and putting up a display is not necessarily time-consuming, they do not have to be works of art. Teaching assistants, technicians and the pupils should be encouraged to help. Display is used for a number of purposes. It can:

- provide vital information in the form of key words, facts, for example, periodic table or currently used equations; paint the big picture of a topic;
- reinforce good habits through the use of key questions: what, when, how, Walt, Wilf, predictions;
- stimulate curiosity, by offering new information, for example, science in the news, puzzling science questions 'When you snap spaghetti from each end it usually snaps into three pieces – why?' (lots more of these available from www.newscientist.co.uk/lastword);
- affirm and inspire through examples of effective pupils' work or quotations.

To be most effective, displays should be positioned just above eye level. Remember that the height of laboratory stools will necessitate display being positioned higher in laboratories than other classrooms. Research has shown that, when the brain is in visual mode, the eyes tend to look up so this is why display just above eye level is the most effective. Not surprisingly when pupils are in listening mode the eyes tend to be level and when in kinaesthetic mode (engaged in a practical task) the eye level tends to drop. The brain is stimulated by novelty so display needs to be changed regularly, again pupils should be involved in this.

Task 1

Reviewing what is currently in place

20 minutes

Sit in the laboratory that you use the most and reflect on the following questions:

- How much display is currently used and how much usable space is there?
- Are there any / enough display boards?
- What condition is the current display in, when was it last changed and who put it up?
- How much of the display supports the current teaching?
- How much pupils' work is included?
- Does the display make the room look more attractive?
- What do the pupils think of it?
- How much display is located in the corridor outside the lab?
- What condition is this in?
- What are the other visible features of the room?

In light of your observations try to answer the following questions.

- What improvements can be made to the laboratory as it stands?
- Does the lab need additional resources to improve the display, for example, display boards, shelves for artefacts, plants, specimens, resources and pupils' books?
- Are there coat pegs so that bags and coats are not strewn around the benches?

Make a note of what you think you might need and approach your head of department with a plan of how you intend to use the new items.

Having reflected on what you might need, you will need to approach whoever is responsible for these kinds of resources in the school. If for some reason the resources cannot be made available, do not give up as plenty can be done to enhance display without a great deal of expense.

Planning your display

There are some items that you will need to have permanently displayed in the laboratory, for example, fire exit notice, gas shut-off valves, form notices, etc. It is a good idea to have these laminated as they begin to look tatty after a couple of months and they will probably be required for at least a year. Whatever you choose for the remaining display will reflect your ideas and interests as well as those of the pupils. The purpose for the display will predetermine what you include. It could include objectives for topics and overviews of the plan for current learning. The following may be used as a checklist for the purposes of display.

Modelling good practice This can be achieved either with pupils' work or by using published texts. This demonstrates to the pupils the features you are looking for in a quality piece of work. It is a good idea to add a teacher commentary or link assessment criteria to the piece of work so the pupils can see exactly what it is about the work that constitutes quality. Displaying the criteria for Sc1 assessments is a good example of this. It goes without saying that, for this reason, heavily marked and annotated pieces should not be included. Displaying the work of older pupils' often raises pupils expectations of what can be achieved and the standards required. On occasion the older pupils are stunned by the quality of work produced by younger pupils and it spurs them into better things. (More information on modelling techniques can be found in Unit 4: *Improving teaching and learning through the use of modelling techniques*).

Raising pupils self-esteem Over time it is desirable that the work of all pupils is displayed. The display of only the very best or neatest work should be avoided as for some pupils this is just too aspirational.

Providing information There is good quality commercially produced information available. The Institutes of Chemistry and Physics provide visually appealing and informative materials. The Natural History and Science museums have very colourful posters and many large pharmaceutical and engineering firms also provide informative posters free of charge to schools. Material that is only relevant to a particular topic should only be displayed for the length of time the topic is being taught. However, if Sc1 planning posters are being used they may be a permanent feature and the yellow stickies changed to show a different investigation.

Practical tip

Having a separate display for news items can prove very powerful in maintaining pupils' interest in science topics. These usually only have a short life span and include newspaper and magazine cuttings that pupils have found interesting. Make a group of pupils responsible for the display and for changing it monthly.

Creating a quality board

The essential elements of a quality board are:

- a good piece of pupils' work;
- a quality picture frame, which is large enough to contain the piece of work and the surrounding commentary;
- teacher annotations either written, if the handwriting is clear, or computer produced, which explains why the work is good.

This should be related to the topic you are teaching, or if it is a piece of investigational work it should focus on the skill you are trying to enhance. You must bring the pupils' attention to it and use it through your teaching.

Case study

A teacher of Year 9 pupils used a quality board to demonstrate to pupils what was expected of them in terms of analysing evidence during an investigation into the reactivity of different metals with hydrochloric acid (QCA unit 9F).

