Chapter 9

Assessing for Learning

Our concern here is using assessment to help children’s learning. To those who associate, or may equate, the word assessment with testing, this may not make sense, or at any rate, not seem a high priority. So we have to start by clarifying the meaning we attach to it here. Assessment serves different functions in education and so we discuss its purpose in helping learning in the context of other purposes. Being clear about what we don’t mean is central to knowing what we do mean. We also want to make clear that there are some very strong reasons for giving attention to assessment for learning; it leads to improved learning of the kind that we are concerned with in this book. After summarizing these reasons we look at what is involved in practice, both for the teacher and the children.

Meanings and Purposes

Assessment—or evaluation—or testing—although not identical, all involve gathering information about children’s ideas and skills and making judgments for various purposes. In primary school classrooms the main purposes relating to children’s learning are

- to find out where children are in the development of desired ideas, skills, and attitudes in order to decide the next steps that will help them in this development (we call this assessment for learning, or formative assessment)
- to find out what children have achieved at certain points in order to monitor progress from time to time and to report on achievement
to parents and others with an interest in the children’s education (we call this assessment of learning or summative assessment)

It is with formative assessment that we are chiefly concerned here, but since more effort and attention is often given to summative assessment we must discuss this too. The difference between the two lies not so much in the way they are carried out but in the use that is made of the information that they provide. Both formative assessment and summative assessment can involve information gathered by teachers, but formative assessment can only serve its purpose if it uses this information gathered in this way—for it cannot otherwise serve its purpose. Conversely, just because information is gathered by teachers this does not make the assessment formative. It is only formative when the information is used to decide the appropriate next steps for individual children and to adapt teaching accordingly. In some cases the focus is the individual child and in some cases the whole class.

Formative assessment

For the individual child, formative assessment occurs in this kind of way:

Ten-year-old Martyn was trying to set up a circuit so that his group could operate an electric bell from a switch. He had successfully connected the bell to the switch but placed the battery on the same arm of the switch so that it rang continuously. His arrangement is shown in Figure 9–1. The teacher watched this and then asked him to trace with his fingers the path from the battery around to the bell and back again. Because this went through part of the switch, Martyn thought he had done what was required. The teacher thought that it was possible that he had not connected this primitive switch with the familiar switch that turns lights on and off. So she left the bell aside for a while to give him chance to explore the switch, for it was clear that he did not identify it as just a way of making and breaking a circuit nor realize the effect this had on the components of a circuit. Had the teacher just told him to connect a wire to the other side of the switch, or if he had done this either by chance or by seeing what others were doing, he would have succeeded in using the switch to operate the bell but still would not have understood the main purpose of the activity, which was to apply and extend his understanding of an electric circuit.
For the whole class, a good example is another teacher at an early stage of a lesson on simple circuits with her third-grade class:

The children had spent about twenty minutes working in pairs to try to make a bulb light from a simple cell. To bring their ideas together she asked each pair to draw on the white board the circuits they had tried, putting ones that worked in one place and ones that didn’t in another. She went on to ask the children to pick out circuits they were not sure about and to try to reproduce the circuit drawings with the equipment. In this way the children identified the errors in their drawings and the teacher identified their misunderstandings. She explained after the lesson that she had two main purposes in mind: “One of the reasons that the students were putting drawings up on the board was for them to see the importance of including detail in their drawings and also I can take a quick look up there and get a read on basically where the class is as a whole. Some need some help.” Her use of the white board was a device that gave her a quick overview of the children’s early progress toward grasping the essentials of a circuit and enabled her to make a judgment as to whether to move on or give more time for this early exploration. (Linda Block, WGBH video 1997)

**Summative assessment**

Summative assessment provides a summary of what has been achieved at a certain time. It can take the form of a review of each child’s work across the period of time in question, perhaps collected in a portfolio, or it can take the form of a test, or it can be some combination of
summarized work and a test score. The key word here is *summarized* for, to serve its purpose, summative assessment has to be in a form that concisely conveys what has been achieved. It cannot convey all the details that are collected and used for formative assessment since this would be unwieldy, perhaps confusing, and for these reasons would probably not be used. The “summary” thus often takes the form of a grade or level or score. A child might be described as having achieved level X or met the standard for grade Y or reached a score of Z in a test. It is important, of course, to know what X, Y, and Z mean in terms of what the child can do, or knows, but too often this is forgotten and the grade or score becomes reified as if it had some existence and meaning in its own right.

