Research for Teachers

Assessment for learning: Putting it into practice

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What happens when teachers try out ideas which research suggests could benefit their students?
In this TLA research summary we feature a study which reported the experiences of a group of teachers who started from research findings to develop formative assessment in their classrooms. The study showed the positive change in their practice.

The study is:

Black, P., C. Harrison, C. Lee, B. Marshall and D. William. *Assessment for Learning: Putting it into practice*. Maidenhead: Open University Press, 2003.

This study built on earlier work by two of the authors: The booklet *Inside the Black Box* (Black and Wiliam, 1998b), a research review which explored how formative assessment contributes to effective teaching. *Inside the Black Box* featured as an earlier TLA research summary.

In *Inside the Black Box*, the authors pointed out the gap they noticed between the positive research findings on formative assessment and the low take-up of the ideas by practising teachers. They suggested that if research was to make an impact on practice, teachers needed structured support:

'Teachers will not take up attractive sounding ideas, albeit based on extensive research, if these are presented as general principles which leave entirely to them the task of translating them into everyday practice ... What they need is a variety of living examples of implementation, by teachers with whom they can identity...and see concrete examples of what doing better means in practice'.

This follow-up study was designed to help bridge the gap between evidence and practice. The study vividly demonstrates how teachers can transform research results into new and effective practice which has a positive

impact on the way students learn together and on their attainment. The authors conclude with suggestions for bringing about whole school change, based on their experience gained during the project.

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Overview

Why is the issue important?

There is clear evidence that assessment for learning (AfL) strategies are effective at improving pupil learning. It is important that teachers are able to transform the research results into new and effective practice which has a positive impact on the way students learn and on their attainment.

What did the research show?

Teachers were able to translate research findings into effective practice. When the researchers looked at the test results of twenty-five classes whose teachers participated in formative assessment activities, they found a positive and significant effect on attainment. The mean attainment of the experimental groups was about 15% better than that of the control groups. The gains in the classes of the teachers who were more successful at using assessment strategies were more consistent than the gains in the other teachers' classes.

How was this achieved?

Researchers introduced teachers to findings by earlier studies of formative assessment. The teachers then planned individual intervention strategies which they developed with one of their classes. The research team visited the schools to observe lessons, give feedback and discuss with the teachers the changes they were making to their practice in order to help them reflect. The assessment for learning strategies that the teachers used included:

- effective questioning that probed students' understanding
- comment only marking that structured students' learning
- sharing criteria with students to help them understand what counts as success
- peer-assessment which helped students learn how to give and take constructive criticism and advice that would help them to progress.

How was the research designed to be trustworthy?

The study involved 12 science, 12 mathematics and 12 English teachers from six comprehensive schools in two local authorities. The researchers collected a variety of data including: student attainment data, interviews (transcribed) with individual teachers at the beginning, middle and end of the project, lesson observations and journals kept by the teachers. They compared the performance of each class with that of a similar class that had not undergone the intervention.

What are the implications?

The study shows the importance of supporting students' learning through, for example:

- helping more students contribute to discussions, by giving them extra time to think about their answers?
- making a special point of seizing on students' misconceptions as a positive contribution to the learning process in order to provide a building block for further discussion
- asking more open questions that focus on causes and explanations and which help develop students' understanding rather than questions that seek descriptions and technical names

- giving written feedback on work that helps students to improve it
- asking students to work with a partner on activities, and encourage students to comment on each others' work.

What do the case studies illustrate?

The case studies show, for example how:

- science teachers in a school identified what their students needed to learn using 'diagnostic probes' and how they used the information to break the learning of science topics into a series of steps
- a teacher changed his style of questioning and how it correspondingly changed the students' learning experience
- a teacher developed her Key Stage 4 students' self assessment skills
- sking students to work with a partner in specific, structured, planned ways can have a positive impact on students' understanding, performance, motivation and self esteem
- a school set about implementing a whole school change in practice in order to improve communication with students about their learning.

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Study

What is 'assessment for learning'?

The term 'assessment' is commonly assumed to mean 'testing'. Summative tests, such as national curriculum tests or GCSE examinations, are used to classify students numerically and to compare them with each other. These formal tests tend to be infrequent, isolated from normal teaching and learning, and carried out on special occasions. The meaning of 'assessment for learning', the focus of this study, is quite different.

Assessment for learning is usually informal, rooted in teaching and learning, and can occur many times in every lesson. 'Assessment', in the context of this study, refers to all the activities undertaken by teachers and their students which provide feedback that shapes and develops the teaching and learning activities engaged in by the class. This becomes 'formative assessment' when the evidence is used to adapt the teaching work to meet the students' learning needs. There is no one simple set of activities that constitute formative assessment - it is not a quick fix process with a single formula. Rather it can involve multiple ways in which teachers can find out what their students know, can do and need to do - and then use this in feedback to students and for future lesson planning.

How did teachers aim to create greater feedback on teaching and learning in their classrooms?

The teachers in this study planned individual strategies to generate feedback about learning, which they could then build on to modify their teaching and improve their students' learning. The strategies were based on the areas suggested in the earlier work of the research team 'Inside the Black Box', which was summarised in our RfT on classroom assessment.

Although the strategies were not all explored to the same extent by all the teachers, collectively, the strategies the teachers implemented in their classroom involved:

- teachers' use of questioning
- feedback through marking
- peer and self assessment by students
- formative use of summative tests.

In the following sections we discuss the impact of the changes on teaching and learning. Later in the RfT we describe why and how teachers brought about the changes to their practice.

What was the evidence of improved students' achievement?

This study grew out of an earlier comprehensive review of research of assessment that established important links between effective formative assessment and students' learning. (See Black, P. and Wiliam, D. (1998b) in Further Reading . Also see our earlier RfT on classroom assessment)

In this study the researchers looked at the test results of 25 classes of students whose teachers participated in formative assessment activities. The tests included national tests at Key Stage 3, internal school examinations and GCSE results. The researchers compared the performance of each class with that of a similar class that had not undergone the intervention. They were then able to measure the effects of the intervention on students' academic achievement.

The 36 project teachers were classified by the researchers into one of four groups, depending on the use they made of formative assessment strategies in their classrooms. The groups were:

- 'experts' - formative assessment strategies embedded in and integrated with practice
- 'moving pioneers' - teachers who were successful with one or two key strategies and were looking for other ways to augment their practice
- 'static pioneers' - teachers who were successful with one or two key strategies who had restricted themselves to these
- 'triallers' - teachers who had attempted strategies, but had not embedded any into their practice.

The researchers found that:

- there was a positive and significant effect on attainment in all but four classes (the mean attainment of the experimental groups was about 15% better than that of the control groups)
- there was no difference in the mean effect size for groups of different ages, but all the Year 11 classes (who took GCSE examinations) had positive effect sizes
- the gains in the classes of the teachers who were more successful at using assessment strategies were more consistent than the gains in the other teachers' classes.

The researchers suggested reasons why positive effects were not found in four of the twenty-five classes - two of the teachers had not attended all the available in-service sessions and had made only limited use of formative assessment, while the other two teachers' classes had been compared with teachers who were much more experienced.

The researchers were cautious about claiming positive effects of the interventions on attainment. They pointed out the difficulty they had had in ensuring fair comparisons between classes. The best form of comparison was between the attainments of the intervention class and that of a parallel class taught by the same teacher the previous year, but it was not always possible to achieve this. Some of the intervention classes were compared with classes taught by a different teacher, where the positive effect may have been due to the project teacher being a better teacher. Sometimes, colleagues of the project teachers copied some of the new practices, which may have reduced the size of the effect.

Despite these reservations, the researchers believed the study provided evidence that improving formative assessment did produce tangible benefits in national tests. Based on this research, they suggest that improvements equivalent to between one-quarter and one-half of a GCSE grade per student per subject are achievable, depending on how successful the teacher is in using assessment for learning.

How did students become active rather than passive learners?

A key finding, reported by the teachers, was that students grew from passive receivers of knowledge delivered by the teacher to active learners who were able to, and were expected to, take responsibility for their own

learning.

Evidence about the ways in which students changed their approach to learning came both from the thirty-six teachers and their classes who participated in this study and from the larger evidence-base in our earlier RfT on this subject.

Evidence suggested, that across the classrooms, an increased number of students:

- took a greater part in their own learning than previously - they became aware of their learning goals and how they could meet them
- participated in shared learning - with all students involved in discussing solutions with their peers - as a common practice in their lessons
- became more confident and effective communicators
- learnt to work in, and helped to create, an ethos in which expressed misunderstandings were received empathetically by the whole class.

