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Formative assessment and self-regulated learning: a model and seven principles of good feedback practice

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The research on formative assessment and feedback is reinterpreted to show how these processes can help students take control of their own learning, i.e. become self-regulated learners. This reformulation is used to identify seven principles of good feedback practice that support self-regulation. A key argument is that students are already assessing their own work and generating their own feedback, and that higher education should build on this ability. The research underpinning each feedback principle is presented, and some examples of easy-to-implement feedback strategies are briefly described. This shift in focus, whereby students are seen as having a proactive rather than a reactive role in generating and using feedback, has profound implications for the way in which teachers organise assessments and support learning.

Introduction

This article positions the research on formative assessment and feedback within a model of self-regulated learning. Formative assessment refers to assessment that is specifically intended to generate feedback on performance to improve and accelerate learning (Sadler, 1998). A central argument is that, in higher education, formative assessment and feedback should be used to empower students as self-regulated learners. The construct of self-regulation refers to the degree to which students can regulate aspects of their thinking, motivation and behaviour during learning (Pintrich & Zusho, 2002). In practice, self-regulation is manifested in the active monitoring and regulation of a number of different learning processes, e.g. the setting of, and orientation towards, learning goals; the strategies used to achieve goals; the management of resources; the effort exerted; reactions to external feedback; the products produced.

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Intelligent self-regulation requires that the student has in mind some goals to be achieved against which performance can be compared and assessed. In academic settings, specific targets, criteria, standards and other external reference points (e.g. exemplars) help define goals. Feedback is information about how the student's present state (of learning and performance) relates to these goals and standards. Students generate internal feedback as they monitor their engagement with learning activities and tasks, and assess progress towards goals. Those more effective at self-regulation, however, produce better feedback or are more able to use the feedback they generate to achieve their desired goals (Butler & Winne, 1995). Self-regulated learners also actively interpret external feedback, for example, from teachers and other students, in relation to their internal goals. Although research shows that students can learn to be more self-regulated (see Pintrich, 1995; Zimmerman & Schunk, 2001), how to enhance feedback (both self-generated and external) in support of self-regulation has not been fully explored in the current literature. This article helps to address this gap by proposing seven principles of good feedback practice in relation to the development of self-regulation.

The rationale for rethinking formative assessment and feedback

Over the last two decades, there has been a shift in the way teachers and researchers write about student learning in higher education. Instead of characterising it as a simple acquisition process based on teacher transmission, learning is now more commonly conceptualised as a process whereby students actively construct their own knowledge and skills (Barr & Tagg, 1995; DeCorte, 1996; Nicol, 1997). Students interact with subject content, transforming and discussing it with others, in order to internalise meaning and make connections with what is already known. Terms like 'student-centred learning', which have entered the lexicon of higher education, are one reflection of this new way of thinking. Even though there is disagreement over the precise definition of student-centred learning, the core assumptions are active engagement in learning and learner responsibility for the management of learning (Lea *et al.*, 2003).

Despite this shift in conceptions of teaching and learning, a parallel shift in relation to formative assessment and feedback has been slower to emerge. In higher education, formative assessment and feedback are still largely controlled by and seen as the responsibility of teachers; and feedback is still generally conceptualised as a transmission process, even though some influential researchers have recently challenged this viewpoint (Sadler, 1998; Boud, 2000; Yorke, 2003). Teachers 'transmit' feedback messages to students about what is right and wrong in their academic work, about its strengths and weaknesses, and students use this information to make subsequent improvements.

There are a number of problems with this transmission view when applied to formative assessment and feedback. Firstly, if formative assessment is exclusively in the hands of teachers, then it is difficult to see how students can become empowered and develop the self-regulation skills needed to prepare them for learning outside university and throughout life (Boud, 2000). Secondly, there is an assumption that when teachers transmit feedback information to students these messages are easily

decoded and translated into action. Yet, there is strong evidence that feedback messages are invariably complex and difficult to decipher, and that students require opportunities to construct actively an understanding of them (e.g. through discussion) before they can be used to regulate performance (Ivanic *et al.*, 2000; Higgins *et al.*, 2001). Thirdly, viewing feedback as a cognitive process involving only transfer of information ignores the way feedback interacts with motivation and beliefs. Research shows that feedback both regulates and is regulated by motivational beliefs. External feedback has been shown to influence how students feel about themselves (positively or negatively), and what and how they learn (Dweck, 1999). Research also shows (Garcia, 1995) that beliefs can regulate the effects of feedback messages (e.g. perceptions of self-efficacy might be maintained by reinterpreting the causes of failure). Fourthly, as a result of this transmission view of feedback, the workload of teachers in higher education increases year by year as student numbers and class sizes become larger. One way of addressing this issue is to re-examine the nature of feedback, and who provides it (e.g. teacher, peer, self), in relation to its effectiveness in supporting learning processes.

