VISIBLE LEARNING
A SYNTHESIS OF OVER 800 META-ANALYSES RELATING TO ACHIEVEMENT

"Reveals teaching's Holy Grail"
The Times Educational Supplement
There do seem to be worthwhile effects from providing worked examples to students, but it is more difficult to find evidence of the effects from providing worked examples to teachers (often called exemplars). Peddie, Hattie and Vaughan (1999) completed an exhaustive search of evidence for research on the effects of exemplars and could find much rhetoric and many claims about their importance. When 50–plus organizations that had developed exemplars were asked to send their research, all sent boxes of exemplars, but none were able to send evidence of their effects.

Implementations that emphasize feedback

This section outlines the meanings of feedback, the effects of different types of feedback, feedback via frequent testing, teaching test-taking skills, providing formative evaluation to teachers, questioning to provide teachers and students with feedback, and the immediacy of feedback.

Feedback

When I completed the first synthesis of 134 meta-analyses of all possible influences on achievement (Hattie, 1992) it soon became clear that feedback was among the most powerful influences on achievement. Most programs and methods that worked best were based on heavy dollops of feedback. When I was presenting these early results in Hong Kong, a questioner asked what was meant by feedback, and I have struggled to understand the concept of feedback ever since. I have spent many hours in classrooms (noting its absence, despite the claims of the best of teachers that they are constantly engaged in providing feedback), worked with students to increase self-helping (with little success), and have tried different methods of providing feedback. The mistake I was making was seeing feedback as something teachers provided to students—they typically did not, although they made claims that they did it all the time, and most of the feedback they did provide was social and behavioral. It was only when I discovered that feedback was most powerful when it is from the student to the teacher that I started to understand it better. When teachers seek, or at least are open to, feedback from students as to what students know, what they understand, where they make errors, when they have misconceptions, when they are not engaged—then teaching and learning can be synchronized and powerful. Feedback to teachers helps make learning visible.

![Diagram of feedback effects]

**KEY**

- **Standard error**: 0.061 (Medium)
- **Rank**: 10th
- **Number of meta-analyses**: 23
- **Number of studies**: 1,287
- **Number of effects**: 2,050
- **Number of people (10)**: 67,931
Recently a colleague and I published a paper devoted to the power of feedback, which provides a deeper explanation than can be presented in this book (Hattie & Timperley, 2007). But, in summary, feedback is information provided by an agent (e.g., teacher, peer, book, parent, or one's own experience) about aspects of one's performance or understanding. For example, a teacher or parent can provide corrective information, a peer can provide an alternative strategy, a book can provide information to clarify ideas, a parent can provide encouragement, and a learner can look up the answer to evaluate the correctness of a response. Feedback is a "consequence" of performance.

To assist in understanding the purpose, effects, and types of feedback, it is useful to consider a continuum of instruction and feedback. At one end of the continuum is a clear distinction between providing instruction and providing feedback. However, when feedback is combined with a correctional review, feedback and instruction become intertwined until "the process itself takes on the forms of new instruction, rather than informing the student solely about correctness" (Kulhavy, 1977, p. 212). To take on this instructional purpose, feedback needs to provide information specifically relating to the task or process of learning that fills a gap between what is understood and what is aimed to be understood (Sadler, 1989), and it can do this in a number of different ways. For example, this may be through affective processes, such as increased effort, motivation, or engagement. Alternatively, the gap may be reduced through a number of different cognitive processes, including helping students to come to a different viewpoint, confirming to the student that they are correct or incorrect, indicating that more information is available or needed, pointing to directions that the student could pursue, and indicating alternative strategies to understand particular information. Winne and Butler (1994) provided an excellent summary in their claim that "feedback is information with which a learner can confirm, add to, overwrite, tune, or restructure information in memory, whether that information is domain knowledge, meta-cognitive knowledge, beliefs about self and tasks, or cognitive tactics and strategies" (p. 5740).

The effect sizes reported in the feedback meta-analyses show considerable variability, which indicates that some types of feedback are more powerful than others. The most effective forms of feedback provide cues or reinforcement to the learner, are in the form of video, audio or computer-assisted instruction feedback, or relate feedback to learning goals. It is also worth noting that the key is feedback that is received and acted upon by students—many teachers claim they provide ample amounts of feedback but the issue is whether students receive and interpret the information in the feedback. At best, each student receives moments of feedback in a single day (Nuthall, 2005; Sirotnik, 1983). Carless (2006) asked students and teachers whether teachers provided detailed feedback that helped students improve their next assignments. About 70 percent of the teachers claimed they provided such detailed feedback often or always, but only 45 percent of students agreed with their teachers' claims. Further, Nuthall (2005) found that most feedback that students obtained in any day in classrooms was from other students, and most of this feedback was incorrect.