He displayed a piece of Year 10 pupil's work which clearly demonstrated a good piece of analytical writing about a 'rates of reaction' investigation. This highlighted where the Year 10 pupil had identified some patterns in his evidence and then used the evidence to construct a graph. He had then used this graph to draw a conclusion about the temperature of the reaction, which was consistent with his experimental evidence. At each point where the pupil had succeeded in matching the assessment criteria the teacher provided a simple commentary as to how the criteria had been matched.

This piece was used to first model the way of writing to the pupils and then referred to as the investigation took place.

Pupils reported that they had a far greater understanding of what was required of them as a result of this.

Task 3

Creating a quality board

30 minutes

Think about a topic you are about to teach. Find and then photocopy a piece of a pupil's work that demonstrates quality in the topic. Plan your annotations and place the documents on a frame.

When you come to teach the class, explain to them what you have done and model for them the features of the work that constitute quality.

After the pupils have completed their own work, ask them if they found the quality board useful in the formulation of their own work and ideas.

Evaluate the quality of the work produced by the class of pupils this time compared with their last piece of work.

Try to choose one piece of work from the class to place on the quality board. Annotate to show why it deserves its place there.

Planning a display

It now remains for you to plan and put up a new display using some of the ideas contained in this unit. Enlist the help of a TA or a small group of pupils. Have a very clear idea of how you will split the laboratory into different display areas. Remember to leave space for notices that will not change over time. Start with about three distinct areas, which will reflect topics you are about to teach, or skills that you want the pupils to develop such as word banks or writing frames. If you are using pupils' work straight away, you will need to have collected it in advance.

Start by:

- clearing away all existing display;
- preparing the chosen area – some areas may look better if you cover them with backing paper;

- repositioning any items that are going to remain, but make sure they still look fresh. Reframing them might help;
- dividing up your 'areas' using paper strips or ribbon so that the areas are distinctive;
- deciding the position of any commercially produced poster materials.

Task 4

Your new display

30 minutes

Share with your colleague or 'volunteers' the ideas you have for the display. It is a good idea to have made some sketches of the room to show what you want and where.

Spend some time mounting the items and trying them in different places before you commit yourself to the stapler!

When it is finished, look around and admire the work you have done.

When you have finished the topic you are teaching, ask the pupils what they thought of the display and how it helped their learning.

Arranging the benches

The arrangement of furniture in a laboratory should reflect and support the way in which you want the pupils to learn. This can be very difficult where fixed benching is concerned, as it does not give you the flexibility to move things as necessary. There are many challenges when it comes to moving laboratory furniture perhaps the most important being the requirements of health and safety legislation. Moving old heavy teak benching on your own is not a good idea. The type of activity you have planned will determine how the laboratory is laid out. Practical issues must be taken into consideration such as access to gas taps, electricity supply and water.

Task 5

Look at the current teaching layout

30 minutes

Consider the laboratory that you teach in most often. What is the dominant furniture layout? How does this influence the teaching and learning approaches that you can use? Do any of the following present barriers to change?

- The benching is fixed and offers very little scope for flexibility.
- Some classes would not respond well to either having the furniture in different positions or to moving it.
- You have no experience of teaching with the furniture in different positions.
- The positioning of gas, electricity and water supplies limits scope for flexibility.

Points to consider

- Can any of the benching be moved or got rid of all together, especially if you only use it for a reason such as storing books?
- If all the benching is in rows this is fine for pupils working individually. However, if the pupils will be required to move around and engage with some groupwork this is the worst possible layout.



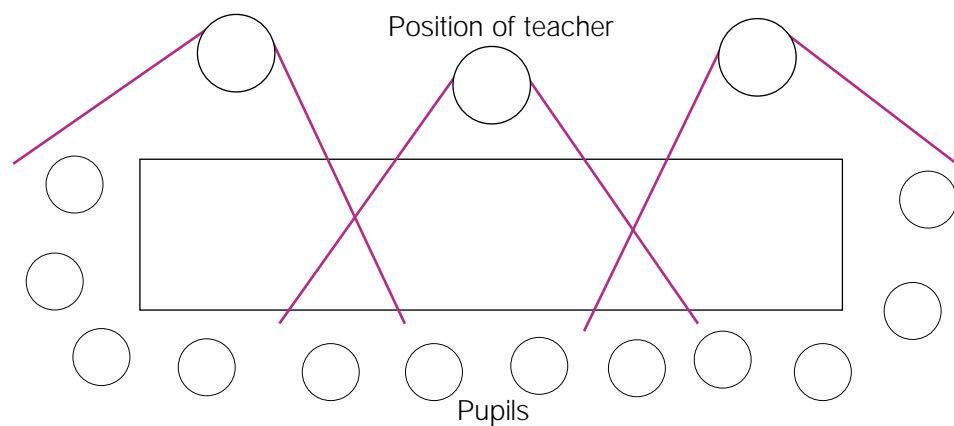
- For effective group work the pupils need to face each other to talk so that they don't need to shout and can keep eye contact.
- Using squared paper, make yourself a scale map of the room.
- Draw on the map all the fixed pieces of furniture and other items.
- Make scale cut outs of those items of furniture which can be moved.
- Think of a lesson that you are about to teach when, in order to improve the pupils' learning, it would be a good idea to move the furniture into a different configuration.
- Move the pieces of paper around and explore the possibilities. Remember to leave room around a demonstration bench in case you want to bring the pupils to you.