In the next section a conceptual model of formative assessment and feedback is presented that centres on the processes inherent in learner self-regulation. A key feature of the model that differentiates it from everyday understandings of feedback is that students are assumed to occupy a central and active role in all feedback processes. They are always actively involved in monitoring and regulating their own performance, both in relation to desired goals and in terms of the strategies used to reach these goals. The student also actively constructs his or her own understanding of feedback messages derived from external sources (Black & Wiliam, 1998; Ivanic *et al.*, 2000). This is consistent with the literature on student-centred and social constructivist conceptions of learning (Palinscar, 1998; Lea *et al.*, 2003).

The conceptual model of self-regulation outlined in this article draws on earlier work by Butler and Winne (1995). Their article stands out as one of the few available to provide a theoretical synthesis of thinking about feedback and self-regulation. Following a presentation of the conceptual model, seven principles of good feedback practice are proposed; these are aligned to the model and backed up by a review of the research literature on assessment and feedback. Relating the recent feedback research to the conceptual model adds significant value to this area of study. First, the model provides a coherent educational rationale to draw together some quite diverse research findings on formative assessment and feedback. Second, the model and seven principles offer complementary tools that teachers might use to think about the design and evaluation of their own feedback procedures. In that context, after describing each principle we identify some related feedback strategies that teachers might easily implement.

A conceptual model of processes of self-regulation and internal feedback

Figure 1 presents a conceptual model of self-regulation and feedback that synthesises current thinking in these areas. The top part of Figure 1 is based on a model originally

published by Butler and Winne (1995). Processes internal to the learner are depicted inside the shaded area. This shows how the learner monitors and regulates learning and performance. It also shows the crucial role of internally generated feedback in these processes. Pintrich and Zusho (2002) provide the following working definition of self-regulation:

> Self-regulated learning is an active constructive process whereby learners set goals for their learning and monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features of the environment. (p. 64)

This definition fits the purpose of this article in that it recognises that self-regulation applies not just to cognition but also to motivational beliefs and overt behaviour. It also recognises that there are limits to learner self-regulation; for example, the teacher usually devises the learning task and determines the assessment requirements.

In the model, an academic task set by the teacher (A) in class, or set as an assignment, is shown as the trigger to initiate self-regulatory processes in the student (shown at the centre of the diagram). Engagement with the task requires that the student draw on prior knowledge and motivational beliefs (B), and construct a personal interpretation of the meaning of the task and its requirements. Based on this internal conception, the student formulates his or her own task goals (C). While there would normally be an overlap between the student's goals and those of the teacher, the degree of overlap may not be high (e.g. if the student wishes only to pass the assignment). The student's goals might also be fuzzy rather than clear (e.g. a vague intention or task orientation). Nonetheless, these goals would help shape the strategies and tactics (D) that are used by students to generate outcomes, both internal (E) and externally observable (F). Internal outcomes refer to changes in cognitive or affective/motivational states that occur during task engagement (e.g. increased understanding, changes in self-perceptions of ability). Externally observable outcomes refer to tangible products produced (e.g. essays) and behaviours (e.g. student presentations).

Monitoring these interactions with the task, and the outcomes that are being cumulatively produced, generates *internal feedback* at a variety of levels (i.e. cognitive, motivational and behavioural). This feedback is derived from a comparison of current progress against desired goals. It is these comparisons that help the student determine whether current modes of engagement should continue as is, or if some type of change is necessary. For example, this self-generated feedback might lead to a reinterpretation of the task, or to an adjustment of internal goals, tactics and strategies. The student might even revise his or her domain knowledge or motivational beliefs which, in turn, might influence subsequent self-regulation.

In the model, external feedback to the student (G) might be provided by the teacher, by a peer or by other means (e.g. a placement supervisor, a computer). This additional information might augment, concur or conflict with the student's interpretation of the task and the path of learning. However, to produce an effect on internal processes or external outcomes the student must actively engage with these external inputs. In effect, the teachers' feedback responses would have to be interpreted,