Summative assessment can also be used for the purpose of providing information about individual children or about a whole class. For the individual child, parents and other teachers need information about individuals—and hopefully they receive more than the terse level or grade. The use of information about the whole class for the purpose of evaluating a teacher or school is controversial, but nevertheless widespread. When information about children’s performance is used in this way—often made public and possibly used to influence resource allocation—it becomes “high stakes.” Further, the more important the consequences of children’s results for the status, reputation, and support of the school, the more attention is given to ensuring that the measurements of children’s achievement are “fair.” This may lead to a preference for basing results on tests, since these are traditionally regarded as being more reliable than teachers’ judgments (even though there is little real evidence to support this view). The tests of greatest reliability are those that focus narrowly on questions with well-defined “right” answers so that they can be reliably graded. But the more reliable they are, the less they say about the full range of goals of education. When the results of these tests become high stakes it is inevitable that teaching focuses on the knowledge that is tested. What we end up with is teaching children to pass tests rather than teaching them science.

Is there anything that can be done to avoid the impact of tests having a stranglehold on the curriculum? The answer is hopeful. Levels of achievement can be raised in another, more educationally sound,
way. Although teachers' own assessments tend to be downgraded and even snuffed out by high-stakes testing, there is convincing evidence that using formative assessment to help learning not only preserves the kind of learning we have been concerned to enhance in this book—that is, building understanding through the active engagement of children with materials and with ideas from others—but indeed leads to improved attainment as measured by tests required by national, state, or local systems. This applies, of course, to all classrooms whether or not in the grip of a testing regime. In the next section we look at these arguments and the supporting evidence.

Why Formative Assessment?

Since the purpose of formative assessment is to help learning, one of the strong reasons for developing practice in formative assessment starts from considering learning. In Chapter 1 (page 11) we described a framework for learning through inquiry. Looking back at that we see that children are using their ideas and skills at many points. But whether they are developing their ideas and skills depends upon the extent to which both the children and the teacher have identified, and are working for, progress in these aspects of learning science. By finding what ideas the children bring to try to understand a new experience, the teacher is in a position to ensure that these are taken into account—tested if necessary—so that any new ideas, or modification of existing ones, make sense to the children. By noticing how they make their observations, express their predictions, and plan their investigations, the teacher can see where the children are in the development of these skills, and he or she is in a position to decide if they need help to do these things more scientifically. Similar opportunities arise when it comes to the important step of interpreting and seeing how their findings help them answer their original question.

We can see that at all these stages the action the teacher takes can be informed by what the children do or say or write or draw. If this information is not taken into account, then the steps the teacher requires the children to take may be out of their reach and they have to follow blindly. Alternatively the steps may be too small, leaving children unchallenged and missing opportunities for learning. This is
not to say that in every part of every activity the teacher has to be gathering information and making teaching decisions on the spot, which would be impossible. What it does mean is having a clear view of progression in learning and making sure that relevant information about where children are in this progression is picked up during the regular course of interactions with children.

Now we turn to the second important reason for improving the practice of formative assessment. This comes from looking across an extensive range of research studies about the effect of classroom assessment. When Black and Wiliam reviewed these studies in 1997, they identified strikingly clear evidence that formative assessment is a most significant element in raising the achievement of students and especially that of the lower-achieving students. The effects on achievement were indeed large, much greater than changes that can be brought about by changes in other conditions, including reducing class size (Black and Wiliam 1998). The characteristics of classroom practice associated with these gains in learning were:

• that assessment was used by teachers to adapt teaching
• that teachers gave feedback to children in terms of how to improve their work, not in terms of judgmental comments, grades, or marks
• that children were actively engaged in learning—meaning that they were active in developing their understanding, not passively receiving information
• that children were engaged in self-assessment and in helping to decide their next steps
• that teachers regarded all children as being capable of learning

The potential for helping children to learn more effectively is very great if these classroom conditions can be brought about. Some of these conditions are not new—good teachers have always practiced them intuitively. However, by looking more closely at what they involve we may be able to spread this practice more widely.

Using Assessment to Adapt Teaching

Formative assessment involves teachers in gathering information, interpreting it in terms of progress toward goals, deciding the next
steps that need to be taken, and then helping children to take these steps. Although these separate components of the process can be identified in theory, in practice they will often occur at much the same time as each other.

