FEEDBACK

Definition and Background

Feedback involves the provision of information regarding some aspect of the performance of the learner and can come from many sources, including parents, teachers, peers, books, and media (Hattie & Timperley, 2007). It is a widely-used technique and its purpose is to close the gap between what the learner knows and a clearly articulated educational goal or learning objective (Hattie & Yates, 2014). Feedback has the potential to greatly influence achievement, in both a positive direction and a negative direction (Hattie & Gan, 2011). For example, Pashler and colleagues (2005) found that learners working on word pairs experienced a 494% improvement in retention on a final test after receiving feedback that a response was incorrect during learning sessions. When the learner provided a correct response, however, feedback (whether delayed or not) provided no benefits to later retention.

There is also evidence that written feedback in the form of comments can be more effective than simply providing a letter grade (Black & Wiliam, 1998; Crooks, 1988). Although feedback can benefit learners, it does not benefit *all* learners under *all* circumstances. Thus, instructors should be cautious using some forms of feedback in some situations (Hattie & Timperley, 2007; Kluger & DeNisi, 1998). Characteristics such as the type of task, the type of feedback, and qualities of the learner influence the effectiveness of feedback for learning. Each characteristic is described below.

Variables

Task characteristics:

- **Familiarity**: Feedback appears to lead to the most improvement in performance when the learner is performing a familiar—versus novel—task (Kluger & DeNisi, 1996).
- **Difficulty**: In one study comparing the effect of feedback on later retention for easy versus difficult items, the authors noted that later retention for items on which learners had delayed feedback was better for difficult items (Clariana, Wagner, & Rohrer Murphy, 2000). Delaying feedback for easy items did not have an effect on later retention.
- **Multiple-choice:** Informing learners of the correct response for multiple-choice items not only benefits learning through quizzing (SEE TESTING EFFECT), but also decreases a potential negative effect: that learners will continue to believe that an incorrect response they have chosen is actually correct, particularly when the

learner did not study sufficiently for the exam (Butler & Roediger, 2008).

- Thus, providing corrective feedback on multiple-choice items can address misconceptions, make corrections, and reduce the chances that the learner will recall an incorrect response later.

Types of feedback:

What makes feedback helpful or not does not depend on whether the feedback is positive or negative. Indeed, both types of feedback can benefit learners (Hattie & Timperley, 2007; Kluger & DeNisi, 1996). Rather, it is other qualities of the feedback that can make it beneficial or detrimental (outlined by Hattie & Timperley, 2007), described below.

- **Task-related**: In terms of learning outcomes, providing feedback regarding the task (e.g., correct/incorrect; "10 out of 10 are correct.") is more impactful than feedback that relates to the learner (e.g., "You are so smart.")When learners engage in trial-and-error activities, they are receiving feedback that is exclusively task-related (Kluger & DeNisi, 1996).
- Simply saying "correct" or "incorrect" has limited benefits when not paired with explanation (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Rich, Van Loon, Dunlosky, & Zaragoza, 2017).
- **Process-related**: Providing feedback regarding the processes necessary to complete the task or problem (e.g., describing the steps in the process of solving a problem or commenting on sentence structure) can assist with deeper learning (than task-related feedback), a reduction in cognitive load, and a greater ability to detect errors (Hattie & Gan, 2011). In addition, process-related feedback can improve learner self-efficacy and confidence (Earley, Northcraft, Lee, & Lituchy, 1990).
- **Self-regulated**: This form of feedback encourages the learner to continue on or to improve the ability to self-evaluate (Hattie & Timperley, 2007) and can improve learner confidence (Hattie & Gan, 2011). For example, the instructor might encourage the learner to slow down when solving easier problems to avoid making careless mistakes.
- **Self**: This form of feedback relates to the learner, not the task, and can involve praising or criticizing the learner (e.g., "You are a talented musician," as opposed to, "You played that piece very well."). This is the least academically useful form of feedback, as it does little to inform the learner how to make corrections. Moreover, one study (Kessels, Warner, Holle, & Hannover, 2008, as cited in Hattie & Gan, 2011) found that including feedback that the instructor was "proud" of the learner worked to decrease effort and

engagement. Another study (Skipper & Douglas, 2011) found that when learners received praise regarding the self on one learning trial, they had more negative responses to subsequent failure than those who did not receive praise, or only received process feedback, and failed. Thus, as feedback moves from task-related to self-related, its benefits decline (Kluger & DeNisi, 1996).