The researchers suggest that the ability to monitor one's own learning may be one of the most important benefits of assessment for learning - that learning how to learn is more important for raising achievement in the long run than how to improve scores on particular tests. It was clear for most of the students that this was the case. One of the science teachers - Roger - recorded the effects assessment for learning had on his class of Year 9 students. The first three quotes are taken from his journal.

Roger explained how the students helped to create a shared learning environment:

'We all had to be aware of everyone else, be prepared not just to listen, but to listen with an empathetic ear, we all had to understand and invest in a common goal, which was to move learning forward'.

In this new learning environment:

'students felt safe to give wrong answers and to express, freely, their lack of understanding ... the classroom ceased to be a habitat where only the brightest survived and flourished, but one where, with careful grouping and good questioning, every student could feel themselves making progress through a lesson'.

Roger noticed how the students began to take risks - allowing themselves to be questioned in a more rigorous manner. In his diary, he recorded:

'they themselves seem to be becoming more confident learners. Attitudes changing faster in some than others, need to tackle "quiet-head-down" low achievers. It has become unacceptable in groups to be loud-low-achievers. Loud-high achievers - the norm'.

Students' growth in confidence was also observed. Another teacher commented on one student, for example:

'...The second [result] is with a girl with a statement for being unable to talk or communicate with an adult. Having got used to the extra thinking time, she now offers answers orally and will now tentatively explain her answers.'

(Gwen, Waterford School)

How did teachers' thinking move away from 'transmission' teaching?

The researchers felt implementing assessment for learning had a profound effect upon the culture of the project teachers' classrooms. The emphasis shifted from teaching about the subject to helping the students learn how to learn. Although the teachers changed their beliefs and practices radically, the change was gradual and slow - many teachers had changed only small details in their practice after a year of the project.

The changes made by the teachers included:

- moving away from being dominated by the curriculum
- changing their beliefs about students' learning capacities from 'fixed' to 'incremental'
- encouraging more thinking among their students
- letting go of some of the control they had previously exerted over teaching and learning.

All the project teachers reported that they had changed the way that they thought of their teaching, seeing their role as helping students' learning, rather than feeling that they had to 'get through' the curriculum. By identifying what they wanted the students to learn, the teachers could then see the 'gap' between the students' current learning and the learning goal and were able to monitor the 'gap' as it closed'.

'I enjoyed classroom teaching again ... I was not facing piles of marking. I was looking forward to being creative and to planning the next day ... I was focusing on the girls' understanding and not on their behaviour. I often found that once the understanding was there, the behaviour followed'.

(Gwen, Waterford School)

Teachers may find it helpful to look at the case study featuring a group of teachers who saw their role as helping students' learning. They developed diagnostic 'probes' to help them identify what their students knew already about particular science topics which also helped them to determine what they needed to learn.

The teachers reported that the extra time they spent on ensuring students understood something was compensated by covering other areas more quickly, because the students were able to understand them more quickly as a result of the earlier work.

Many of the teachers moved away from viewing their students as having a fixed level of ability to seeing them as being able to improve with appropriate help and support - a shift from a fixed to an incremental view of ability. If the required learning did not seem to be happening, the teachers tried a different approach and gave the students more time. They did not think that the students were unable to understand because they lacked ability. They expected all students to be successful as result of the project.

The teachers also expected their students to do more thinking in lessons in the belief that the more students think, the more they learn. The teachers aimed to strike a better balance between the thinking that the teacher did in a lesson and the thinking the students did. This teacher attempted to do this by involving more students in class discussions:

'The class knows that they will all contribute at some point and most responses are requested by me rather than volunteered.'

(James, Two Bishops' School)

The teachers gave students more control in the lessons, over what they needed to learn in a topic, how long they would spend on the topic and what activities were to be engaged in to aid the learning. Teachers expected students to take more responsibility for their learning. So, for example, in classroom questioning, every student was expected to have an opinion and be prepared to express it. The teachers expected students to monitor and manage their own learning:

'I have thought carefully about pupils taking ownership of their own learning. I have now thought more about letting pupils know what the intention of the lesson is and what they need to do to achieve it. This way they have to think what they know and take more responsibility for their own learning'.

(Angela, Cornbury Estate School)

What was different about the ways in which the teachers used questioning?

Drawing on earlier research (for example Rowe, 1974, see Further Reading) the researchers helped teachers analyse their practice in terms of 'wait time' (i.e. time teachers allowed students to answer) and the effectiveness of their style of questioning. The teachers became aware of shortcomings in their approaches, as this quote shows:

'I'd become dissatisfied with the closed Q & A [question and answer] style that my unthinking teaching had fallen into, and I would frequently be lazy in my acceptance of right answers ... they and I knew that if the Q & A wasn't going smoothly, I'd change the question, answer it myself, or only seek answers from the 'brighter students'. I had always been wary of wrong answers ... I want to encourage children to answer in class ... so I'd usually end up with a lame 'That's an interesting way of looking at it'. No-one learnt anything from this exchange except the willing student, who gradually learnt to be less willing'.

(James, Two Bishops' School)

During the workshops, project teachers worked on developing approaches to questioning that fostered reflection and discussion in their classrooms, including:

- preparing quality questions designed to explore and challenge common misunderstandings, and to create some conflict requiring discussion (see example 'open questions' below)
- using incorrect answers from both class work and homework as discussion points to be taken up by the whole class
- giving students more time to think and sometimes time to discuss their thoughts with peers
- encouraging students to put mistakes right together, reaching answers collaboratively
- abandoning the usual practice of students putting their hands up to volunteer answers to questions - by insisting on 'hands down' - to discourage competition
- asking open questions so that all the students felt they had something to say.

These are two examples of how teachers can change closed questions that emphasise recall of facts into 'big' open questions promoting reflection and discussion:

Closed, factual questions	Open, discussion questions
Some people describe friction as the opposite of slipperiness. Do you agree or disagree?	Some people describe friction as the opposite of slipperiness. What do you think?
What is the equation for photosynthesis?	If plants need sunlight to make food, how come the biggest plants don't grow in deserts, where it's sunny all the time?

Open questions allowed all students to begin to formulate ideas and to be part of a discussion, not just the students who knew of, or understood, for example, key terms such as photosynthesis and friction.

The use of open questions that challenged students' existing ideas echoes the emphasis on 'cognitive challenge' in thinking skills approaches. See our earlier RfTs: Cognitive Acceleration in Science Education (CASE) project and Social interaction as a means of constructing learning: the impact of Lev Vygotsky's ideas on teaching and learning.

Many of the improved questioning styles are highlighted in case study 2 in which a teacher changes practice to using questioning as a formative tool.

Project teachers commented on the many benefits they noticed with the new approach to questioning. For example:

'I now use the 'hands down' strategy and this has made a big difference to my classroom discussions. In particular, it has broadened the range of participation and removed (at its best) the curious mixture of envy and relief which characterised the mood of the group while the usual people answered questions'.

(Paul, Cornfields School)

'...because they have to explain their answers each time orally, this has carried through to their written work and now they set out their answers fully without being prompted'.

(Gwen, Waterford School)

'My whole teaching style has become more interactive. Instead of showing how to find solutions, a question is asked and students are given time to explore answers together'.

(Nancy, Riverside School)

What did the teachers think about the way they marked their students' work?

Marking is crucial to assessment for learning. When reflecting on their marking practice the teachers concluded that:

- students rarely read comments, preferring to compare marks with peers, as their first reaction on getting work back
- teachers rarely give students time in class to read comments that are written on work and probably few, if any, students return to consider these at home
- often the teachers' comments are brief and/or not specific, for example 'Details?'
- the same written comments frequently recur in a student's book, implying that students do not take note of or act on the comments.

The teachers wanted to find the best way to communicate to the students about what they had achieved and what they needed to work on next. They also wanted to find ways of encouraging and supporting the students to act upon the feedback.

At the start of the project, the comments given by teachers tended to be one or a combination of the following types:

- a general evaluation, such as 'good' or 'well done'
- geared to improving presentation, for example, 'title?', 'date?', 'space out the questions on the page', 'rule off each piece of work', or 'use a pencil and ruler for diagrams'
- instructions to complete the work, for example, 'please finish' or 'answer all the questions'.

The teachers' comments tended not to indicate what had been achieved or what steps to take next. Ofsted 1998 (Further Reading) indicated that this kind of practice is common. The report stated: 'Marking is usually conscientious, but often fails to offer guidance on how work can be improved'.