**Gathering and interpreting information**

A number of ways of gathering information as part of teaching have been mentioned in earlier chapters:

- questioning (pages 31, 57)
- asking children to draw their ideas (pages 58, 114)
- concept maps (page 59)
- discussing words (page 58)
- listening to children-only discussions (pages 58, 104)
- and, more generally, observing what children do as well as looking at what they produce

Observing actions is of particular value for gathering evidence about children’s developing process skills and attitudes. But it helps if you know what to look for. As we saw in Chapter 7, observation for anyone—child, teacher, or scientist—involves knowing what to look for, otherwise you might miss it. Teachers have found it particularly helpful to have in mind the kinds of things that children do or say that are indicators of a skill, attitude, or idea being used. If, at the same time, these “indicators” are arranged in a sequence that reflects progression in development of these attributes, then they help also in the interpretation of the children’s behavior and give some pointers to the next steps. Here are some examples (from Harlen 2000a), for planning, observing, and communicating:

**Planning investigations**

Do the children:

1. start with a useful general approach even if details are lacking or need further thought?
2. identify the variable that has to be changed and the things that should be kept the same for a fair test?
3. identify what to look for what or measure to obtain a result in an investigation?
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4. succeed in planning a fair test using a given framework of questions?
5. compare their actual procedures after the event with what was planned?
6. spontaneously structure their plans so that independent, dependent, and controlled variables are identified and steps taken to ensure that the results obtained are as accurate as they can reasonably be?

Observing
Do the children:
1. succeed in identifying obvious differences and similarities between objects and materials?
2. make use of several senses in exploring objects or materials?
3. identify differences of detail between objects or materials?
4. identify points of similarity between objects where differences are more obvious than similarities?
5. use their senses appropriately and extend the range of sight using a hand lens or microscope as necessary?
6. distinguish from many observations those that are relevant to the problem in hand?

Communicating
Do the children:
1. talk freely about their activities and the ideas they have, with or without making a written record?
2. listen to others’ ideas and look at their results?
3. use drawings, writing, models, paintings to present their ideas and findings?
4. use tables, graphs, and charts when these are suggested to record and organize results?
5. regularly and spontaneously use information books to check or supplement their investigations?
6. choose a form for recording or presenting results that is both considered and justified in relation to the type of information and the audience?
In each of these lists the questions refer to behaviors indicating progression, from 1 to 6, in the particular skill. They were created from the best of what is known about development in general, but they will not fit each and every child exactly. They have several uses. Initially they prompt teachers to observe particularly relevant aspects of children’s behavior. Then they help in bringing together observations made over time to address the questions for each child. In this way they help the teacher to find where the answers turn from “yes” into “sometimes” into “no.” Where it becomes difficult to say yes or no indicates the child’s position in the progression, where skills need to be consolidated before moving toward the ones where there is a definite “no.”

The same approach can be used for scientific attitudes, for example:

**Respect for evidence**

Do the children:

1. attempt to justify conclusions in terms of evidence even if the interpretation is influenced by preconceived ideas?
2. realize when the evidence doesn’t fit a conclusion based on expectations, although they may challenge the evidence rather than the conclusion?
3. check parts of the evidence that don’t fit an overall pattern or conclusions?
4. accept only interpretations or conclusions for which there is supporting evidence?
5. show a desire to collect further evidence to check conclusions before accepting them?
6. recognize that no conclusion is so firm that it can’t be challenged by further evidence?

When it comes to children’s understanding, the emphasis is upon children’s ability to use progressively more complex concepts relating to particular “big ideas.” For example:

**Forces and movement**

Can the children use these ideas?
1. To make anything move or stop moving there has to be something pushing, pulling, or twisting it.
2. Speed is a way of saying how far something moves in a certain time.
3. How quickly an object will start moving depends on the amount of force acting on it, and the faster it is moving the more force is needed to stop it.
4. It takes more force to start or stop a heavy object than a lighter one.
5. Things fall because of a force acting on everything on the Earth pulling toward the Earth (gravity).
6. When several forces act on an object their effect is combined.
7. When an object is not moving, the forces acting on it cancel each other, and there must be a force acting against gravity to stop it falling (as in floating).

Helping children to take the next steps

The test of whether the assessment is or is not formative is whether it is used to take children forward in their learning. It is of little value to know where children are unless this informs teaching. So what can teachers do to help children? We noted in Chapter 5 in the discussion of helping children’s concept development that we can’t be prescriptive about what to do in any particular case since this must depend on the ideas that are revealed. But we can propose a number of strategies. An important part of deciding which is appropriate in a particular case is to identify how children have come to their ideas. This generally indicates whether they will benefit most from more exploration, a wider range of experience, testing their ideas, talking through them, or trying alternative ideas with scaffolding from the teacher (see page 62).