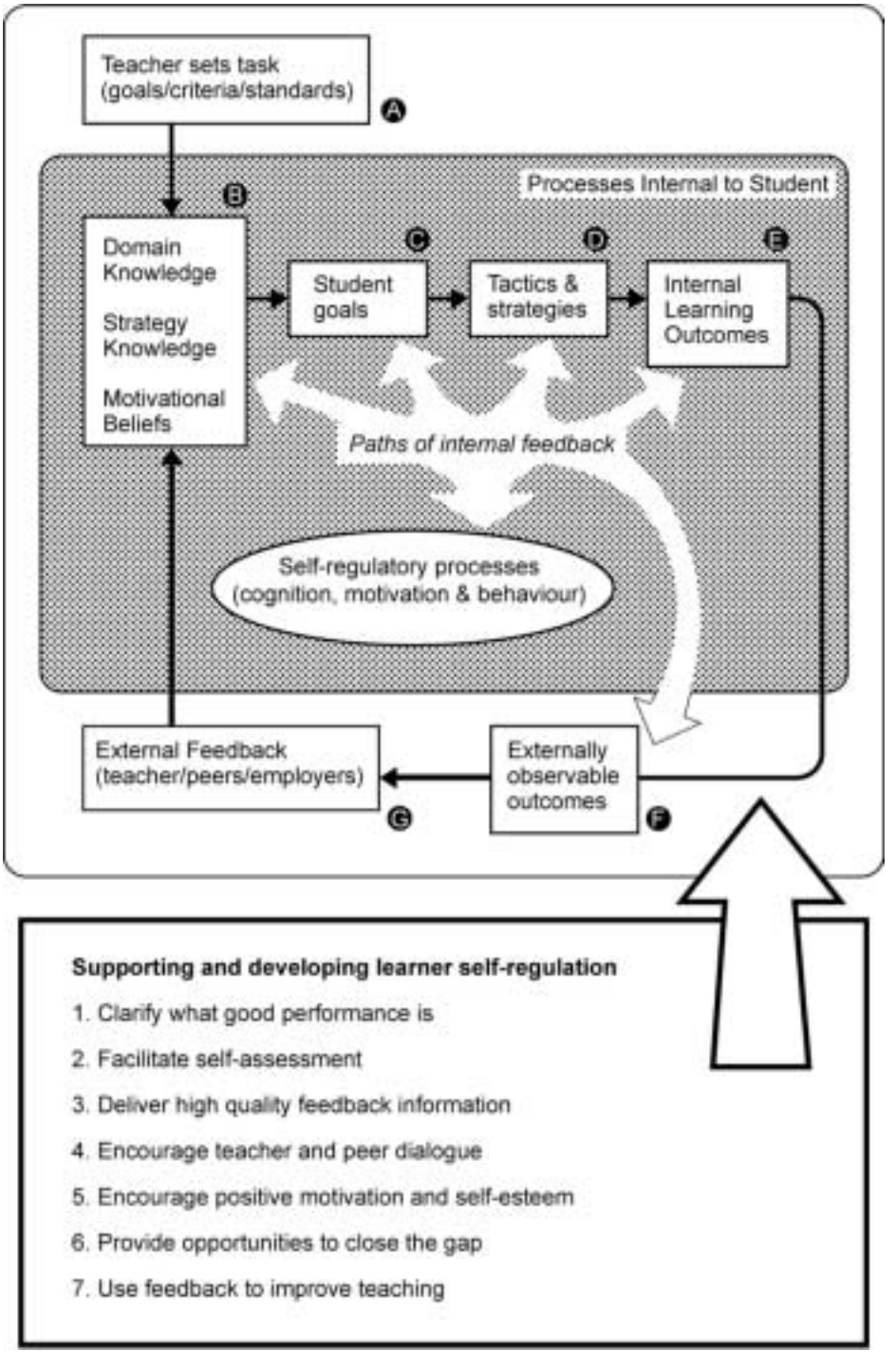

Figure 1. A model of self-regulated learning and the feedback principles that support and develop self-regulation in students

constructed and internalised by the student if they were to have a significant influence on subsequent learning (Ivanic *et al.*, 2000).

Some supporting research

There is considerable research evidence to show that effective feedback leads to learning gains. Black and Wiliam (1998) drew together over 250 studies of feedback carried out since 1988, spanning all educational sectors. These studies focused on real teaching situations, and the selection included teacher-made assessments and self and peer assessments. A meta-analysis of these studies revealed that feedback produced significant benefits in learning and achievement across all content areas, knowledge and skill types, and levels of education. While the bulk of Black and Wiliam's data came from the school sector, their review and that of others (e.g. Hattie, 1987; Crooks, 1988), provides convincing evidence of the value of feedback in promoting learning. In addition, there is a large body of complementary research studies demonstrating the effects of self and peer feedback on learning (e.g. Boud, 1995; Boud *et al.*, 1999). Nonetheless, while the work of Black and others has had an important influence on teaching practices in schools (Black *et al.*, 2003) it has so far had much less influence on higher education.

One of the most influential articles underpinning the Black and Wiliam review, and the writings of other researchers (e.g. Yorke, 2003), is that of Sadler (1989). Sadler identified three conditions necessary for students to benefit from feedback in academic tasks. He argued that the student must know:

1. what good performance is (i.e. the student must possess a concept of the goal or standard being aimed for);
2. how current performance relates to good performance (for this, the student must be able to compare current and good performance);
3. how to act to close the gap between current and good performance.

From this analysis Sadler made an important observation: for students to be able to *compare* actual performance with a standard (as suggested by 2), and take action to close the gap (3), then they must already possess some of the same evaluative skills as their teacher (Sadler, 1989). For some writers, this observation has led to the conclusion that, as well as improving the quality of feedback messages, teachers should focus much more effort on strengthening the skills of self-assessment in their students (Boud, 2000; Yorke, 2003). Sadler's argument, that students are already generating their own feedback, also helps account for the common finding that students still make significant progress in their learning even when the external feedback they receive is quite impoverished (especially in many large enrolment classes).

Although Sadler's writings are consistent with the argument in this article, his focus on 'control theory and closing gaps' has been interpreted by some as too limited a basis to account for the range of effects produced by feedback (Gibbs, 2004). This article addresses this concern by repositioning formative assessment and feedback within a wider framework that encompasses self-regulation of motivation and

behaviour as well as of cognition. For example, feedback is involved when students actively control their study time or their interactions with others (behaviour), and when they monitor and control motivational beliefs to adapt to the demands of the course (e.g. choosing a personal goal orientation).