The students were also clear about the way they wanted their teachers to give feedback. Students wanted their teachers to:

- write legibly so that the comments could be read
- write statements that could be understood
- not use red pen because students felt that it ruined their work.

How did the way the teachers marked their students' work change?

During workshops, the teachers worked on feedback strategies from a number of perspectives including:

- designing more challenging activities which created opportunities for teachers to give a much broader range of comments to students
- familiarising themselves with the sorts of comments that were effective - because they explained to the students what they had done well and what they needed to improve upon, and gave guidance on how to make that improvement
- thinking up ways of making the increased feedback economical in time
- designing procedures for monitoring students' responses to feedback.

By the end of the project, the teachers had become more adept at writing comments, which prompted students to take action and reflect on their work. The authors gave the following examples:

'Susan, you have got the right idea here about trying to explain your rule. Think: does it apply to all triangles?

'Go back to your notes from 29th September and look up where chlorophyll is and what it does'.

'Well explained so far but add reasons why the Haber process uses these conditions'.

Practitioners may like to read the case study about how a child improved her story in response to written comments provided by a teacher, but delivered by a computer, which we featured in an earlier summary about effective teachers of literacy.

Teachers noticed that some tasks were useful in revealing students' understandings and misunderstandings, and that others focused mainly on conveying information. This led the teachers to design activities that created opportunities for giving a range of different comments.

How did teachers find time for giving extra feedback as well as teaching?

The teachers found time-saving ways of accommodating the increased amount of feedback they provided by, for example:

- entering marks into record books, but not writing them in the students' books
- giving marks only after a student had responded to the teachers' comments
- using lesson time to allow students to redraft their work
- not marking some pieces of work
- involving students in checking their answers to straightforward tasks.

The teachers also devised ways of monitoring the students' responses to their comments. For example:

'I was keen to try and have a more easy method of monitoring pupils' response to my comments without having to trawl through their books each time to find out if they'd addressed my comments. I implemented a comment sheet at the back of my Year 8 class's books. It was A4 in size and the left-hand side is for my comments and the right-hand side is for the pupils to demonstrate by a reference to the page in their books where I can find the evidence to say whether they have done the work ... The comments have become more meaningful as the time has gone and the books still only take me one hour to mark'.

(Sian, Cornbury Estate School)

The teachers' initial fears that students and parents might react unfavourably to not receiving marks turned out to be ungrounded, as these teachers explained:

'At no time during the first 15 months of comment-only marking did any of the students ask me why they no longer received grades... I found this amazing, particularly considering just how much emphasis students place on the grades and how little heed is taken of the comments generally'.

(Derek, Century Island School)

'The whole faculty moved to a comment-only assessment policy in September ... I am not aware of a single parent expressing concern over a lack of grades/levels/marks'.

(James, Two Bishops School)

Evidence for the effectiveness of comment only marking is given in a case study in our earlier RfT on assessment for learning.

In what ways did the teachers use peer and self-assessment skills to improve learning?

The researchers suggested that self- and peer-assessment could be a means of helping students understand what their learning goals were and the approach they needed to take to meet them. Specifically, they regarded peer assessment as a means of helping students to develop the detachment they need for self-assessment because:

- peer-assessment improves the students' motivation to work more carefully
- peers use the same language and can provide models of achievement
- students accept criticisms more readily from their peers than from their teachers
- peer-assessment helps improve communication between students and their teacher about their learning
- peer-assessment helped the students to identify learning goals and what had to be done to achieve them, skills they then transferred into self-assessment
- peer-assessment activities give teachers time to observe, reflect and frame helpful interventions
- students learn by taking the roles of teachers and examiners of others.

The project teachers devised a variety of strategies to develop their students' peer and self-assessment skills, including:

- asking students to mark their peers' investigational work using the national curriculum level descriptions. From this peer assessment, the students produced their own targets which they then used to help them rewrite their investigational work
- asking students to 'traffic light' a piece of their own work, then to indicate by a show of hands whether they put green, amber or red (according to whether they think they have good, partial or little understanding). The teacher then paired up the students with amber and green lights to help each other improve their work, whilst the teacher worked with the remaining group of red students
- using criteria supplied by examination boards for grading their peers' or their own work
- using summative tests as a resource for formative assessment.

Teachers may find it helpful to look at the case study about how a teacher helped her students improve their French writing skills by developing their self-assessment skills.

Teachers may like to read the four vignettes featured in the main study showing how teachers developed peer- and self-assessment.

Teachers wanting to find out more about the positive effects of peer-assessment may like to look at the case study about students who worked with writing buddies to produce a short story.

The researchers suggested that whilst summative tests (such as national curriculum tests and GCSE examinations) are usually seen as being incompatible with formative practices, they can be used as a resource to give students the opportunity to gain helpful feedback in a number of ways, including:

- using peer and self-assessment to make revision more effective
- setting practice test questions
- students marking test answers.

The process of using summative tests formatively helped students to see tests in a different way:

'They feel that the pressure to succeed in tests is being replaced by the need to understand the work that has been covered and the test is just an assessment along the way of what needs more work and what seems to be fine'.

(Belinda, Cornbury Estate School)

What challenges did the teachers have to face?

Students in some classes were resistant to the changes their teachers wished to implement. One teacher - Barbara - explained the problem she faced when she changed school:

'The school I now teach in is a grammar school and I find that students who have already achieved well in a 'traditional' classroom are not so keen to get involved with their learning on a grand scale! ... The first time I asked a Year 10 top set to work in groups to examine the errors they had made in a test and to help each other to understand fully what was being asked of them, it was unsuccessful. They were not used to the ethos of taking that level of responsibility. That lesson I heard several times, "Why don't you just tell us?" ...I needed them to see that their actual test scores were not the issue; what we did about improving their understanding was much more important'.

Barbara persevered with the class. She found the idea of a 'traffic light' on each piece of work helped all her students take time to reflect on their understanding and decide for themselves whether they were red, amber or green. She recorded traffic lights for each student in her mark book (a system she found much more visual than a mark) and used the traffic lights to group students according to their own perceived understanding.

The other element she found helpful was questioning. She explained:

'By accepting every oral answer with the same body language and then asking another student to comment on it, the programmed responses of students are challenged. (What is the answer? Is that right? Why is it right/wrong?) The ethos of the class has to be right - non-judgmental and all striving for understanding - and when it is, this opens up so much discussion and teases out misunderstandings'.

Teachers also found it difficult to change their practice, as this teacher explained:

'Increasing waiting time after asking questions proved difficult to start with - due to my habitual desire to 'add' something almost immediately after asking the original question. The pause after asking the question was sometimes 'painful'. It felt unnatural to have such a seemingly 'dead' period, but I persevered. Given more thinking time, students seemed to realise that a more thoughtful answer was required. Now, after many months of changing my style of questioning I have noticed that most students will give an answer (and an explanation where necessary) without additional prompting.

(Derek, Century Island School)

How might other schools plan for a whole school change of practice?

The authors suggested some starting points for implementing whole school change, based on their experiences gained during the project. We have divided this process into two main parts reflecting activities related to what happens or needs to happen in schools to bring about changes in teachers' practice and how the changes can be monitored and measured. Briefly, the activities designed to bring about changes in teaching and learning involve:

- a clear vision of the aims of the strategy
- a review of existing practices of the school
- putting the plan into action
- providing support for those involved; (including through CPD)

- ongoing evaluation and dissemination (see next section)
- an overall timetable (see next section).

Aims and vision

The authors recommended that schools should centre their plans on a clear vision of the changes that will be brought about in the roles of the teachers and students.

Review of existing practices

The authors highlighted the value of a review of:

- the existing strengths of the school in promoting students' learning
- the extent to which staff are close to, or a long way from, the new practices.

Implementing the plan

The authors suggested that schools should begin on a small scale with a few groups - perhaps selecting two departments, or a group of teachers from different departments, with each teacher choosing to develop one of the activities. Gradually, after studying and evaluating the experience of the teachers involved in the project, other colleagues can become involved and the number of activities can be expanded.

Support

The authors suggested the programme for improvement will need the support of senior management including:

- initial support such as INSET in which training is provided by outside experts to the first group of teachers
- sharing experiences regularly with colleagues to reflect on immediate experiences in the light of the overall vision
- support from a member of the school management team, with knowledge about, and enthusiasm for, formative assessment
- release from school policies that might hinder the innovation
- consultation with parents so they understand the effects on their children
- INSET for the whole school to make all staff aware of the innovation.

The head of department will be a key figure in the change process - providing support and time for discussion. Outside agencies can also support school developments. For example, the LEA or local universities can provide access to expertise and experience from other schools, from its own officers and from links with research. Publishing results through established networks within the authority can also make it possible for other schools to learn from the developing expertise of the teachers involved.