Timing and frequency of feedback:

- **Immediate feedback:** Although some researchers have cautioned that providing immediate feedback may negatively impact long-term retention (Metcalfe, Kornell, & Finn, 2009; Schmidt & Bjork, 1994), immediate feedback is generally considered more beneficial to learning than delayed feedback (Kulik & Kulik, 1988; Metcalfe, Kornell, & Finn, 2009; Pashler et al., 2005; see Mory, 2004 for a review of the literature), especially for novice learners (Hattie & Yates, 2014). One should use caution and avoid providing feedback so quickly, however, that the learner does not have an opportunity to process the information on his or her own (Bangert-Downs, Kulik, Kulik, & Morgan, 1991; Pashler et al., 2005).
- **Delayed feedback:** Delayed feedback is helpful for learning facts (Pashler, Rohrer, Cepeda, & Carpenter, 2007). Whether immediate or delayed feedback is more beneficial at the process level is less clear (Bangert-Drowns et al., 1991;Bardwell, 1981; Clariana, Wagner, & Rohrer Murphy, 2000; Kulhavey, 1977; Kulik & Kulik, 1988). In particular, motor skills may be what most benefits from delayed feedback (Pashler et al., 2005).
- **Task-dependent feedback:** There is some evidence that the benefits of immediate versus delayed feedback may depend on the type of task. For example, immediate feedback appears to be more beneficial during acquisition of a skill, but more detrimental when the learner is working on becoming more fluid at the skill (Hattie & Timperley, 2007).
- **Benefits of feedback**: Providing feedback (whether immediate or delayed) is considered superior to *no* feedback for correcting misinformation and improving later performance (Butler & Roediger, 2008; Pashler et al., 2007).
- **Frequency of feedback** can also affect learning. Frequent feedback when a learner is acquiring a skill can assist learners with obtaining the correct answer (Schmidt & Bjork, 1994). However, feedback that is too frequent during acquisition can also interfere with later retention (Schmidt & Bjork, 1994).

Amount of feedback and prior knowledge:

However, there is evidence that, in a web-based learning environment, learning outcomes for those with high prior knowledge are improved

with global feedback (e.g., the answer is correct/incorrect) rather than elaborate feedback (e.g., the answer is correct/incorrect with explanation and solution steps). However, Smits and coworkers report appreciating elaborate feedback more (Smits, Boon, Sluijsmans, & van Gog, 2008).

Learner characteristics:

- **Confidence**: Although it may seem counterintuitive, feedback has its *greatest* benefits when the learner is confident that the answer is correct and, in fact, he or she is wrong (Butterfield & Metcalfe, 2001; Kulhavy, 1977; Metcalfe & Finn, 2011; Williams, Bergström, & Grainger, 2016). Receiving confirmation that the answer was correct when the learner's confidence in the answer is low can also be beneficial to future performance (Butler, Karpicke, & Roediger, 2008). On the other hand, when the learner is certain of the answer and is correct, or when the learner is uncertain of the answer and learns that the answer is incorrect, feedback should have its lowest impact (Kulhavy & Stock, 1989).
- **Self-esteem**: is another learner characteristic that affects the benefits of feedback. Praise appears to be effective when learners are faced with low levels of threat to self-esteem because the learner is able to focus on the feedback when the threat is low (Kluger & DeNisi, 1996).

Educational Implications

Some authors have said that "withholding corrective feedback after an error is always harmful, even if done only intermittently," (Pashler et al., 2007, p. 190). For tasks that are specific, challenging, and of low complexity, provide timely feedback that gives information about how to be more effective at the task (Crooks, 1988; Hattie & Timperley, 2007; Kluger & DeNisi, 1996). The most effective feedback is focused on showing learners how to perform tasks more effectively, rather than focused on the self, and is given when tasks are familiar (Hattie & Timperley, 2007; Kluger & DeNisi, 1996). Be cautious about using punishment, praise, or reward, especially early in the feedback process: It can affect later effort, confuse students, and affect attention to later revisions (Hattie & Timperley, 2007; Hyland & Hyland, 2006). Providing rewards for tasks that are inherently interesting to students can serve to undermine motivation and encourage competition (Deci & Ryan, 1985; Lepper, Greene, & Nisbett, 1973).

For further information, Hattie & Gan (2011, p. 262) provide a graphic organizer for feedback levels and questions instructors can consider at each level. Mory (2004, p. 768) and Hoska (1993) also provide extensive summaries regarding when and how to use feedback.

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