Despite the appeal of self-regulation as a construct, it is important to recognise some basic assumptions underlying its use. While it is assumed that students can self-regulate internal states and behaviour as well as some aspects of the environment, this does not mean that the student always has full control. Learning tasks set by teachers, marking regimes and other course requirements are not under students' control, even though students still have latitude to self-regulate within such constraints. Also, students often learn in implicit or unintentional ways without explicit regulation (e.g. aspects of some skills such as reading are automated).

There is a large body of empirical evidence, mainly published in the USA, showing that learners who are more self-regulated are more effective learners: they are more persistent, resourceful, confident and higher achievers (Pintrich, 1995; Zimmerman & Schunk, 2001). Also, the more learning becomes self-regulated, the more students assume control over their learning, and the less dependent they are on external teacher support when they engage in regulatory activities (Zimmerman & Schunk, 2004). Importantly, this research also shows that any student, even those 'at risk', can learn to become more self-regulating (Pintrich & Zusho, 2002). The development of self-regulation in students can be facilitated by structuring learning environments in ways that make learning processes explicit, through meta-cognitive training, self-monitoring and by providing opportunities to practise self-regulation (Schunk & Zimmerman, 1994; Pintrich, 1995). The contribution of this article is to identify how formative assessment and feedback processes might help foster self-regulation (it is beyond the scope of this article to summarise the literature on self-regulation but a useful first text might be that by Zimmerman and Schunk, 2001).

Seven principles of good feedback practice: facilitating self-regulation

From the self-regulation model and the research literature on formative assessment it is possible to identify some principles of good feedback practice. These are shown at the bottom of Figure 1. Good feedback practice is broadly defined here as anything that might strengthen the students' capacity to self-regulate their own performance. A synthesis of the research literature led to the following seven principles:

Good feedback practice:

1. helps clarify what good performance is (goals, criteria, expected standards);
2. facilitates the development of self-assessment (reflection) in learning;
3. delivers high quality information to students about their learning;
4. encourages teacher and peer dialogue around learning;
5. encourages positive motivational beliefs and self-esteem;
6. provides opportunities to close the gap between current and desired performance;
7. provides information to teachers that can be used to help shape teaching.

The following sections provide the rationale for each principle in terms of the self-regulation and the associated research literature. Specific strategies that teachers can use to facilitate self-regulation are proposed after the presentation of each principle.

1. Helps clarify what good performance is

Students can only achieve learning goals if they understand those goals, assume some ownership of them, and can assess progress (Sadler, 1989; Black & Wiliam, 1998). In academic settings, understanding goals means that there must be a reasonable degree of overlap between the task goals set by students and the goals originally set by the teacher. This is logically essential, given that it is the students' goals that serve as the criteria for self-regulation (Figure 1). However, there is considerable research evidence showing significant mismatches between tutors' and students' conceptions of goals, and of assessment criteria and standards.

Hounsell (1997) has shown that tutors and students often have quite different conceptions about the goals and criteria for essays in undergraduate courses in history and psychology, and that poor essay performance is correlated with the degree of mismatch. In a similar vein, Norton (1990) has shown that, when students were asked to rank specific assessment criteria for an essay task, they produced quite different rankings from those of their teachers, emphasising content above critical thinking and argument. Weak and incorrect conceptions of goals not only influence what students do, but also the value of external feedback information. If students do not share (at least in part) their teacher's conceptions of assessment goals (and criteria and standards), then the feedback information they receive is unlikely to 'connect' (Hounsell, 1997). In this case, it will be difficult for students to evaluate discrepancies between required and actual performance. It is also important to note here that feedback not only has a role in helping guide students towards academic goals, but, over time, it also has a role in helping clarify what these goals are (Sadler, 1989).

One way of clarifying task requirements (goals/criteria/standards) is to provide students with written documents containing statements that describe assessment criteria and/or the standards that define different levels of achievement. However, many studies have shown that it is difficult to make assessment criteria and standards explicit through written documentation or through verbal descriptions in class (Rust *et al.*, 2003). Most criteria for academic tasks are complex, multidimensional (Sadler, 1989) and difficult to articulate; they are often 'tacit' and unarticulated in the mind of the teacher. As Yorke (2003, p. 480) notes:

> Statements of expected standards, curriculum objectives or learning outcomes are generally insufficient to convey the richness of meaning that is wrapped up in them.

Hence there is a need for strategies that complement written materials and simple verbal explanations. An approach that has proved particularly powerful in clarifying goals and standards has been to provide students with 'exemplars' of performance (Orsmond *et al.*, 2002). Exemplars are effective because they make explicit what is

required, and they define a valid standard against which students can compare their work.