Pick a class to work with that you think will respond positively to a new approach. Teach the lesson and then evaluate how effective the furniture movement was in terms of the pupils' engagement.

Practical tip

Where you stand in the room will influence the pupils you address, particularly when it comes to question and answer sessions. Research has shown that teachers tend to focus on pupils in a fairly narrow arc. Simply by moving your position you can involve a wider range of pupils.

In this diagram the teacher has the pupils around a front demonstration bench. You can see that by moving position three times the teacher can involve all pupils.



Make sure that you move regularly but don't overdo it, as you will make the pupils dizzy!

Look at video 'Improving the learning climate' clip 1.

This shows a fairly typical laboratory with mains services and some fixed and some movable benching. As the camera pans around the room reflect on how the room could be arranged for the following activities:

- 1 a whole class practical activity looking at the use of enzymes to speed up a reaction, for example, pectinase on apple pulp;
- 2 a class debate on the effects of pollution in a local stream;
- 3 a research activity into planetary movements;
- 4 a demonstration of the effects in water of reactive metals;
- 5 using data loggers to measure temperature change over time.

For one of your classes, pick an activity you are going to use which is similar to the ones listed above. Consider how you can maximise the laboratory facilities to support pupils' learning. Plan your lesson and try out your ideas.

Putting pupils into groups and how to select those groups is dealt with in Unit 1 *Strengthening group talk and argument*, and is not repeated here.

Once you are in the habit of moving the furniture around with the minimum amount of fuss, in your lesson plans indicate which format would be the most useful for a particular lesson. Explain to the pupils why you have chosen a particular layout. By keeping them informed you will alleviate the niggles that can be caused by asking them to change a routine. Once pupils are used to the routine, they may be asked to sit in different places. Tell them the content of the lesson and the types of activity they are going to be undertaking and then ask them to choose the most appropriate layout for the activity. You will be pleasantly surprised by their positive contributions.

Creating a climate of success

In the previous section we looked at how the physical environment in the laboratory could influence pupils' learning and highlight pupils' successes, for example, the creation of a 'quality board'. In this section we will look at the action of the teacher's language and interactions on creating a climate of success.

Science teachers spend a great deal of time explaining both science and instructions for practical work. How these explanations are delivered has influence on how the pupils perceive the relationship between themselves and the teacher. This in turn affects their commitment to learning. It is the way in which teachers show their dedication to the principles of respect, fairness, challenge, support and security.

Effective teachers often demonstrate their commitment by:

- warmly greeting pupils by name when they arrive at the lesson;
- offering a positive comment to each pupil individually over a period of time and thanking pupils at the end of a good lesson.

In *Strategies for closing the learning gap* (Network Educational Press), Mike Hughes describes the types of language that teachers use to influence pupils motivation and learning.

- **The language of success** This means giving pupils the message that you can have confidence in them and their abilities. For example, saying to a pupil 'I know you can ...' is far more encouraging than saying 'I think you can ...'
- **The language of hope** Ban phrases such as 'I can't do this.' Instead encourage the pupils to adopt the attitude 'I can do it but I need some help.' Display phrases such as 'You can do it.' 'What help do you need?'
- **The language of possibility** Pupils often put limits on what they think is possible, believing that in some way a task or even a subject is beyond their capability. They may describe their supposed inabilities with phrases such as 'I'll never be good at science' or 'I always mess up science experiments'. Unsurprisingly, their belief affects their motivation and their commitment to learning. By careful choice of language, teachers can create a climate of greater possibility, which will influence pupils' views of themselves.

Task 7

Reviewing your use of language

15 minutes

The grid given below is adapted from *Strategies for closing the learning gap*. It shows how a slight shift in your use of language can make a difference to the outcome of a typical classroom situation.

Think about a recent situation in which you have responded to a pupil in the way described in the first example.

How could you have changed what you said in order to encourage the pupil?

How will you manage to remember to adopt the language of possibility more often?