Continuing professional development

The change strategy contains clear implications for the key features of successful continuing professional development (CPD) and closely embodies the findings of a recent systematic review of CPD.

Among the factors contributing to successful CPD outcomes for teachers and students, the review identified specifically:

- the role of external experts in providing access to research findings
- developing the CPD around issues of concern identified by teachers
- building on what teachers know
- creating conditions for teacher control of the CPD
- using peer observation and feedback.

Teachers may like to read the case study about how one school went about a whole school change of practice.

How can you ensure that you know what effect the intervention is having?

The efforts of the first group of teachers participating in the project should be evaluated, to track changes in teaching and learning. Because many complex variables are involved it is easy to forget key aspects. Change takes time to embed and teachers can easily feel they have failed when, in fact, students are moving towards the teacher's goals in important ways. On the other hand, they may feel they have 'finished' long before all the key features of formative assessment are in place. Tracking helps to monitor progress - teachers formatively assess their own learning.

Evaluation could consist of pre and post collection of data to give evidence of changes and questionnaires to students about their perceptions of the classrooms in which changes are being implemented, perhaps comparing with questionnaires with students in other classes. Progress might be helped by setting and checking on targets. A target could be, for example, allowing ample 'wait time' for at least some questions asked in a class and the achievement of such targets could be checked by peer-assessment among teachers who observe one another's classrooms.

The authors suggested that evidence of outcomes from the initial intervention is likely to occur after about a year of work and, on this basis, the whole school could adopt formative assessment during the second year. Evaluation plans should take into account evidence that might inform subsequent decisions about the development and diffusion of changes across the school.

How was the research designed?

Twelve science and twelve mathematics teachers, and, at a later stage, twelve teachers of English, from six comprehensive schools in two local authorities (Oxfordshire and Medway) worked with a research team from King's College London. The project, which became known as the 'King's Medway Oxford Formative Assessment Project' (KMOFAP) ran for two and a half years - from January 1999 until the summer of 2001. The findings relating to changes in students' and teachers' learning in this study corroborate the evidence collected in the earlier Black and Wiliam study *Inside the Black Box*. (See Further Reading.)

After the researchers had introduced the teachers to findings highlighted by their earlier studies into formative assessment, the teachers planned individual intervention strategies which they developed with a Year 7, Year 8 or Year 10 class of their own choice.

The research team worked with the teachers involved in the project in two main ways:

- teachers, researchers and LEA officers met during twelve INSET days to share ideas, formulate action plans and discuss progress
- the research team visited schools to observe lessons, give feedback and discuss with the teachers the changes they were making to their practice in order to help them reflect.

The researchers gathered evidence for their study from the following sources:

- student attainment data
- interviews (transcribed) with individual teachers at the beginning, middle and end of the project
- lesson observations
- documents and observations from the INSET meetings
- the teachers' action plans
- closing statements from each school about plans to extend and disseminate the work
- journals kept by many of the teachers
- the closing statements by the teachers, summing up their reflections on the experience.

Implications for practice

Leaders wanting to help their colleagues bring about improved student learning through a change of assessment practice may want to consider the following questions:

- has formative assessment featured as an area for collaborative professional development in your department or school - would it be helpful to create opportunities for teachers to work on developing new strategies?
- could you do more to support colleagues trying out formative assessment strategies for the first time, by for example, organising workshops and inviting external help, such as practitioners from university education departments or other schools?

Teachers wanting to create more opportunities for improving their students' learning may wish to consider the following questions about their current practice.

When conducting question and answer sessions, could you do more to:

- help more students contribute to discussions, by giving them extra time to think about their answers?
- make a special point of seizing on students' misconceptions as a positive contribution to the learning process in order to provide a building block for further discussion?
- ask more open questions designed to help develop students' understanding, as in the photosynthesis example given earlier?
- avoid questions that seek descriptions and technical names - to focus instead on causes and explanations and let names and specialist vocabulary emerge in the process?

When marking your students' work, could you do more to:

- encourage students to show their understanding of the key features of what they have learnt, such as making a short presentation to the rest of their group?
- adopt a 'comments only' method?

Could you do more to help your students learn self-assessment skills, by for example:

- asking students to work with a partner on activities, and encourage students to comment on each other' work?
- getting students to level each others work according to national assessment criteria (perhaps simplified and set out on card)? and
- trying the 'traffic lights' strategy (click to page 10 above) during revision?

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Case studies

We have selected the following vignettes and case studies to illustrate what teachers have done to change their practice.
Case studies 2 and 4 were part of the study itself.
Case studies 1, 3, 5 and 6 were drawn from independent classroom-based research conducted by teachers.

Using 'diagnostic probes' to identify students' understanding in science

We have chosen this case study because it is an example of how science teachers in a school identified what their students needed to learn and how they used the information to break the learning of science topics into a series of steps. This study describes how the teachers created a tool - 'diagnostic probes' - to assist them in their planning and teaching, by effectively and efficiently identifying students' levels of understanding within particular areas of science. The study involved 200 Year 7, 8 and 9 pupils from ten classes. The Year 7 and 8 pupils were taught in mixed ability, mixed gender groups, but were grouped by attainment in Year 9. The sample groups were taken from the whole ability range.

The teachers focused on particular areas of science such as: 'inheritance', 'burning' and 'the Earth in space and gravity'. They reviewed previous research on children's understanding in science to identify possible categories of ideas which pupils usually have. 'Probes' were developed in each of the chosen areas. These were trialled with a small group of pupils and refined before being used with the main test groups of pupils.

Developing 'the Earth in space and gravity' diagnostic probes
The review of previous research on students' understanding of the earth in space and gravity for example, revealed:

- a clear pattern of development in students' ideas from a flat earth to a spherical model
- gravity pulls objects down - this may be in conflict with the idea of pulling towards the centre of mass
- gravity does not exist in space
- the universe takes the form of a sphere made of all the other objects lying outside the solar system
- great confusion exists regarding the sizes and distances of objects in the universe.

The teachers created the following five probes for the earth in space and gravity topic to probe their own students' understanding:

Models - the probe involved the use of a range of different sized balls to probe the problems children have with scale in the universe - in particular the solar system.

Order - this involved the use of a card sort in which students were asked to sequence bodies (sun, galaxy, solar system etc) in order of size. This was to identify the ideas pupils have about the orders of size of bodies and systems in the universe.

Solar system - this involved the use of a card activity in which students could choose bodies (star, planet, comet, galaxy, milky way etc) that they would find in our solar system. This was used to identify what students knew and believed about the objects present in the solar system.

Gravity (ball) - students were provided with a diagram and asked to explain what would happen when a ball was released in different places. This was intended to identify the ideas that students had about why objects fall.

Gravity (objects) - students were provided with a diagram on which different objects were shown around the earth and they were asked to explain what would happen when the objects were released. This was used to identify the ideas that students have about the effect of gravity on different objects.

When the teachers used the earth in space and gravity probes with the students, they found that many of the students:

- encountered a major problem with scale when thinking about the universe and found three dimensional models even harder to use than two dimensional diagrams
- believed that the solar system is the largest system in the universe and believed that galaxies and other stars would be found in our solar system
- did not associate 'falling' under gravity with mass, but were confident with the ideas that heavy objects will fall and light objects will not
- believed that gravity does not exist in space - they will change their ideas of falling to meet the context in which it is considered - a ball will fall on earth, but will not fall on the moon.

Learning grids
Having found out what the students did and did not know about a particular science topic, the teachers developed learning grids to identify possible learning routes through the topic - recognising that the students have to go through some significant steps in learning.

The place of diagnostic probes in teaching
The teachers recognised the diagnostic probes they developed could be used for many purposes, including:

- measuring students' initial understanding prior to teaching a topic
- a learning activity for challenging and stimulating thought during teaching
- evaluating the teaching of a topic at the end of the topic
- informing colleagues of the ideas that students may hold about a topic
- assisting teachers to review and develop schemes of work
- assisting teachers in target setting for individuals and groups of pupils
- challenging teachers' own thinking and understanding
- stimulating and motivating teachers through being more effective.

Reference
David Nixon, Hilary Kirk and Richard Needham, Brooksbank School, Elland, West Yorkshire, *The use of 'diagnostic probes' to aid teaching and learning in science* .