Other strategies that have proved effective in clarifying criteria, standards and goals include: (i) providing better definitions of requirements using carefully constructed criteria sheets and performance-level definitions; (ii) increasing discussion and reflection about criteria and standards in class (e.g. before an assignment); (iii) involving students in assessment exercises where they mark or comment on other students' work in relation to defined criteria and standards; (iv) workshops where students in collaboration with the teacher devise or negotiate their own assessment criteria for a piece of work. These strategies exemplify increasing levels of self-regulation.

2. Facilitates the development of self-assessment (reflection) in learning

As suggested earlier, one effective way to develop self-regulation in students is to provide them with opportunities to practise regulating aspects of their own learning and to reflect on that practice. Students are (to some extent) already engaged in monitoring gaps between internally set task goals and the outcomes that they are generating (both internal and external). This monitoring is a by-product of purposeful engagement in a task (Figure 1). However, in order to build on this, and to develop systematically the learner's capacity for self-regulation, teachers need to create more structured opportunities for self-monitoring and the judging of progression to goals. Self-assessment tasks are an effective way of achieving this, as are activities that encourage reflection on learning progress.

Over the last decade there has been an increasing interest in self-assessment in higher education (Boud, 1995). Research shows that, when suitably organised, self-assessment can lead to significant enhancements in learning and achievement. For example, McDonald and Boud (2003) have shown that training in self-assessment can improve students' performance in final examinations. Also, Taras (2001, 2002, 2003) has carried out a number of studies on student self-assessment in higher education which have shown positive benefits. In one study, students were trained in self-assessment under two conditions: self-assessment prior to peer and tutor feedback and self-assessment with integrated tutor feedback. The latter condition involved students self-assessing after they had received tutor feedback. The results showed that, while both conditions benefited learning, self-assessment with integrated tutor feedback helped students identify and correct more errors (those that they or peers had not been aware of) than self-assessment prior to peer or tutor feedback. Interestingly, this study not only shows the benefits of integrating external and internal feedback, but also ways of helping students internalise and use tutor feedback.

In developing self-assessment skills it is important to engage students in both identifying standards/criteria that will apply to their work (discussed in principle 1 above), and in making judgements about how their work relates to these standards (Boud, 1986). While structured opportunities for training in self-assessment are important, there are other ways of supporting the development of these skills. One

approach is to provide students with opportunities to evaluate and provide feedback on each other's work. Such peer processes help develop the skills needed to make objective judgements against standards, skills which are transferred when students turn to producing and regulating their own work (Boud *et al.*, 1999; Gibbs, 1999). Another approach is to create frequent opportunities for reflection by students during their study. Cowan (1999) identifies ways that this can be done, both in the context of simple classroom activities and during longer-term projects.

Other examples of structured reflection and self-assessment are varied and might include students: (i) requesting the kinds of feedback they would like when they hand in work; (ii) identifying the strengths and weaknesses in their own work in relation to criteria or standards before handing it in for teacher feedback; (iii) reflecting on their achievements and selecting work in order to compile a portfolio; (iv) reflecting before a task on achievement milestones and reflecting back on progress and forward to the next stage of action (Cowan, 1999).

3. Delivers high quality information to students about their learning

While research shows that teachers have a central role in developing their students' own capacity for self-regulation, they are also a crucial source of external feedback. Feedback from teachers is a source against which students can evaluate progress, and check out their own internal constructions of goals, criteria and standards. Moreover, teachers are much more effective in identifying errors or misconceptions in students' work than peers or the students themselves. In effect, feedback from teachers can help substantiate student self-regulation.

In the research literature there is little consensus about what constitutes good quality external feedback. Quality is defined quite broadly, and tends to be discussed in relation to student needs and teacher-defined goals. For example, most researchers and textbook writers (e.g. Freeman & Lewis, 1998) are concerned that feedback to students might be delayed, not relevant or informative, that it might focus on low-level learning goals or might be overwhelming in quantity or deficient in tone (i.e. too critical). For these researchers, the way forward is to ensure that feedback is provided in a timely manner (close to the act of learning production), that it focuses not just on strengths and weaknesses but also on offering corrective advice, that it directs students to higher order learning goals, and that it involves some praise alongside constructive criticism. While each of these issues is important, there is a need for a more focused definition of quality in relation to external feedback, a definition that links more closely to the idea of self-regulation. Hence it is proposed here that:

- Good quality external feedback is information that helps students troubleshoot their own performance and self-correct: that is, it helps students take action to reduce the discrepancy between their intentions and the resulting effects.

In this context, it is argued that, where feedback is given, it is important that it is related to (and that students understand its relation to) goals, standards or criteria. Moreover, from this definition it is clear that external feedback should also help

convey to students an appropriate conception of the goal. This is not always the case. For example, it has become common practice in recent years to devise feedback sheets with assessment criteria, as a way of informing students about task requirements and of providing consistent feedback in relation to goals (where there are a number of assessors). However, Sadler (1983) has argued that the use of criteria sheets often has unwanted effects in relation to essay assessments: for example, if there are a large number of criteria (12–20), this may convey to the student a conception of the essay as a list of things to be done (ticked off) rather than as a holistic process (e.g. involving the production of a coherent argument supported by evidence). So, as well as relating feedback to criteria and goals, teachers should also be aware that the instruments they use to deliver feedback might adversely influence students' conceptions of the expected goals.