<p>Pupil: I can't do practical work. It's boring.</p>	<p>The student is actually saying, 'I don't believe I can be successful with this and therefore I don't want to take the risk.' Note: It may or may not be boring.</p>
<p>Teacher: Of course you can. Just keep trying and put a bit more effort in and you will get it.</p>	<p>Inadvertently, we have denied the validity of the pupil's feelings. Exhorting her to 'keep trying' is not motivating if she believes the task is beyond her. Asking her to put a bit more effort presupposes she is not trying hard enough and it's her fault. Again – not motivating.</p>
<p>A simple change in language may have the desired effect</p>	
<p>Pupil: I can't do practical work. It's boring.</p>	
<p>Teacher: OK, it's a little tricky at the moment. Which bit of the experiment can you not do yet?</p>	<p>By initially agreeing with the pupil, we are validating how she is actually feeling, which will always (sic) be correct. This is a start to gaining rapport and therefore effective communication. However by reframing the problem as a 'little tricky at the moment', we have also diluted the severity of the problem and made it a temporary stage. 'Which bit can't you do yet?' repeats the pupil's words (<i>can't</i>), which she will accept and also lessens the difficulty by presupposing it's only a bit. The inclusion of the word 'yet' serves to emphasise the temporary nature of the difficulty and retains a connection to the possibility of things improving.</p>

Mike Hughes with Andy Vass, *Strategies for closing the learning gap* (Network Educational Press) © 2001. Mike Hughes. Reproduced by permission of the publisher. www.networkpress.co.uk; fax 01785 228566

We all fall into the trap of using negative language at times, even when it does not accurately convey what we are thinking. You may find that a colleague will describe 9C as 'unteachable' when what they really mean is that the lesson did not go to plan for some reason. We need to be sympathetic to these feelings in pupils and colleagues. Remember, however, to use language to support learning.

As well as adopting positive language you can also:

- Remove the language of failure: Try to avoid telling the pupils they are wrong. As well as being demotivating it does not encourage pupils to see mistakes as a vital part of learning. To say 'you are a step nearer' is much more powerful than saying 'wrong again!' The use of words like 'rehearsal' or 'trial' can be very useful.
- Use no-blame language: Avoid appearing to blame the pupil for their lack of learning. Phrases such as 'which bit did I not explain clearly' will stop pupils feeling that it is all their fault.

Other useful positive words and phrases include:

- When you finish ...
- I know you can ...
- Which part did you not see me do?
- I'm sorry I should have made that clearer.
- It is important to remember here ...
- OK, you might not have mastered it yet, but ...
- Up to now this has proved tricky ...
- Today you have a brilliant opportunity to show yourself how much you have understood so far.
- You will remember ...
- Your choice/it's up to you/you need to decide ...
- That's right, isn't it?

Task 8

Using support strategies

60 minutes

The following checklist provides a list of strategies that can create a better learning climate. Look at the list and tick the strategies that you use currently. Pick a couple that you would like to develop. When you plan your next lesson look for opportunities to incorporate them into your teaching. It would be good if another adult could watch the lesson and share their observations about how successful you were at the new techniques. Alternatively you could video the lesson and look at it later.

	Currently use or would like to develop further
Smile often, it promotes confidence.	
Use open and welcoming body language.	
Although you cannot speak individually to every pupil every lesson, over a short period of time try to notice something positive to say about each of them.	
Make eye contact with pupils, especially when you are doing a demonstration or asking them questions.	
Use polite language to model the tone of respect that you expect.	
Use names frequently in an affirmative way, such as 'Steve has just given me the names of two halogens with a reason for his choice'. Avoid pointing at pupils.	
Try to keep your voice pitched low and avoid shouting.	
Try to use praise, frequently, but not indiscriminately. Reward progress towards targets. Pupils value praise if it is clear that it is deserved. This is particularly true in challenging classes, as pupils tend to respond to praise given directly to them even if their work is acknowledged more publicly.	
Encourage pupils to be supportive of each other, to listen and respond with respect, your own modelling should demonstrate this, for example, 'I agree with Steve that ..., however I also think that ...'	
Avoid putting pupils on the spot. Use tactics that allow pupils to feel safe to answer – for example extend the wait time (try to count to eight before continuing); use, think, pair, share; preface challenging questions with 'this is going to be hard for us to answer, so I will ask several people to have a go, then we will try to find the best answer together'.	

Starting well

Many of us have had the experience of a lesson that has not gone as well as expected because the pupils were slow to settle and get on with their work. It is easy to blame the previous teacher for not disciplining the pupils sufficiently, or that they were slow to finish P.E. However, common features of effective lessons are the established classroom routines that pupils are familiar with. Some routines are more effective than others! The grid below is adapted from *Closing the learning gap*, and contrasts some effective and some ineffective routines.