Improving question and answer sessions

We chose this case study because it shows the change in a science teacher's use of questioning which correspondingly changed the students' learning experience. This example featured in the main study. The authors of the main study commented on transcripts of the start of two Year 7 (11-12 year olds) science lessons where a question and answer session was followed by a practical activity. In the first lesson, the teacher asked individual students closed questions, requiring brief factual answers. In the second lesson, students were involved in a discussion - the teacher encouraged the students to comment on each others' answers, giving them the opportunity to consolidate or modify their answer.

This first transcript was from the start of a lesson about electricity, which took place near the beginning of the project. The students had been studying electric circuits for two weeks before this lesson and were familiar with the setting up of series and parallel circuits, but the teacher did not try to elicit their understanding in this extract. Instead, he engaged in conversation with a few children to see if they could guess the facts which he had in his head and which he wanted them to grasp before they began their experiment.

Teacher: Anyone know what we call these and where you might find one?
Starts to walk round and show groups the ammeter.
Two hands go up in the class.
Teacher: Look carefully. Where have you seen something like this? You might have seen something like it before. What is it involved with? It's got a special name . . .
Three more hands go up. The teacher selects one of these students.
Teacher: Yes. . . Jay?
Jay: In electricity, sir.
Teacher: That's right. You can use these in electric circuits. Anyone know what it is called? This word here helps. Can you read what it says? Carolyn?
Carolyn: Amps.
Teacher: And what is this instrument called that measures in amps ?
Pause of 2 seconds. No hands go up.
Teacher: No? No-one? Well, it's an ammeter because it measures in Amps.

The teacher played a fast pace question-and-answer game, in which some students scored points because they guessed what the teacher wanted them to say, while others were highlighted for not paying attention:

Teacher: ...And where do we find these ammeters? Monica?
Monica shrugs her shoulders.
Six children have their hands raised.
Teacher: No idea. Tell her Rebecca.
Rebecca: In electric circuits.
Teacher: Good. I am starting to spot which of you are sleeping today. Are we with it now Monica?

Monica nods.

Teacher: Right. Now we are going to use these ammeters in our practical today and so gather round and I will show you how it works. Quietly please.

Over the next few months, this teacher worked on:

- extending wait time
- involving a larger number of students in whole-class question-and-answer sessions
- dealing with incorrect answers rather than ignoring them.

This second transcript taken from a lesson about photosynthesis seven months later shows a change in the same teacher's use of questioning. The teacher began by showing the class two geranium plants - one which was healthy and large, the other quite spindly. First he asked the students to discuss in pairs why the plants had grown differently; then he asked the pairs to share their ideas with the others in a whole-class discussion.

Teacher: Okay. Ideas?
About half the class put up their hands. Teacher waits for 3 seconds. A few more hands go up.
Teacher: Monica - your group? Pair?
Monica: That one's grown bigger because it was on the window. [Pointing]
Teacher: On the window? Mmm. What do you think Jamie?
Jamie: We thought that.. .
Teacher: You thought. . .?
Jamie: That the big 'un had eaten up more light.
Teacher: I think I know what Monica and Jamie are getting at, but can anyone put the ideas together?
Window - Light - Plants? Again about half the class put up their hands. The teacher chooses a child who has not put up his hand.
Teacher: Richard.
Richard: Err yes. We thought, me and Dean, that it had grown bigger because it was getting more food.
Some students stretch their hand up higher. The teacher points to Susan and nods.
Susan: No it grows where there's a lot of light and that's near the window.
Teacher: Mmmm. Richard and Dean think the plant's getting more food.
Susan . . . and Stacey as well? Yes. Susan thinks it's because this plant is
getting more light. What do others think? Tariq.
Tariq: It's the light cos its photosynthesis. Plants feed by photosynthesis.
The teacher writes photosynthesis on the board.
Teacher: Who else has heard this word before?
The teacher points to the board. Almost all hands go up.
Teacher: Okay. Well can anyone put plant, light, window and photosynthesis together and tell me why these two plants have grown differently?
The teacher waits 12 seconds. Ten hands went up immediately he stopped speaking. Five more go up in the pause.
Teacher: Okay. Carolyn?
Carolyn: The plant . . . The big plant has been getting more light by the window and cos plants make their own food by photosynthesis, it's . . .
Jamie: Bigger.

This transcript showed a marked change in the way that the teacher approached questioning. For example the teacher:

- no longer used questioning to seek terms and descriptions or to support classroom management through revealing those students who failed to listen or refrained from taking part as he had in the lesson about electricity. Rather, he tried to explore students' understanding
- created opportunities for the students to exchange ideas, articulate their thoughts and to modify answers in a supportive

environment
- extended 'wait time' which encouraged more students to participate and give longer answers containing indications of their conceptual understanding, rather than of their knowledge of names and terms
- changed the way the students participated in the classroom dialogue - the aim was not for discrete right answers to be celebrated, but for a discussion of the ideas to be explored.

Developing self-assessment strategies in writing in KS4 French

We have chosen this case study because it is an example of how a teacher developed her Key Stage 4 students' self assessment skills which helped them to improve their writing in French. The study involved four Year 10 French groups - two experimental groups (a top set and a mixed ability set) and two parallel control groups.

Over the year, the students in the two experimental groups were introduced to a combination of learning and checking strategies, which they practised frequently and regularly during lessons. These included:

- translating a sentence written in French back into English, to see if the writing made sense, revising the sentence where appropriate
- brainstorming before starting to write, relying on what the students already knew (without access to a dictionary) and using this as a plan for writing
- checking verbs in sentences in a systematic way, using colour-coding
- monitoring use and effectiveness of the dictionary when composing
- assessing their own coursework and setting own targets, based on feedback given to the whole class.

The students were helped to develop these strategies through:

- using A4 whiteboards for writing in pairs, practising verbs, brainstorming vocabulary on a particular theme or a group of words such as conjunctions, memory games and writing drafts
- learning how to use verb tables and dictionaries
- using word processing packages to redraft - particularly lengthening sentences and making sentences more interesting
- whole class brainstorming activities in both English and French, whole class writing activities and whole class feedback
- planned lesson time for review and correction in response to feedback.

At the beginning and the end of Year 10, all the students were asked to produce a piece of writing in French, using only a dictionary for support. Their pieces of writing were analysed and compared. All the students completed a questionnaire asking them to reflect on the progress they had made during the year and on their performance in the end of year writing examination.

The students in all four groups made progress during the year, but those in the mixed ability experimental group displayed the greatest improvement. Their average sentence length improved by 2.5 words per sentence (from 5.3 to 7.8) and the percentage of totally accurate verbs by 11% (from 55% to 66%). The top set experimental group showed greater confidence in and enjoyment of French and were producing original, sophisticated and creative pieces of writing by the end of the year.

Some of the students were reluctant to adopt some of the strategies until after the summer examination, leading the teacher to conclude that it may be necessary to explain to students the purposes of the strategies and at what stage in their writing they would be helpful.

Reference
Belinda Bartley, *Developing learning and checking strategies in writing in Key Stage 4 French.*

Examples of four lessons using peer and self-assessment skills

We have chosen these vignettes because they illustrate the variety of ways peer assessment activities can be set up to help students learn self-assessment skills. The vignettes featured in the main study. The lessons are examples of formative practice because they created opportunities for students to reveal their own understanding of the criteria for success to their peers and then to improve it. The opportunities were the result of careful planning - the tasks given to the groups had a sharp focus, with clear requirements of the students.

Piers

All the students in Pier's mixed-ability Year 9 class had just completed a mock Key Stage 3 test. Piers had read through the scripts and identified several questions on which all the students had done badly in the reading paper. He handed the papers back unmarked and asked them to first think about, then discuss, a mark scheme for awarding levels. They agreed on the following mark scheme:

Level 3: Good punctuation and spelling and be able to answer the required question.
Level 4: All of the above, good use of PEE (Point, Evidence, Explanation), good length answer.
Level 5: All the above, good use of PEE, well explained answer.
Level 6: All the above, good use of language and time.
Level 7: All the above, couldn't be better.

Piers then identified particular questions from the test and asked them to identify what they would need to change to go up one level. During the activity, the students made comments such as:

'I think in our comments we could have explained more'.

'We didn't use enough quotes; we could have had one per paragraph'.

The activity was followed by a detailed re-working of one of the questions which the students then re-levelled.

Mary

Mary's top-set Year 11 English class were preparing for timed examination essay answers. The class spent the first half of the lesson on a timed essay on 'poetry from other cultures'. Mary collected in the essays and then redistributed the papers randomly. She asked the students to:

- identify the important parts of the essay title, which she then set against the qualities that the examiners would be looking for (structure, language, interest, culture and use of references)
- mark in the margin of their peer's work where they felt the person showed evidence of these elements and to note anything they felt the person had missed
- give verbal feedback.