In the literature on essay assessment, some researchers have tried to formulate guidelines regarding the quantity and tone of feedback comments that, when analysed, show a close correspondence with the principle underlying the above definition of feedback quality. For example, Lunsford (1997) examined the written feedback comments given by writing experts on students' essays. From his analysis he made two proposals: firstly, that three well-thought-out feedback comments per essay was the optimum if the expectation was that students would act on these comments; and secondly, and more importantly, these comments should indicate to the student how the reader (the teacher) experienced the essay as it was read (i.e. playing back to the students how the essay worked), rather than offer judgemental comments. Such comments would help the student grasp the difference between his or her intentions (goals) and the effects of the writing. Lunsford also advises that the comments should always be written in a non-authoritative tone, and where possible they should offer corrective advice (both about the writing process as well as about content) instead of just information about strengths and weaknesses. In relation to self-regulation, Lunsford's reader-response strategy supports the shift from feedback provided by the teacher to students' evaluating their own writing.

The literature on external feedback is undeveloped in terms of how teachers should frame feedback comments, what kind of discourse should be used, how many comments are appropriate and in what context they should be made. Much more research is required in this area. One fruitful area of investigation is that currently being conducted by Gibbs and Simpson (2004) on the relationship between feedback and the time students spend on task. They have shown that if students receive feedback often and regularly, it enables better monitoring and self-regulation of progress by students. Other research is investigating the strengths of alternative modes of feedback communication (e.g. audio feedback, computer feedback) and of alternative ways of producing feedback information (e.g. poster productions where students get feedback by comparing their work with that of other students) (Hounsell & McCune, 2003; Hounsell, 2004).

Further strategies that increase the quality of teacher feedback based on the definition given above and on other research include: (i) making sure that feedback is provided in relation to pre-defined criteria but paying particular attention to the

number of criteria; (ii) providing timely feedback—this means before it is too late for students to change their work (i.e. before submission) rather than just, as the research literature often suggests, soon after submission; (iii) providing corrective advice, not just information on strengths/weaknesses; (iv) limiting the amount of feedback so that it is actually used; (v) prioritising areas for improvement; (vi) providing online tests so that feedback can be accessed anytime, any place and as many times as students wish.

4. Encourages teacher and peer dialogue around learning

In the self-regulation model, for external feedback to be effective it must be understood and internalised by the student before it can be used to make productive improvements. Yet in the research literature (Chanock, 2000; Hyland, 2000) there is a great deal of evidence that students do not understand the feedback given by tutors (e.g. 'this essay is not sufficiently analytical'), and are therefore not be able to take action to reduce the discrepancy between their intentions (goals) and the effects they would like to produce (i.e. the student may not know what to do to make the essay 'more analytical'). External feedback as a transmission process involving 'telling' ignores the active role the student must play in constructing meaning from feedback messages, and of using this to regulate performance.

One way of increasing the effectiveness of external feedback, and the likelihood that the information provided is understood by students, is to conceptualise feedback more as *dialogue* rather than as information transmission. Feedback as dialogue means that the student not only receives initial feedback information, but also has the opportunity to engage the teacher in discussion about that feedback. Some researchers maintain that teacher–student dialogue is essential if feedback is to be effective in higher education (Laurillard, 2002). Freeman and Lewis (1998) argue that the teacher 'should try to stimulate a response and a continuing dialogue—whether this be on the topics that formed the basis of the assignment or aspects of students' performance or the feedback itself' (p. 51). Discussions with the teacher help students to develop their understanding of expectations and standards, to check out and correct misunderstandings and to get an immediate response to difficulties.

Unfortunately, with large class sizes it can be difficult for the teacher to engage in dialogue with students. Nonetheless, there are ways that teachers might increase feedback dialogue even in these situations. One approach is to structure small group break-out discussions of feedback in class, after students have received written comments on their individual assignments. Another approach is to use classroom technologies. These technologies help collate student responses to in-class questions (often multiple-choice questions) using handset devices. The results are fed back to the class visually as a histogram. This collated feedback has been used as a trigger for peer discussion (e.g. 'convince your neighbour that you have the right answer') and teacher-managed discussion in large classes (e.g. Boyle & Nicol, 2003; Nicol & Boyle, 2003).

These studies identify another source of external feedback to students—their peers. Peer dialogue enhances in students a sense of self-control over learning in a variety of

ways. Firstly, students who have just learned something are often better able than teachers to explain it to their classmates in a language and in a way that is accessible. Secondly, peer discussion exposes students to alternative perspectives on problems and to alternative tactics and strategies. Alternative perspectives enable students to revise or reject their initial hypothesis, and construct new knowledge and meaning through negotiation. Thirdly, by commenting on the work of peers, students develop detachment of judgement (about work in relation to standards), which is transferred to the assessment of their own work (e.g. 'I didn't do that either'). Fourthly, peer discussion can be motivational in that it encourages students to persist (see Boyle & Nicol, 2003). Finally, it is sometimes easier for students to accept critiques of their work from peers rather than tutors.