More effective	Less effective
The teacher is waiting at the laboratory door to welcome pupils.	Pupils arrive before the teacher who is often several minutes late because of rushing around to collect practical apparatus.
Pupils arrive promptly, enter the lab in an orderly way and have out books and equipment ready for the lesson to start.	Pupils drift in, in twos and threes, take their time to settle and leave books in their bags.
Latecomers enter quickly and quietly. Their presence is acknowledged and they expect to be spoken to about their lateness during the lesson.	Latecomers arrive casually over time and are chastised individually for their lateness before the lesson gains any momentum.
The teacher begins the lesson promptly by making the context for the lesson clear and sharing the objectives with the pupils in a way they understand. This conveys the expectation that pupils are about to learn something of value.	As some quiet is established, the teacher takes the register and collects in last week's homework. Most pupils hand this in but a significant number take a long time to explain why the tasks have not been completed.
The teacher describes and explains the structure of the lesson and gives the timings for the various elements, e.g. group task, practical activity, and discussion. The first activity is quickly underway making explicit demands for pupils' full attention.	The teacher debates with some frustration (and occasional amusement) pupils' reason for not completing their homework. By this time over eight minutes have elapsed and no meaningful activity has taken place.
Pupils engage positively with tasks, anticipating challenge and interest. Textbooks, if used, are efficiently distributed in a well-understood routine.	Some pupils are beginning to get restless and are tempted to fiddle with the gas taps and water supply. Anticipation of an exciting lesson is fading fast.
The end of the lesson is identified by a period of reflection on what has been learned. Pupils know and play an active role in this.	The lesson draws to a close with pupils dashing around, trying to get an extra few readings to plot on a graph and putting equipment away.
There is sufficient time to explain any homework and its purpose. This is sometimes done part way through the lesson to avoid rushing at the end.	Pupils' attention has already turned to more important things such as TV or games practice. Homework is hurriedly set and not all pupils record the task effectively.
The teacher controls how the pupils leave the lab, so that the lesson is orderly. The opportunity is taken to say something of a personal nature to one or two pupils as they leave.	Pupils scramble out, knocking over equipment and breaking glassware. They are unsure of the homework task; most have already forgotten the lesson.

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Task 9

Review your routines

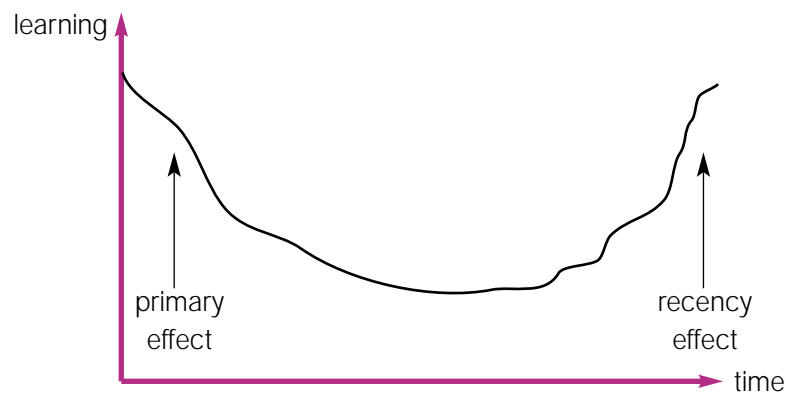
15 minutes

Read through the chart of routines outlined above. Reflect on your own lessons. Where on the continuum between more and less effective do your laboratory routines lie?

The importance of lesson beginnings cannot be overemphasised. In *Closing the learning gap*, Mike Hughes explains:

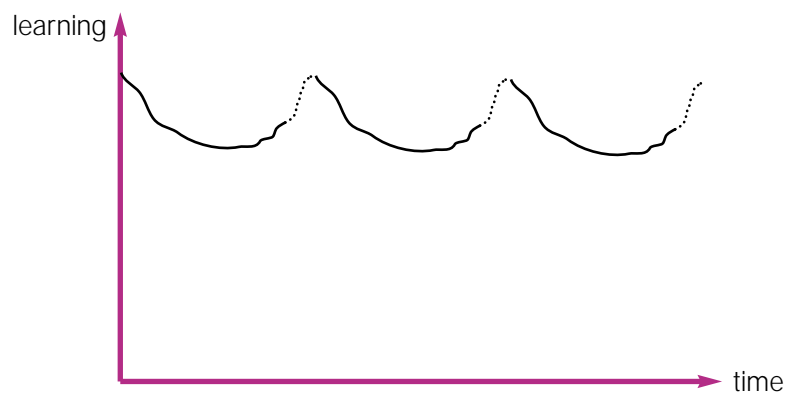
- Students learn more at the beginning and end of a learning experience than they do in the middle. This is sometimes called the BME (beginning, middle, end) principle.
- The beginning, in particular, is the time when the potential for learning is at its greatest, when the relatively high concentration, but particularly anticipation, makes the learner more receptive.

The BME principle



The primary effect is that, when pupils arrive at a lesson, they are full of anticipation. The recency effect is that, at the end of a lesson, they can reflect on recent learning.

Exploiting the BME principle



Lessons should have lots of beginnings and be based on a number of activities. Many lessons are based around only one learning activity. This means that there is only one beginning, lots of middle and long periods of time when children are at their least receptive.

The most effective time to introduce the key learning point is at the beginning of a learning activity. By key learning point, I mean the bit they all must know – the key piece of information that is central to the whole topic.

So careful consideration must be given to when a key learning point is introduced. Doing this in the middle of a lesson could be counter-productive. In order to be effective, key learning points should be introduced within the first five minutes of any lesson.