The students completed the task in almost silence, except for the odd comment, such as 'I needed to do that' or 'I haven't done that' - the peer assessment exercise had triggered reflection about the strengths and weaknesses of their own work.

Derek

Derek began his Year 11 lesson on plant nutrition by getting the students, in groups of four, to do poster-size concept maps for the topic. The groups were then split into pairs; one pair stayed with their poster, while the other group went round the different posters asking the pairs remaining with their poster why they had included some of the terms and why they had linked some terms together. The pairs in each foursome then swapped places and repeated the exercise. This was followed by a 'feedback' session chaired by Derek where students reported on aspects of the activity such as the terminology selected, pointing out links they felt were good or confusing.

The students were then given the following question to discuss:

'If a villain got hold of a chemical that could destroy chlorophyll, what effect would this have on plants if released?'

Each group of four were asked to record between three and five criteria they felt were needed for a good written answer to the question. These criteria were discussed by the whole class and a final list of criteria was drawn up:

- say what chlorophyll does
- explain photosynthesis as a process
- put in the equation for photosynthesis
- describe the effect on plants of no chlorophyll
- add any secondary effects from photosynthesis stopping.

The students then wrote their answers for homework. Derek marked the work by writing comments and not allocating grades. In another lesson, the students read the comments in pairs to check they understood the teacher's suggestions then redrafted and improved their answer.

Philip
Philip asked his Year 10 class to revise for homework, work done so far on human nutrition, circulation and excretion. In the next lesson, he split the class into groups of five. Each group was given a set of five topic cards - absorption, blood, circulation, digestion and enzymes. Each student took one of the cards and spent five minutes preparing a short talk on that topic which they would then give to the other four members of the group. To help them prepare their talk, each card gave three or four suggestions for what to include. For example, the 'blood' card had the following suggestions:

- what are the main components of blood?
- briefly what job does plasma do?
- briefly what job do red cells do?
- how do white blood cells defend the body against pathogens?

The rest of the group had to secretly 'traffic light' each presentation and give details to justify their decision, like this:

Green: better than I could have done it/I learnt something from this.
Amber: about the same as I could have done it/no major omissions or mistakes.
Red: not as good as I could have done it/some serious omissions or mistakes.
The students gave their talks in alphabetical order and feedback was delayed until they had all given their talks. The suggestions on the cards were used to support the discussion, and sometimes disagreement about the traffic lights given. Philip then facilitated a five minute whole-class discussion, in which some students were asked to explain why their talk had not been awarded 'green' and what they needed to do to improve. The students who accepted that they were 'red' or 'amber' for their talks wrote out an improved version, whilst the students who were 'green' chose another card and wrote a talk on that topic. The students who finished before the end of the lesson read the work of other students to check that they had included all the points.

Peer and self-assessment in creative writing

We have chosen this case study because it illustrates how asking students to work with a partner in specific, structured, planned ways can have a positive impact on students' understanding, performance, motivation and self esteem. Two Year 8 classes - an above average and a below average literacy set - took part in the study. The students worked on producing a short story. This was an extended project, which spanned several weeks.

The teacher developed the creative writing project in the following sequence:

- the students chose "Writing Buddies" whom they would work with for the whole project
- they were helped to compose assessment criteria based on the genre work done previously
- the writing buddies were encouraged to work together on planning - explaining their ideas orally, swapping outline plans etc before the writing process began
- during writing, partners swapped books at frequent intervals and were encouraged to question and constructively criticise the writing using the assessment criteria as a reference
- when the final draft was complete, each student produced a word-processed copy
- the students were asked to write an assessment of their own and their partner's finished story, referring directly to the original agreed assessment criteria
- the students assigned a national curriculum level using a checklist to help them, having previously practiced using level descriptions to make assessments of model texts.

Evaluating the impact of the project, the teacher found:

- assessments made before and after the project showed clear gains in achievement with an average gain of approximately two thirds of a national curriculum level and similar gains being made by the most and least able students
- the students' attitudes were very positive, with many pupils feeling that the project had increased their self-esteem as writers
- the process of ongoing discussion about stylistic issues during the writing process led to many opportunities to teach grammar and structure within a real context, according to individual need
- most pupils felt that they gained a much greater understanding of what constitutes 'quality' in writing and were able to apply it to their own work
- most pupils were very accurate in the levels they assigned to their work
- the students' behaviour was exemplary, even where problems might have been expected.

Reference
Rachel Swaffield, *Self-assessment in creative writing*.

Working towards a whole school change of practice

We have chosen this case study because it is an example of how a school set about implementing a change in practice. The school wanted to improve communication with students about their learning. The change was implemented in three stages. First, teachers belonging to the schools' Effective Learning Group identified 11 new strategies by reflecting on ideas from research. Next, 37 teachers who taught two Year 9 tutor groups volunteered to trial the strategies. Their questionnaire and interview responses helped the school identify successful actions. Finally, it was anticipated that all the staff at the start of the following academic year would implement a modified set of strategies.

The strategies
The 11 strategies and their outcomes were:

- using checking questions to make sure that students were saying what they meant to say - many of the teachers felt using checking questions worked well by helping discussion and deepening thinking
- using 'why' questions to check what was going on in the student's mind - a small proportion of teachers reported having difficulty using the 'why' questions in a non-threatening way
- setting up opportunities for peer-peer reflection - this was not well understood by all the teachers, but was reported to work well by one teacher
- using questionnaires in which students rated their level of understanding in writing - this was not well received by teachers as they found it hard to use

- when speaking to students, emphasising the validity of the communication by using eye contact, smiles and affirmative nods - most teachers recognised the value of this strategy
- when speaking to students on a one-to-one basis, being on the same physical level as they are - the teachers recognised this as a valuable strategy though found it difficult to implement it in small rooms
- giving negative messages using non-verbal signals only and giving positive signals verbally or non-verbally - this was found to be a successful strategy by some teachers
  reducing the isolation of students from the teacher by using a 'U' shape for
- seating - the teachers found this impracticable in crowded classrooms
- using checklists to enable the same points to be made to a number of students to help ensure that positive comments are not forgotten - these were found to be practicable when developed collaboratively, and when checklists were used, they provided insights for teachers and seemed to lead some students to improve their presentation
- encouraging students to write comments and questions in their books - some teachers did not like encouraging students to write comments and questions in their books because they felt it defaced the student's work
- adopting mechanisms for the teacher to encourage students to see them without thinking they had done something wrong - this was unsuccessful with some of the boys.

In general the evaluation suggested:

- the teachers wanted practical suggestions to improve practice, but they needed to be involved in the change process to avoid them rejecting the suggestions
- the teachers who were successful at implementing difficult strategies could be a useful learning resource - helping others move forward and establishing a learning ethos
- more account should have been taken of the change required of students in accommodating the change in teachers' practice.

The modified strategies
Based on the experiences of the group of teachers who trialled the strategies, the following six modified strategies were identified:

- check students say what they mean to say by asking checking questions such as "So what I think you are saying is ... is that right?", "Can you say why you think [what they have just said] is true ... what makes you know that?"
- set up opportunities for peer-peer reflection through a scoring system for students to express their understanding - giving themselves a score out of five by holding up their hands with a number of fingers showing
- when speaking to students on a one-to-one basis, give full attention to the student through eye contact, smiling and affirmative nods, and try to be on the same level as the students (standing or sitting)
- use non-verbal communication for negative communication and use verbal or non-verbal communication for positive
- use checklists for marking to make it more likely that positive comments will not be forgotten and design spaces for students to write comments or questions on the checklists and in their books
- use mechanisms such as asking students to collect smiley faces or "smart" stamps from the teacher to encourage students to use them without thinking they have done something wrong.

The school felt that the modified strategies would improve communication between teachers and students and intended to have all teachers in the school implement them at the start of the following academic year.

Reference
The Effective Learning Group, John Mason School, Abingdon, Oxon, *Communication between students and their teachers about learning*.

....

Further reading

What else might I enjoy reading?

Black, P. and Wiliam, D. (1998) Assessment and Classroom learning. Assessment in Education, 5(1), pp.7-71

Black, P. and Harrison, C. (2001) Feedback in questioning and marking : the science teacher's role in formative assessment. School Science Review, 82(301), pp.55- 61.

Black, P. and Wiliam, D. (1998) Inside the Black Box: raising standards through classroom assessment London: School of Education, King's College.

Black, P. and Harrison, C., (2001) Feedback in questioning and marking : the science teacher's role in formative assessment. School Science Review, 83(302), pp.43-49.