Dialogical feedback strategies that support self-regulation include: (i) providing feedback using one-minute papers in class (see Angelo & Cross, 1993); (ii) reviewing feedback in tutorials, where students are asked to read the feedback comments they have been given earlier on an assignment, and discuss these with peers (they might also be asked to suggest strategies to improve performance next time); (iii) asking students to find one or two examples of feedback comments that they found useful and to explain how they helped; (iv) having students give each other descriptive feedback on their work in relation to published criteria before submission; (iv) group projects, especially where students discuss criteria and standards before the project begins.

5. Encourages positive motivational beliefs and self-esteem

Motivation and self-esteem play a very important role in learning and assessment, as is shown in Figure 1. Studies by Dweck (1999) show that, depending on their beliefs about learning, students possess qualitatively different motivational frameworks. These frameworks affect both students' responses to external feedback and their commitment to the self-regulation of learning.

Research in school settings has shown that frequent high-stakes assessment (where marks or grades are given) has a 'negative impact on motivation for learning that militates against preparation for lifelong learning' (Harlen & Crick, 2003). Dweck (1999) argues that such assessments encourage students to focus on performance goals (passing the test, looking good) rather than learning goals (mastering the subject). In one study, Butler (1988) demonstrated that feedback comments alone increased students' subsequent interest in learning when compared with two other controlled situations, one where only marks were given and the other where students were given feedback and marks. Butler argued that students paid less attention to the comments when given marks, and consequently did not try to use the comments to make improvements. This phenomenon is also commonly reported by academics in higher education.

Butler (1987) has also argued that grading student performance has less effect than feedback comments, because it leads students to compare themselves against others (ego-involvement) rather than to focus on the difficulties in the task and on making

efforts to improve (task-involvement). Feedback given as grades has also been shown to have especially negative effects on the self-esteem of low-ability students (Craven *et al.*, 1991).

Dweck (1999) has interpreted these findings in terms of a developmental model that differentiates students into those who believe that ability is fixed, and that there is a limit to what they can achieve (the 'entity view'), and those that believe that their ability is malleable and depends on the effort that is input into a task (the 'incremental view'). These views affect how students respond to learning difficulties. Those with an entity view (fixed) interpret failure as a reflection of their low ability, and are likely to give up, whereas those with an incremental view (malleable) interpret this as a challenge or an obstacle to be overcome, and increase their effort. Grant and Dweck (2003) have confirmed the validity of this model within higher education, as have Yorke and Knight (2004), who found that about one-third of a sample of 2269 undergraduates students in first and final years, and across a range of disciplines, held beliefs in fixed intelligence.

Although this is an underexplored area of research, there is evidence that teachers can have a positive or negative effect on motivation and self-esteem. They can influence both the goals that students set (learning or performance goals), as well as their commitment to those goals. Praising effort and strategic behaviours, and focusing students through feedback on learning goals, leads to higher achievement than praising ability or intelligence. The latter can result in a learned-helplessness orientation (Dweck, 1999). As Black and Wiliam (1998) note, feedback that draws attention away from the task and towards self-esteem can have a negative effect on attitudes and performance. In other words, it is important that students understand that feedback is an evaluation, not of the person but of the performance in context. This holds true whether the feedback derives from an external source or is generated through self-assessment.

These studies on motivation and self-esteem are important—they help explain why students often fail to self-regulate. In terms of teaching practice they suggest that motivation and self-esteem are more likely to be enhanced when a course has many low-stakes assessment tasks, with feedback geared to providing information about progress and achievement, rather than high-stakes summative assessment tasks where information is only about success or failure, or about how students compare with their peers (e.g. grades). Other strategies that help encourage high levels of motivation and self-esteem include: (i) providing marks on written work only after students have responded to feedback comments (Gibbs, 1999); (ii) allocating time for students to rewrite selected pieces of work—this would help change students' expectations about purpose and learning goals; (iii) automated testing with feedback; (iv) drafts and resubmissions.

6. Provides opportunities to close the gap between current and desired performance

So far, feedback has been discussed from a cognitive or informational perspective, and from a motivational perspective. However, in terms of self-regulation we must

also consider how feedback influences behaviour and the academic work that is produced. According to Yorke (2003), two questions might be asked regarding external feedback. First, is the feedback of the best quality, and second, does it lead to changes in student behaviour? Many writers have focused on the first question, but the second is equally important. External feedback provides an opportunity to close a gap between current performance and the performance expected by the teacher. As Boud notes:

> The only way to tell if learning results from feedback is for students to make some kind of response to complete the feedback loop (Sadler, 1989). This is one of the most often forgotten aspects of formative assessment. Unless students are able to use the feedback to produce improved work, through for example, re-doing the same assignment, neither they nor those giving the feedback will know that it has been effective. (Boud, 2000, p. 158)

In the self-regulation model (Figure 1), Boud's arguments about closing the performance gap might be viewed in two ways. First, closing the gap is about supporting students while engaged in the act of production of a piece of work (e.g. essays, presentations). Second, it is about providing opportunities to repeat the same 'task-performance–external feedback cycle' by, for example, allowing resubmission. External feedback should support both processes: it should help students to recognise the next steps in learning and how to take them, both during production and in relation to the next assignment.