At the start of any lesson the class should be engaged with something about today's lesson or something positive and memorable about the last one. A **stimulating starter** activity is a good way to do this. Examples of interesting starter activities can be obtained from your local science consultant. The lesson objectives should be shared with the class. Often these are written on the board, but it is no good asking the pupils to simply copy them down without interacting with them, otherwise they pass from the board to pupils' books without anything being learned! Plan when you will introduce the key learning point and make it as early as possible. The collection of homework and the taking of the register can be left until the pupils have engaged with the first task so as not to disrupt the beginning of the lesson.

Task 10

Improve the starts

15 minutes

Choose a class that you feel confident to experiment with.

At the end of one lesson explain that you are going to change the way you begin the next lesson and why. Tell the pupils to be prepared or give them a question to think about.

Plan an improved start to their lesson, keeping in mind the tactics previously suggested. Include a challenging task, for example:

- tell your partner one fact you know about the way cells are specialised;
- find out what evidence there is for global warming;
- write down two key words from last week's lesson on energy sources; be prepared to explain to a group of four why these are the key words for you.

Begin the lesson as you have planned. During the lesson you can follow up the responses to your initial questions, if necessary modify what you teach to more closely match what the pupils already know. This will raise pupils' self-esteem by acknowledging what they already know.

Towards the end of the lesson ask the pupils what they thought of this new way of working.

With your partner, teacher review the effectiveness of your lesson start.

Don't expect miracles. Pupils will need to be taught new routines and their purpose before they will engage properly. As you restructure your lesson beginnings, explain to the pupils the purpose and your change in expectations of them. Explain how it will help them to learn more effectively. Once you introduce a new routine it should be used every subsequent lesson until it becomes embedded.

To really make the most of pupils' potential for learning, you can increase the number of beginnings in a lesson. Effective lessons are often constructed from a number of episodes, each of which offers an opportunity for new beginning. For more on planning episodes of teaching, see science training unit *Effective teaching and learning in science* (DfES 2003).

The challenge of lesson endings

If we take Mike Hughes's research ideas it can be seen from the first graph on page 16 that much learning is also undertaken at the end of lessons. In order to maximise this there are a number of tactics which can support you to make the time more organised and productive.

- End early. Don't try to cover too much material in one hit. Don't mistake pace for manic activity. Leave at least eight minutes to finish off the lesson properly.
- Use a structured plenary to end the session. This should be a group or individual reflection on what has been learned.
- Ask the pupils to identify two or three key points they have learned from the lesson. These can be shared in small groups either written or as drawings and cartoons. A review of these points could become a regular feature of a homework routine.
- Summarise the learning.
- Set the scene for the following lesson.
- Have clear routines for an organised departure. Don't fall into the trap of not clearing away apparatus in good time. Make sure that pupils put on their coats as a last task before leaving the room.
- Vary the way in which the pupils are dismissed, for example, row-by-row, small groups, alphabetically, one by one after answering a question. This will help keep the lesson focus right until the end.

Planning plenary activities

Your Key Stage 3 science consultant can help out by providing lots of ideas which are both generic and activity-specific. The big challenge is to make these as varied as possible. The Key Stage 3 Strategy leaflet *Making good use of the plenary* lists the purposes of the plenary as to:

- draw together what has been learned, to highlight the most important rather than the most recent points, to summarise key facts, ideas and vocabulary, and stress what needs to be remembered;
- generalise from examples generated earlier in the lesson;
- go through an exercise, question pupils and rectify any misunderstandings (misconceptions);
- make links to other work and what the class will do next;
- highlight not only the progress that has been made and remind them about personal targets;
- set homework to extend or consolidate classwork and prepare for future lessons.

You can also find ideas for plenary activities in the science-training unit *Effective lessons in science* (2003).

As with the previous task, choose a class you are confident to work with.

Keep in mind the tactics mentioned above, plan a lesson ending to include a plenary activity.

At the beginning of the lesson explain to the class what you have planned for the plenary and why. This will help them to prepare.