Black, P., Harrison, C., Lee, C., Marshall, B., and Wiliam, D. (2002)Working Inside the Black Box: Assessment for learning in the classroom. London: Department of Education and Professional Studies, King's College.

The project teachers looked at several studies on the importance of oral feedback. The study that created the most discussion was:

Butler, R. (1988) Enhancing and undermining intrinsic motivation. British Journal of Educational Psychology, 58, pp.1-14

Rowe, M.B. (1974) Wait time and rewards as instructional variables, their influence on language, logic and fate control. Journal of Research in Science Teaching, 11, pp.81-94.

Sadler, R. (1989) Formative assessment and the design of instructional systems. Instructional Science, 18, pp.119-44.

Ofsted (1998) Secondary education - a review of secondary schools in England 1993-1997. London: HMSO

Where else might I find information online?

Assessment under pressure (Oxford Brookes University)
http://www.brookes.ac.uk/services/ocsd/2_learntch/aup14pr.html

Practitioners may find it helpful to read these case studies of how university lecturers have used formative assessment with their students.

Teachers' and students' roles in formative assessment
http://www.standards.dfes.gov.uk/research/themes/assessment_for_learning/MonSep151522482003/
A digest of some of the earlier work by the authors is available on the DCSF Research informed practice website.

King's College: Formative assessment

Further information about publications and other resources for formative assessment by the research team can be obtained on the King's College website. Some of the publications can be downloaded from this site. There are also references to other useful websites.

Toolkit 98
http://www.nwrel.org/assessment/toolkit98.php
Groups of teachers wanting to think through the issues before developing formative assessment in their school may find it helpful to look at this 'toolkit' of readings, overheads, exercises and handouts.

Assessment for learning 8 schools project report (Secondary National Strategies):
http://education.gov.uk/publications/standard/publicationDetail/Page1/DCSF-00067-2007

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Appraisal

Robustness

This study built on earlier work by two of the authors (Black and Wiliam) now widely known as 'Inside the Black Box' which explored how formative assessment contributes to effective teaching - see our earlier RoM Raising standards through classroom assessment.

This follow up study was designed to help bridge the gap between evidence and practice. It reported the experiences of 12 science and 12 mathematics teachers, and, at a later stage, 12 teachers of English, from six comprehensive schools in two local authorities (Oxfordshire and Medway) who worked with a research team from King's College London. The project, which became known as the 'King's Medway Oxford Formative Assessment Project' (KMOFAP) ran for two and a half years - from January 1999 until the summer of 2001. After the researchers had introduced the teachers to findings highlighted by their earlier studies into formative assessment, the teachers planned individual intervention strategies for development with a Year 7, Year 8 or Year 10 class of their own choice. The findings relating to improvements in students and teachers' learning in this study corroborate the evidence collected in the earlier Black and Wiliam study.

The researchers gathered evidence for their study from a number of sources, including:

- student attainment data
- interviews (transcribed) with individual teachers at the beginning, middle and end of the project
- lesson observations
- journals kept by many of the teachers.

Relevance

Our impression, supported by, for example, feedback from the RoM website, is that the topic continues to grow in importance and popularity. Assessment for learning is now embedded in the national key stage 3 strategy. Whilst this study involved teachers of year 7, year 8 and year 10 classes and their students, the approaches described and explored in the report are relevant to all age groups from primary to post-16. The authors also offer suggestions for bringing about whole school change, based on their experience gained during the project, which lead to several implications for teacher professional development, that teachers and leaders will find useful.

Applicability

The report is practically focused and gives lots of illustrations about work by the teachers in classrooms with which teachers at all levels of experience will identify. Teachers wishing to shift the emphasis from teaching about their subject to helping the students learn how to learn will find these examples helpful for their own practice. The reported gains in students' attainment will help to boost teachers' confidence in both the theory underpinning assessment for learning and its practice. The report contains detailed illustrations about questioning and feedback. This includes allowing sufficient time for students to answer questions, asking open questions and comment only marking. The report also looks at peer and self- assessment, including the use of 'traffic light' strategies to highlight levels of understanding of content material.

Writing

The report is readable and there is little by way of statistical analysis. Findings are described in ways teachers can readily access. The authors have aimed to make their report of the study user-friendly - for example, they

provide an explicit guide to the structure of the book, and also present explanations of terms such as assessment, formative, etc. The processes involved in the study and the outcomes of the study are clearly distinguished.

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Research tasters: Five activities

Below are five practical research activities that take aspects of the RfT summary as their starting point, which you could try in your classroom, either on your own or with the help of a colleague.

1. Marking pupils' work - how can we ensure we move our pupils on with their learning?

When the project teachers reflected on their marking, they noticed that:

often their comments were brief and/or not specific, for example 'Details?'
the same written comments frequently recurred in a student's book, implying that students did not take note of, or act on, the comments.

The teachers wanted to communicate to the students about what they had achieved and what they needed to work on next. They also wanted to find ways of encouraging and supporting the students to act upon the feedback so they experimented with writing comments that prompted students to take action and reflect on their work.

Investigating learning in your classroom

You might like to reflect on your approach to marking pupils' work by examining a range of your pupils' exercise books. As you scan them, you could look out for the extent to which:

- your marking and feedback consists of correcting mistakes
- you ask pupils questions to prompt their understanding
- you give hints or information intended to help the pupils find a solution for themselves
- you offer suggestions about how the work could be improved
- you point out what, specifically, is good about your pupils' work
- your pupils appear to respond to your feedback by reducing the number of similar mistakes in subsequent work.

What potential can you spot for enhancing the way you mark work? You might like to identify two or three different patterns of problems and possible responses.

Next steps

Having analysed your current marking practice, you might like to find more ways of encouraging pupils to find their own solutions to problems, rather than relying mainly on you to supply an answer. Perhaps you could talk with colleagues who are also interested in formative assessment strategies, and share ideas and strategies with them? You could explain to your pupils why you are experimenting with new approaches to marking and ask them what comments and feedback they find most helpful in developing their understanding.

2. How might we develop our questioning skills?

During the workshops, project teachers worked on developing approaches to questioning that fostered reflection and discussion in their classrooms, including asking more open, discussion questions and fewer closed, factual questions. Open questions allowed all students to begin to formulate ideas and to be part of a discussion, not just the students who knew of, or understood, for example, key terms such as photosynthesis and friction.

Investigating learning in your classroom

You and a colleague might like to gather evidence about how you use questions. You could observe each other during a lesson or part of a lesson such as the introduction and note down the questions you ask and who they were addressed to using a code (eg. Hab=high ability, Lab=low ability, B=boy, G=girl). You could transcribe the questions the teacher asks and classify them according to whether they are:

1. closed questions (low level cognitive demand)

For example:

- to recall information (eg. 'What is an adjective?')
- to give an on the spot solution (eg. 'What is 28 divided by 4?')
2. open questions (high level cognitive demand)

For example:

- to explore information and ideas with no set answer - reasoning/interpreting, hypothesising/speculating, imagining/inventing (eg. 'How do you think the hero would feel if ...?')
- to encourage synthesis of information and ideas by focusing on contradictions, discrepancies, different sources of evidence (eg. 'What do you think really happened ... ?')
- to encourage evaluations, decision making and judgements (eg. 'Would it be fair if ...?')
- to encourage the transfer of ideas and application of knowledge (eg. 'How is what we've found out useful?')
What do you notice about the level of cognitive demands you make of your pupils?

Next steps

You might like to see if you can increase the number of open questions you ask that check your pupils' understanding and encourage them to think and reflect. Would you find it helpful to work with your colleague to devise and practice asking such higher-order questions? Afterwards, you could observe each other teaching another session to see whether you used more higher-order questions with your pupils.

3. How might we improve the way we handle pupils' responses to questions?

As well as analysing the effectiveness of their style of questioning, the project teachers became aware of shortcomings in the way they handled their pupils' responses. One teacher, for example, explained the difficulty he had with handling incorrect answers:

'I had always been wary of wrong answers ... I want to encourage children to answer in class ... so I'd usually end up with a lame 'That's an interesting way of looking at it'. No-one learned anything from this exchange except the willing student, who gradually learned to be less willing'.

Investigating learning in your classroom

You might like to explore how you handle pupils' responses in question and answer sessions. You could agree to work with a colleague and take turns to observe one another for three five-minute periods during a teaching session. You could note down where the teacher:

- ignored any pupils' responses

- gave an evaluative comment (eg. Yes, that's right!')
- paused before responding
- prompted any pupils to give additional detail or explanation
- invited other pupils to respond to an initial answer given by a pupil
- encouraged pupils to put mistakes right together through discussion.