Programmed instruction, praise, punishment, and extrinsic rewards were the least effective forms of feedback for enhancing achievement. Indeed, it is doubtful whether rewards should be thought of as feedback at all. Deci, Koestner, and Ryan (1999) have described tangible rewards (stickers, awards, and so on) as contingencies to activities rather than feedback because they contain so little task information. In their meta-analysis of the effects of feedback on motivation, these authors found a negative correlation between extrinsic
rewards and task performance ($d = -0.34$). Tangible rewards significantly undermined intrinsic motivation, particularly for interesting tasks ($d = -0.68$) compared to uninteresting tasks ($d = 0.18$). In addition, when the feedback was administered in a controlling manner (e.g., saying that the student performed as they “should” have performed), the effects were even worse ($d = -0.78$). Thus, Deci et al. concluded that extrinsic rewards are typically negative because they “undermine people’s taking responsibility for motivating or regulating themselves” (Deci et al., 1999, p. 659). Rather, extrinsic rewards are a controlling strategy that often leads to greater surveillance, evaluation, and competition, all of which have been found to undermine enhanced engagement and regulation (Deci & Ryan, 1985).

Providing feedback is not about giving rewards, but rather providing information about the task. Cameron and Pierce (1994) asked about the causal effects of extrinsic rewards and reinforcement on intrinsic motivation (hence this meta-analysis is not included in the Appendices because achievement is not the outcome). The results show that rewards did not significantly affect intrinsic motivation: the effects of rewards were $d = -0.06$ for free time on task, $d = 0.21$ for attitude, $d = 0.08$ for performance during free-time period, and $d = 0.05$ for willingness to volunteer. When intrinsic motivation was measured by attitude toward a task, rewarded subjects reported higher intrinsic motivation than non-rewarded subjects. Verbal rewards appeared to produce a positive effect and tangible rewards suggested a negative effect. Those rewarded with verbal praise or positive feedback showed greater intrinsic motivation and spent more time on a task once the reward was withdrawn than non-rewarded subjects. It is critical, however, to note how small these effects are and thus to conclude that rewards and praise are or are not critical seems moot.

The most systematic study addressing the effects of various types of feedback was published by Kluger and DeNisi (1996). Their meta-analysis included studies of feedback interventions that were not confounded with other manipulations, included at least a control group, measured performance, and included at least ten participants. Although many of their studies were not classroom or achievement based, their messages are of much interest. From the 131 studies, they estimated 470 effect sizes, based on 12,652 participants, and the average effect size was $d = 0.38$, and 32 percent of the effects were negative. Specifically, feedback is more effective when it provides information on correct rather than incorrect responses and when it builds on changes from previous trials. The impact of feedback was also influenced by the difficulty of goals and tasks. There is highest impact when goals are specific and challenging but when task complexity is low. Giving praise for completing a task appears to be ineffective, which is hardly surprising because it contains such little learning-related information. Feedback is more effective when there are perceived low rather than high levels of threat to self-esteem, presumably because low threat conditions allow attention to be paid to the feedback.

Figure 9.9 presents a framework in which feedback can be considered. The claim is made that the main purpose of feedback is to reduce discrepancies between current understandings and performance and a learning intention or goal. The strategies that students and teachers use to reduce this discrepancy depend partly on the level at which the feedback operates. These levels include the level of task performance, the level of process of understanding how to do a task, the regulatory or meta-cognitive process level, and the self or person (unrelated to the specifics of the task). Feedback has differing effects across these levels.
Figure 9.9 A model of feedback
The major feedback questions are “Where am I going?” (learning intentions/goals/success criteria), “How am I going?” (self-assessment and self-evaluation), and “Where to next?” (progression, new goals). An ideal learning environment or experience is when both teachers and students seek answers to each of these questions. These three questions do not work in isolation at each of the four levels, but typically work together. Feedback relating to “How am I going?” has the power to lead to doing further tasks or “Where to next?” and “Where am I going?”. As Sadler (1989) has convincingly argued, it is closing the gap between where the student is and where they are aiming to be that leads to the power of feedback.