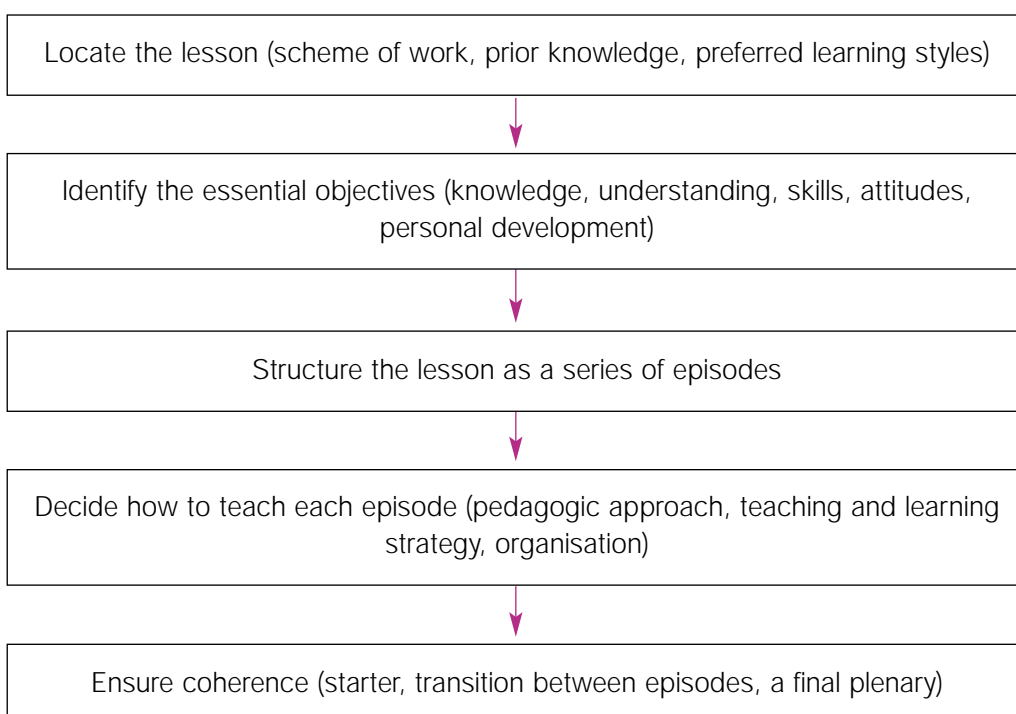
With your teacher partner, review how the lesson ending went, then plan to incorporate more into future lessons.

Structuring the learning

You will have been asked on a number of occasions through your career to state what you believe constitutes a good lesson. While we all have a slightly different view of this there is some consistency in the views held by the majority of teachers. Most would agree that the requirements for good teaching and learning require that teachers:

- focus and structure their teaching;
- actively engage pupils in their learning;
- develop systematically pupils' learning skills to support independence;
- use assessment for learning to reinforce learning and support reflection and target setting;
- have high expectations of each pupil's effort and achievement;
- make the learning motivating (well-paced, stimulating activities, range of learning styles);
- create a settled and purposeful atmosphere.

Within this there are some fundamental aspects of a lesson designed with the learner in mind which can be summarised as:



This diagram demonstrates how lesson planning needs a number of different inputs in order to be successful for pupils. In this unit we have looked at climate and organisation which should pervade each 'episode' of the lesson.

Task 12

Reflection

20 minutes

Locate the map that you drew for task 1. Think about the tasks and reading that you have undertaken through completing this unit. Look for areas that you have developed and perhaps some areas that you know about now but were unaware of before.

Alter your map to reflect your current thinking about the learning climate.

Summary of evidence

Summary of research

Summarised from *Effective teaching: a review of the literature*, by David Reynolds and Daniel Muijs, available at www.teachernet.gov.uk

In any lesson a major factor in determining how effectively pupils learn is *time on task* which is in turn related to classroom management. Five significant aspects of classroom management have been identified:

- Starting the lesson
- Seating arrangements
- Establishing clear rules and procedures
- Maintaining momentum during the lesson
- Ending the lesson

Starting the lesson

Teachers can ensure as fast and smooth a transition to appropriate classroom behaviour as possible by instituting some set procedures for dealing with lesson starts. These might include: writing instructions on the board before the pupils come in so they can get started on the lesson immediately, training pupils to take the roll and read instructions and having certain set activities that pupils can start doing as soon as they come into the classroom.

Seating arrangements

These need to be suitable for the type of lesson teachers intend to give. For co-operative group work it is recommended that groups sit around tables to allow them to interact easily with each other, an arrangement which is not effective if pupils need to work individually. Seating pupils around a big table or in a circle or semicircle can facilitate whole-class discussion, whereas seating in rows must be avoided.

Establishing clear rules and procedures

This is one of the main factors for ensuring lessons run smoothly. *Rules* are more formal, usually written, statements that specify what pupils are allowed to do or expected not to do. *Procedures* are more informal arrangements that specify how things are to be done in a particular classroom. Rules are usually school-wide and have been identified as distinguishing more effective from less effective schools. Procedures can also be school-wide but are often specified by a teacher for their own class. Effective teachers have been found to spend a considerable amount of time and effort on specifying and clarifying procedures at the beginning of the school year. While this may seem at odds with the principle of maximising pupils' opportunities to learn, the additional time taken at the beginning of the year is more than made up by time saved through less time-wasting during the year.

For rules and procedures to work they need to be actively taught to pupils. It is better to stick to a small number of clearly understood and consistently enforced rules.