In relation to the development of process skills there are some general points that emerge from the discussion of separate skills in Chapters 6, 7, and 8. Teachers can help children to develop their process skills by:

- providing opportunity to use process skills in the exploration of materials and phenomena at first hand
- asking questions that require children to use the process skills
- involving children in critically reviewing how they have carried out their activities
• small-group and whole-class discussion of whether their ideas are consistent with the evidence
• discussing how they have learned as well as what they have learned (metacognition)
• teaching the techniques needed for advancing skills

Feedback from Teacher to Children
Feedback from the teacher is an important vehicle for enabling children to know how to improve their work, but its effectiveness depends on the form of the feedback. Often teachers give feedback on how well something has been done using a mark, grade, or a judgmental comment. Research evidence supports the experience of effective and sensitive teachers that giving marks or grades does not improve learning. What does improve both interest and achievement is giving comments that are nonjudgmental and that indicate how improvements can be made. Giving marks or grades together with comments is just as ineffective as giving marks or grades only, since the students’ attention is focused on how well they did and the comments are ignored. Only those with high marks feel good, and the others feel that they have been labeled as “no good.” This is consistent with Kohn’s (1993) telling dictum:

“Never grade students while they are still learning.”

Because this point is so important in characterizing feedback that is formative, it is worth spelling out what is nonjudgmental and what is judgmental. Nonjudgmental feedback gives information and

• focuses on the task, not the person;
• encourages children to think about the work, not about their feelings or ability;
• provides comments on what to do next and ideas about how to do it.

Judgmental feedback:
• is expressed in terms of how well the child has done, rather than the quality of the work that has been done
• gives a judgment that encourages children to label themselves
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• provides a grade or mark that children use often to compare themselves with each other or with what they want to achieve

It is useful to note that praise comes into the judgmental category; it makes children feel they are doing well but does not necessarily help them to do better. (So praise is fine if you want to make children feel good, but not if you want them to improve their work.) A remark or mark that indicates a judgment on the work will divert children’s attention from any comment that is made about improvement. Children are more motivated by comments that help them think about their work and realize what they can do to improve it, and that give them help in doing this. This means oral or written questions and comments such as, “How did you decide which was the best _______?” “Is there another way of explaining this by thinking of what happened when _______?” “Next time, imagine that someone else is going to use your drawing to set up the circuit and make sure that you show them clearly what to do.”

Children Assessing Their Own Work

Several of the key factors in effective formative assessment relate to children taking an active role in their learning. This includes taking part in assessing their own progress and in helping to decide their next steps and what they need to do to take them. All these things put children “in the know” about their learning. They don’t then have to rely on someone else telling them how they are doing and what to do next; they are in a position to take some responsibility for their own learning. But this does not come about without sustained consistent action from the teacher that involves:

• sharing with children the goal of learning in an activity so that they know where they are going
• giving children some way of judging where they are in relation to this goal
• helping them to think about their learning (metacognition again)
• ensuring that the children have the skills and confidence to take the next steps

All of these are important and none is easy to implement, but they all depend on the first one, sharing with children the goals of their
learning. That is the place to start if a teacher wants to move toward “letting children in on their learning.” Anyone who is trying to learn needs a clear idea of what he or she is aiming for and children are no exception. This includes both goals that refer to the kind of thing to do and those referring to doing it well. However, it is not easy to communicate learning goals to children and this certainly can’t be done in the formal language of “targets” and “standards.” Some ways in which teachers have succeeded in sharing their goals with children are by discussing “best work”; stating its purpose at the start of an activity and reinforcing during the course of it; asking children to show what they have learned; and using examples.

**Discussing “best work”**

One teacher described an approach that can be used with children from about the age of eight. It begins with the children selecting their “best” work and collecting it in a folder or bag. Children are given time to review and select their work; time is also set aside for the teacher to talk to each child about why certain pieces of work have been selected. During this discussion the way in which the children are judging the quality of their work becomes clear. The children’s reasons may have messages for the teacher. For example, if work seems to be selected less for its content than for its tidy appearance, then perhaps this aspect is being overemphasized.

At first the discussion serves to clarify the criteria the children use for selecting work as their best. “Tell me what you particularly liked about this piece of work.” Gradually it will be possible for the teacher to suggest criteria without dictating what the children should be selecting. This can be done through comments on the work. “That was a very good way of showing your results, I could see at a glance which came out best.” “I’m glad you think that was your best investigation because although you didn’t get the result you expected, you did it very carefully and made sure that the result was fair.”