Supporting the act of production requires the generation of concurrent or intrinsic feedback that students can interact with while engaged in an assessment task. This feedback would normally be built into the task (e.g. a group task with peer interaction, or a computer simulation), or the task might be broken down into components each associated with its own feedback. Many forms of electronic feedback (e.g. online simulations) can be automatically generated to support task engagement (Bull & McKenna, 2004). Providing feedback at sub-task level is not significantly different from other forms of feedback described in this article.

In higher education, most students have little opportunity to use directly the feedback they receive to close the performance gap, especially in the case of planned assignments. Invariably they move on to the next assessment task soon after feedback is received. While not all work can be resubmitted, many writers argue that resubmissions should play a more prominent role in learning (Boud, 2000). Also, greater emphasis might need to be given to providing feedback on work-in-progress (e.g. on structures for essays, plans for reports, sketches) and to encouraging students to plan the strategies they might use to improve subsequent work (Hounsell, 2004).

The following are some specific strategies to help students use external feedback to regulate and close the performance gap: (i) provide feedback on work in progress and increase opportunities for resubmission; (ii) introduce two-stage assignments where feedback on stage one helps improve stage two (Gibbs, 2004); (iii) teachers might model the strategies they would use to close a performance gap in class (e.g. model how to structure an essay when given a new question); (iv) specifically provide some

'action points' alongside the normal feedback provision; (v) involve students in groups in identifying their own action points in class after they have read the feedback on their assignments. The latter strategy would integrate feedback into the teaching and learning process, and involve the students more actively in the generation and planned use of feedback.

7. Provides information to teachers that can be used to help shape the teaching

Good feedback practice is not only about providing accessible and usable information that helps students improve their learning, but it is also about providing good information to teachers. As Yorke (2003, p. 482) notes:

> The act of assessing has an effect on the assessor as well as the student. Assessors learn about the extent to which they [students] have developed expertise and can tailor their teaching accordingly.

In order to produce feedback that is relevant and informative and meets students' needs, teachers themselves need good data about how students are progressing. They also need to be involved in reviewing and reflecting on this data, and in taking action to help support the development of self-regulation in their students.

In the self-regulation model (Figure 1) information about students only becomes available when the learning outcomes are translated into public performances and products. Teachers help generate this public information about students through a variety of methods—by setting assessment tasks, by questioning of students in class and by observing behaviour (e.g. presentations). Such information helps teachers uncover student difficulties with subject matter (e.g. conceptual misunderstandings) and study methods.

Frequent assessment tasks, especially diagnostic tests, can help teachers generate cumulative information about students' levels of understanding and skill, so that they can adapt their teaching accordingly. This is one of the key ideas behind the work in the USA of Angelo and Cross (1993). They have shown how teachers can gain regular feedback information about student learning within large classes by using variants of the one-minute paper—questions that are posed to students before a teaching session begins, and responded to at the end of the session (e.g. What was the most important argument in this lecture? What question remains uppermost in your mind now at the end of this teaching session?). These strategies can be adapted to any classroom situation or discipline. Moreover, they help develop in students important meta-cognitive skills such as the ability to think holistically and to identify gaps in understanding (Steadman, 1998).

As well as giving feedback to the teacher, one-minute papers can also be used to provide feedback to the student (e.g. when teachers replay some of the student responses to the one-minute paper in class at the next teaching session). Indeed, this approach allows teachers and students to share, on a regular basis, their conceptions about both the goals and processes of learning (Stefani & Nicol, 1997), thus supporting academic self-regulation.

Other strategies available to teachers to help generate and collate quality information about student learning include: (i) having students request the feedback they would like when they make an assignment submission (e.g. on a pro forma with published criteria); (ii) having students identify where they are having difficulties when they hand in assessed work; (iii) asking students in groups to identify 'a question worth asking', based on prior study, that they would like to explore for a short time at the beginning of the next tutorial.

Conclusion and future work

This article has argued that conceptions of assessment have lagged behind conceptions of learning in higher education. While students have been given more responsibility for learning in recent years, there has been far greater reluctance to give them increased responsibility for assessment processes (even low-stakes formative processes). Yet, if students are to be prepared for learning throughout life, they must be provided with opportunities to develop the capacity to regulate their own learning as they progress through higher education. This article has identified ways in which formative assessment and feedback might be organised so as to support this development. It has provided some key principles of good feedback practice that address a wide spectrum—the cognitive, behavioural and motivational aspects of self-regulation. How might teachers use the ideas in this article? One practical proposal is that teachers examine current assessment practices in relation to the self-regulation model and to the seven principles. An audit of this kind might help identify where assessment practices might be strengthened. However, the seven principles presented here do not exhaust all that teachers might do to enhance self-regulated learning in classrooms. They merely provide a starting point. The research challenge is to refine these principles, identify gaps and to gather further evidence about the potential of formative assessment and feedback to support self-regulation.

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