Maintaining momentum during the lesson

One of the most fruitful ways of preventing pupil misbehaviour during lessons is to ensure the smooth flow of a lesson, keeping the momentum going. Sometimes teachers can themselves slow momentum by, for example, stopping an activity which is under way in order to do something else (sometimes referred to as a *dangle*); where the teacher returns to the original activity afterwards this is sometimes called a *flip-flop*. Both can leave pupils confused about their task and priorities. *Overdwelling* occurs when teachers go on explaining instructions well after the pupils have grasped what they have to do. *Fragmentation* is where a task is broken down into too many very small steps. All these can easily be avoided by careful planning.

Ending the lesson

Problems include not leaving enough time to finish planned activities, lessons running over time and instruction for homework getting lost as pupils rush to collect their belongings. Effective teachers experience fewer problems with ending the lesson than less effective teachers through planning and pacing their lessons, sometimes giving out homework before the end of the lesson and establishing procedures for pupils leaving the classroom.

Classroom climate

Aspects of classroom climate which affect pupil achievement include:

- the relationship between teacher and pupil;
- teacher enthusiasm;
- displays;
- the physical environment;
- teacher expectations.

Teachers who appear understanding, helpful, friendly and who show leadership without being too strict have been found to enhance pupil outcomes. Teachers should try to create an unthreatening environment in which pupils' opinions are valued, respected and solicited. All of these encourage pupils with problems to

request help. The classroom climate should reflect teacher enthusiasm for their subject and for learning. Attractive displays help to make the classroom a more pleasant place to be as well as giving pupils a chance to have their work displayed. Clean and tidy classrooms, hallways and toilets can create a better atmosphere in school. A highly visible way of improving the classroom climate is to greet pupils when they enter.

Ofsted evidence

Individual lesson planning has improved in over half of the schools. The recommended three-part lesson structure is used in nearly all schools and pupils take part actively in all aspects of the lesson. Lessons start promptly with good use of starter activities and a brisk pace is maintained throughout the lesson. Clear learning objectives are spelled out and form the basis of learning and assessment. Teachers are doing more to build on pupils' prior experience, most often through questioning. Plenary sessions are used where appropriate.

In lessons where the teaching was judged to be unsatisfactory, learning objectives were either not shared with the pupils or did not in fact form the foundation for the lesson (OFSTED report *The Key Stage 3 Strategy: evaluation of the third year HMI 2090*, March 2004).

Principles from *School improvement: what can pupils tell us?*

In their book *School improvement what can pupils tell us?* Ruddick, Chaplain and Wallace put forward a set of principles which were found to make a significant difference to learning:

- respect for pupils as individuals and as a body occupying a significant position in the school;
- fairness to all pupils irrespective of their class, gender, ethnicity or academic status;
- autonomy – not as an absolute state but as a right and a responsibility in relation to physical and social maturity;
- intellectual challenge that helps pupils to experience learning as a dynamic, engaging and empowering activity;
- social support in relation to both academic and emotional concerns;
- security both in relation to the physical setting of the school and in interpersonal encounters (including anxiety about threats to pupils' self-esteem).

Summary

The quality of classroom management has a direct effect on the quality of learning. The most significant aspects of management are the start and end of lessons, seating arrangements, the establishment of clear rules and procedures and the maintaining of momentum during lessons. In addition, teachers need to consider the classroom climate – in particular, interpersonal relationships, displays, the quality of the physical environment and the level of expectation of the pupils.

Next steps

In this unit there have been several suggestions for you to twin up with another teacher or your science consultant as a means of support while you develop your confidence in improving the learning climate. Here are some ideas to consider in order to take this work forward.

- Start small: choose one class to work with. Year 7 would be a good choice because these pupils still have vivid memories of their primary school where display is more prominent and furniture arrangements less stable. However, if you have another class you feel would respond well to this, then use them.
- Ask another teacher or your science consultant to help you. You may have an AST in school who is not a member of the science department but who recognises and uses some of the techniques in this unit. They would be a good source of help.
- Technicians and teaching assistants can be very useful in helping you to re-arrange the room and put up display materials.
- Make sure your line manager or head of department or subject leader knows what you are doing. This will enable dissemination to happen much more easily.
- Read some research about learning climate from the range of references provided.
- Talk to the pupils about how changing the laboratory helps them to learn.

Setting professional targets

Reflect on the experiences you have had while undertaking this unit and set yourself two targets to develop over the next year. Below are just a few suggestions of the kind of things you might want to undertake

Observe an AST or leading teacher in science who will be able to demonstrate how to establish a positive climate for learning.

Work with your science consultant and plan to team teach a module using the techniques that you have learned during this unit.

Plan a series of lessons for next term using these techniques and invite a colleague to observe you teaching.

Setting targets

Bearing in mind the guidance given above, reflect on the further steps you are going to take, perhaps by discussing the possibilities with a colleague or your line manager. Set yourself two targets to work towards over the coming year.

Specify:

- the outcomes you will seek in terms of developing an effective learning climate in your classroom;
- the strategies you will employ to disseminate your good practice to the rest of the department.

References

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