**Discussing the purpose of activities**

Another example is the teacher who regularly discusses with the children the purpose of their activities, so that they know where to focus their attention. Although she usually does this in general terms
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with the whole class at the start, this is never enough on its own. She reinforces it in her discussions with groups later and may identify more specific targets to suit individual children. It is important to find the right wording that shares the goal without telling children “the answer.” In science this is more difficult than in some other subjects (where, for instance, the teacher could indicate that the goal of a particular piece of writing was to use quotation marks correctly). For example, in explaining the goal of an investigation, the goal should not be put in the form “Find out that [stating the intended idea]” but rather “Find out about [the materials to be used].” When the goal is to refine the process of inquiry, the children should be aware of this and not be left with the impression that they have spent all their time finding out something that is in fact rather trivial. This happened in a class where some boys were observed to have spent three lessons finding out which of three kinds of paper was the strongest. The observer interviewed the boys after the lesson:

INTERVIEWER: What do you think you have learned from doing your investigation?
ROBERT: . . . that graph paper is stronger, that green one.
INTERVIEWER: Right, is that it?
ROBERT: Um . . .
INTERVIEWER: You spent three lessons doing that, seems a long time to spend finding out that graph paper is stronger.
JAMES: Yeah, and we also found out which . . . paper is stronger. Not just the graph paper, all of them.

The boys appeared to be unaware of the process of investigation as a learning goal, in contrast with their teacher. It seems reasonable to assume that, had they been aware of this goal, they would have reflected more on the way they were investigating, found more satisfaction in the investigation, and made more progress toward the goal that the teacher had in mind but kept to herself.

Asking children to show what they have learned

Children can be asked to show others what they have learned. At times when they report the findings of their inquiries to the whole class this is an opportunity to ask them to include a statement of what
they have learned as well as what they did and found out. Particularly when there was some unplanned exploration or problem that had to be solved, the teacher can ask, “What did you learn from that?”

One teacher set the children to make a practical test for each other to test their knowledge of simple circuits. The tasks were far harder than the teacher would have given. All the children, those setting and responding to the tasks, not only enjoyed this challenge but extended their learning in the process.

**Using examples**

Communicating the intended quality, or standard, of work to aim for is difficult at any level. Teachers find it helpful to have standards exemplified by children’s work and in a similar way these are also helpful to children. Indeed there is no reason why some of the examples produced for teachers in publications such as *Performance Standards: New Standards* (1997) or *Exemplification of Standards: Science at Key Stages 1 and 2, Levels 1 to 5* (SCAA 1995) should not be shared with children, to show what other children have done. This can avoid problems that might arise by discussing examples taken from the work of classmates. Sometimes it is useful not to have a perfect example but to discuss shortcomings as well as the more positive aspects of a piece of work. A collection of pieces of work could be created for this purpose but it is best if the authors of the work cannot be identified. Teachers from different schools can often agree to exchange examples of work for this purpose.

Of course, involving children in assessing their own work takes time, but this time is paid back severalfold by the children’s efforts, their enjoyment in learning, the reduction in waiting time (because they don’t have to wait for the teacher to tell them what to do by), and the focusing of effort where it is most needed.

**Summary of Main Points**

This chapter has been concerned with assessment for the two main purposes that it has in the primary or elementary school: formative and summative. Formative assessment is part of teaching and can provide information to adapt teaching according to the needs and
progress of the children. It is a process in which teachers gather
detailed information about all learning goals and use this to identify
next steps for individual children or for the class as a whole.

The purpose of summative assessment is to provide a summary of
what has been achieved at a certain time. It often takes the form of a
test but can also be based on summarizing across a range of children's
work. When summative assessment is used for evaluating and judging
teachers and schools for high-stakes purposes, there is a tendency for
the tests to be narrowed to increase reliability and, in turn, to influ-
ence the curriculum and teaching.

The improvement of formative assessment can raise standards of
achievement of all children and particularly the lower achievers. The
potential improvement is greater than for any other intervention in
children’s education.

Formative assessment is most effective when teachers use it to
adapt teaching, provide nonjudgmental feedback to children, involve
children in self-assessment and making decisions about their next
steps, and engage all children in active learning. The following are
suggestions for actions that teachers can take in relation to these key
components of formative assessment:

**Feedback into teaching**

1. Collect information as part of regular interaction with children,
   ensuring that there is evidence for the judgments that are made.
2. Interpret the information in terms of what it means for progression
   in the development of concepts, skills, and attitudes.
3. Use the information about where children are in their development
to decide the next steps possible for them to take and the appropri-
ate strategy for helping them to take these steps.

**Feedback to children**

1. Comment on the work, not on the ability or performance of
   the child.
2. Indicate by question or comment what the child should do either
to improve the work or to move on.
3. Do not give marks or grades even if these are accompanied by a
   comment.
Involving children in self-assessment

1. Tell children what they should be aiming to try to do in an activity but without suggesting a particular outcome.
2. Ask them what they have learned from an activity and what they have still to learn.
3. Help the children to identify good work, through discussing their own work and examples of others’ work.
4. Involve them in deciding what their next steps should be and how they might set about taking them.
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