You could explore with each other why you handled the pupils' responses in the ways you did and discuss the effects the different approaches had on the pupils. You might also like to discuss how else you might have handled your pupils' responses.

Next steps

Now that you are more aware of your usual approach, you might like to experiment with different ways of responding so that you probe pupils' reasoning, uncover misconceptions and open up their ideas to discussion by the class. For example, if you find you usually respond straight away, you might like to see what happens if you pause before offering a response. What happens to the subsequent discussion if you prompt pupils to "Go on ..." or ask others to say what they think about an answer? What do your pupils' various responses tell you about their individual levels of understanding? Could you use what you discover to plan follow up tasks and activities?

4. How might we encourage pupils to take a more active role in lessons?

The project teachers aimed to strike a better balance between the thinking that the teacher did in a lesson and the thinking the students did, in the belief that the more students think, the more they learn. One teacher attempted to do this by involving more students in class discussions.

Investigating learning in your classroom

You might like to investigate the balance between your input into a lesson and your pupils' input. One way you could do this could be to monitor the amount of talking you do compared to your pupils. You could audio tape one of your lesson introductions or work with a colleague to observe each other's lesson introductions. You could consider:

- how much speaking there is
- who is doing the speaking
- which pupils speak
- how long/full their answers are
- when the pupils speak and when the teacher speaks.

You could estimate or calculate the amount of time you talk (and think) compared with your pupils. Most people find time goes very quickly when they are talking. Are you talking for as long as you think is ideal?

Next steps

If you find that you seem to be doing a large amount of the talking that goes on in your class, you might like to consider how you could shift the balance towards the pupils. You might like to try, for example, some of the strategies suggested by the project teachers in the RfT summary, such as:

- giving students more time to think about their answers and sometimes time to discuss their thoughts with peers
- abandoning the practice of students putting their hands up to volunteer answers to questions
- asking open questions that give all students the opportunity to contribute, and
- encouraging pupils to discuss each other's ideas.

5. How might we encourage our pupils to learn from each other?

The researchers suggested that self- and peer-assessment could be a means of helping students understand what their learning goals were and the approach they needed to take to meet them. They saw peer assessment as a way of helping students to develop the detachment they need for self-assessment because:

- peer-assessment improves the students' motivation to work more carefully
- peers use the same language and can provide models of achievement
- students accept criticisms more readily from their peers than from their teachers
- peer-assessment helps students to identify learning goals and what they need to do to achieve them
- students learn by taking the roles of teachers and evaluators of others' work.

Investigating learning in your classroom

You might like to explore the learning that takes place between pairs of pupils in one of your classes. You could monitor (or if necessary plan) a series of activities designed to help your students to learn from each other about, for example, a particular writing genre, such as a description. You could ask them to:

- first write a description
- then share their work with each other by reading their descriptions out loud to each other and commenting on what they feel works well and what doesn't
- then revise their own description in the light of their peer's comments.

You could compare your students' original and revised pieces, noting down the differences, to help you see what they learned from each other. You could also ask your students (individually or in small groups) about the feedback they received from their partner and what they felt they learned from working with a peer, and note down what they tell you.

Next steps

Having gained an idea of the criteria and strategies your students currently use, you might like to consider how you could enhance them. Would you find sharing your marking schemes or the criteria supplied by examination boards with your students, and getting them to apply them to each other's work helpful? Would you find it helpful to share ideas with a colleague about ways of getting students to work effectively with each other?

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CPD leader resource: Diamond 9 activity

Why use Diamond 9?
The aim of a Diamond 9 activity is to stimulate focussed discussion between people in a fairly short space of time. It is designed to help people collectively prioritise a list of issues. It is an excellent way of facilitating conversations in which they can discuss issues together, discover one another's different viewpoints and agree a pattern of priorities.

Why is it called Diamond 9?
Participants are given a list of issues and asked to discuss and agree which are the most important items. Each item is placed on a large, diamond-shaped grid. The most important item is usually placed in the top of the diamond and the least important at the bottom of the diamond. Items in each row are of equal importance. (Some groups prefer to put the most important card in the centre - either approach is fine, as it's the discussion surrounding the group's decisions that is important.) The diamond shape enables the group to encompass a range of priorities and perspectives.

Information about this Diamond 9
The purpose of this Diamond 9 is to help participants discuss key messages from the RfT on Assessment for Learning, so they can:

- deepen their understanding

- connect it with what they know already

- reach a shared agreement about their relative importance

- begin to explore possible implications for their pupils' learning.

The materials here support discussion on three different aspects of assessment for learning:

- feedback and marking
- questioning; and
- peer- and self- assessment.

Participants could discuss each in turn, or a large group of staff could be split into smaller groups, each of which could discuss one of the three aspects.

Prior knowledge

- Essential: Some knowledge and experience of teaching
- Desirable: Some understanding of different forms of assessment

Preparation before your CPD session for using the Diamond 9
Each group will need:

- one set of nine statement cards from the Assessment for Learning RfT, either 'Feedback and Marking', 'Questioning' or 'Peer and self- assessment', depending upon which aspect the group intends to focus
- an enlarged Diamond 9 base to record the group's priorities
- a copy of the relevant question for the aspect the group is focusing on.

Before the session:

- download a copy of each set of Diamond 9 statement cards ('Feedback and Marking', 'Questioning' or 'Peer and self- assessment') and a Diamond 9 base from the website
- use a photocopier to enlarge the base to at least A3 size and trim the edges
- make enough large copies of the base for each group to have their own
- decide which set(s) of statement cards will be most helpful for your school context and make enough copies for each group to have their own set of nine cards. Cut the cards up and use a paper clip or elastic band to keep the sets apart. (You might wish to make a few extra sets to have a back up activity for early finishers.)
- make a copy of the relevant focus question (see below) for each group
- if you think your groups might like to display their base on a wall, you could stick the statements onto post-it notes before the session
- think about the composition of each group. The discussion works well with groups of between three and five, ideally made up from people with a variety of experience.

Focus questions
For the 'Questioning' cards

Teachers at Hilltown School are keen to improve the quality of questioning and of discussion between pupils and teachers as part of their school-wide programme of assessment for learning. They have made a list of suggestions for making these improvements. Work with a group of colleagues to discuss and agree the relative importance of each suggestion for promoting learning through questioning and discussion.

For the 'Peer- and self-assessment' cards

Teachers at Hilltown School are keen to promote peer-assessment and self-assessment amongst pupils as part of their school-wide programme of assessment for learning. They have listed several actions that they believe are important for this project. Which items do you and your colleagues think would be most effective for the success of this project and why?

For the 'Feedback and marking' cards

Teachers at Hilltown School are keen to improve the quality of feedback and marking as part of their school-wide programme of assessment for learning. They have made a list of suggestions that they believe are important for the success of this project. Work with a group of colleagues to discuss and agree the relative importance of each suggestion for promoting your pupils' learning.

Using the Diamond 9 in your CPD session
Timing for the activity

- Introduction: 5 minutes
- Colleagues discuss and sort the cards: 15 to 20 minutes
- Debrief colleagues' choices: 10 minutes
- Activities to take the learning further (timing depends on your situation)

Using the Diamond 9
Introduce the game and how to play it (5 minutes)

- Divide people into groups of three to five, ideally made up from people who don't normally work closely together.
- Give each group a Diamond 9 base, a set of cards about one aspect of assessment for learning and a matching focus question.
- Explain that they have 15 - 20 minutes to discuss the statements on the cards and to sort them on the diamond pattern according to their level of importance.
- Explain that they will then be asked to present their top three choices and to briefly explain how they arrived at this choice.

Play the game (15 to 20 minutes)

If a group finishes early, facilitators might wish to suggest that they begin to consider a second aspect of assessment for learning.

Debrief colleagues' choices (10 minutes)

Each small group presents their top three choices to the whole group and explains briefly how they arrived at this selection. The facilitator asks each group to explain why they prioritised one item over another.

Activities to take your learning further

The statements on the cards were taken from the RfT summary.

When you have debriefed the Diamond 9 activity, you could take a few minutes to discuss and agree which of the following activities you wish to use to take your learning further. If you have time, you could try some of them now.

Identify the issues that were seen as most important or where there was significant disagreement. Use these 'hot issues' as a basis for further discussion and to interrogate the RoM for other perspectives and ideas.

Construct a light touch audit of different approaches and practices related to formative assessment used by colleagues in your school.

Try out the activity on 'Priorities and action planning' included in this suite of CPD materials.
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