So far so good, but the difficulty arises from the way in which feedback works at the four levels noted above. First, feedback can be about the task or product, such as the work is correct or incorrect. This level of feedback may include directions to acquire more, different, or correct information, such as “You need to include more about the Treaty of Versailles”. Second, feedback can be aimed at the process used to create the product or complete the task. This kind of feedback is more directly aimed at the processing of information, or learning processes required for understanding or completing the task. For example, a teacher or peer may say to a learner, “You need to edit this piece of writing by attending to the descriptors you have used, so the reader is able to understand the nuances of your meaning”, or “This page may make more sense if you use the comprehension strategies we talked about earlier”. Third, feedback to the student can be focused at the self-regulation level, including greater skill in self-evaluation, or confidence to engage further on the task. For example, “You already know the key features of the opening of an argument. Check to see whether you have incorporated them in your first paragraph.” Such feedback can have major influences on self-efficacy, self-regulatory proficiencies, and self-beliefs about the student as a learner, such that the student is encouraged or informed how to better and more effortlessly continue on the task. Fourth, feedback can be personal in the sense that it is directed to the “self” which, it will be argued below, is too often unrelated to performance on the task. Examples of such feedback include, “You are a great student”, “Well done!”.

The art is to provide the right form of feedback at, or just above, the level where the student is working—with one exception. Feedback at the self or personal level (usually praise) is rarely effective. Praise is rarely directed at addressing the three feedback questions and so is ineffective in enhancing learning. When feedback draws attention to the self, students try to avoid the risks involved in tackling a challenging assignment, they minimize effort, and they have a high fear of failure (Black & William, 1998) in order to minimize the risk to the self. Thus, ideally, teaching and learning move from the task to the processes and understandings necessary to learn the task, and then to continuing beyond it to more challenging tasks and goals. This process results in higher confidence and greater investment of effort. This flow typically occurs as the student gains greater fluency and mastery.

We need to be somewhat cautious, however. Feedback is not “the answer” to effective teaching and learning; rather it is but one powerful answer. With inefficient learners or learners at the acquisition (not proficiency) phase, it is better for a teacher to provide elaborations through instruction than to provide feedback on poorly understood concepts. If feedback is directed at the right level it can assist students to comprehend, engage, or develop effective strategies to process the information intended to the learnt. To be effective, feedback needs to be clear, purposeful, meaningful and compatible with students’ prior
knowledge, and to provide logical connections. It also needs to prompt active information processing on the part of the learner, have low task complexity, relate to specific and clear goals, and provide little threat to the person at the self level. The major discriminator is whether feedback is clearly directed to the various levels of task, processes, or regulation, and not directed to the level of "self". These conditions highlight the importance of classroom climates that foster peer and self-assessment, and allow for learning from mistakes.

We need classes that develop the courage to err.

Thus, when feedback is combined with effective instruction in classrooms, it can be very powerful in enhancing learning. As Kluger and DeNisi (1996) noted, a feedback intervention provided for a familiar task that contains cues that support learning, attracts attention to feedback-standard discrepancies at the task level, and is void of cues that direct attention to the self, is likely to yield impressive gains in students' performance. It is important to note, however, that under particular circumstances, instruction is more effective than feedback. Feedback can only build on something; it is of little use when there is no initial learning or surface information. In summary, feedback is what happens second, is one of the most powerful influences on learning, occurs too rarely, and needs to be more fully researched by qualitatively and quantitatively investigating how feedback works in the classroom and learning process.

**Frequent testing/Effects of testing**

Another form of feedback is repeated testing, but this is only effective if there is feedback from the tests to teachers such that they modify their instruction to attend to the strengths and gaps in student performance. Although performance is increased with more frequent testing, the amount of improvement in achievement diminishes as the number of tests increase (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991). Students taking at least one test during a 15-week term scored about half a standard deviation higher in criterion examinations than students taking no tests. When two groups answered identical test items, superior performance was obtained from students who answered the questions on a large number of short tests rather than on a small number of long tests. The caution is that it may not be the frequency of test taking but that frequent test taking made the learning intentions and success criteria more specific and transparent. Clariana and Kouli (2006) found that multiple-try feedback was less effective for surface outcomes \(d = -0.22\) but more effective for higher-order outcomes \(d = 0.10\). "Multiple try