

TABLE 2

Formative feedback guidelines to enhance learning (things to do)

Prescription	Description and references
Focus feedback on the task, not the learner.	Feedback to the learner should address specific features of his or her work in relation to the task, with suggestions on how to improve (e.g., Butler, 1987; Corbett & Anderson, 2001; Kluger & DeNisi, 1996; Narciss & Huth, 2004).
Provide elaborated feedback to enhance learning.	Feedback should describe the what, how, and why of a given problem. This type of cognitive feedback is typically more effective than verification of results (e.g., Bangert-Drowns et al., 1991; Gilman, 1969; Mason & Bruning, 2001; Narciss & Huth, 2004).
Present elaborated feedback in manageable units.	Provide elaborated feedback in small enough pieces so that it is not overwhelming and discarded (Bransford et al., 2000; Sweller et al., 1998). Presenting too much information may not only result in superficial learning but may also invoke cognitive overload (e.g., Mayer & Moreno, 2002; Phye & Bender, 1989). A stepwise presentation of feedback offers the possibility to control for mistakes and gives learners sufficient information to correct errors on their own.
Be specific and clear with feedback message.	If feedback is not specific or clear, it can impede learning and can frustrate learners (e.g., Moreno, 2004; Williams, 1997). If possible, try to link feedback clearly and specifically to goals and performance (Hoska, 1993; Song & Keller, 2001).
Keep feedback as simple as possible but no simpler (based on learner needs and instructional constraints).	Simple feedback is generally based on one cue (e.g., verification or hint) and complex feedback on multiple cues (e.g., verification, correct response, error analysis). Keep feedback as simple and focused as possible. Generate only enough information to help students and not more. Kulhavy et al. (1985) found that feedback that was too complex did not promote learning compared to simpler feedback.
Reduce uncertainty between performance and goals.	Formative feedback should clarify goals and seek to reduce or remove uncertainty in relation to how well learners are performing on a task, and what needs to be accomplished to attain the goal(s) (e.g., Ashford et al., 2003; Bangert-Drowns et al., 1991).
Give unbiased, objective feedback, written or via computer.	Feedback from a trustworthy source will be considered more seriously than other feedback, which may be disregarded. This may explain why computer-based feedback is often better than human-delivered in some experiments in that perceived biases are eliminated (see Kluger & DeNisi, 1996).
Promote a "learning" goal orientation via feedback.	Formative feedback can be used to alter goal orientation—from a focus on performance to a focus on learning (Hoska, 1993). This can be facilitated by crafting feedback emphasizing that effort yields increased learning and performance, and mistakes are an important part of the learning process (Dweck, 1986).

(continued)

TABLE 2 (continued)

Prescription	Description and references
Provide feedback after learners have attempted a solution.	Do not let learners see answers before trying to solve a problem on their own (i.e., presearch availability). Several studies that have controlled presearch availability show a benefit of feedback, whereas studies without such control show inconsistent results (Bangert-Drowns et al., 1991).

TABLE 3
Formative feedback guidelines to enhance learning (things to avoid)

Prescription	Description and references
Do not give nonnormative comparisons.	Feedback should avoid comparisons with other students—directly or indirectly (e.g., “grading on the curve”). In general, do not draw attention to “self” during learning (Kluger & DeNisi, 1996; Wiliam, 2007).
Be cautious about providing overall grades.	Feedback should note areas of strength and provide information on how to improve, as warranted and without overall grading. Wiliam (2007) summarized the following findings: (a) students receiving just grades showed no learning gains, (b) those getting just comments showed large gains, and (c) those with grades and comments showed no gains (likely due to focusing on the grade and ignoring comments). Effective feedback relates to the content of the comments (Butler, 1987; McColskey & Leary, 1985).
Do not present feedback that discourages the learner or threatens the learner’s self-esteem.	This prescription is based not only on common sense but also on research reported in Kluger and DeNisi (1996) citing a list of feedback interventions that undermine learning as it draws focus to the “self” and away from the task at hand. In addition, do not provide feedback that is either too controlling or critical of the learner (Baron, 1993; Fedor et al., 2001).
Use “praise” sparingly, if at all.	Kluger & DeNisi (1996), Butler (1987), and others have noted that use of praise as feedback directs the learner’s attention to “self,” which distracts from the task and consequently from learning.
Try to avoid delivering feedback orally.	This also was addressed in Kluger & DeNisi (1991). When feedback is delivered in a more neutral manner (e.g., written or computer delivered), it is construed as less biased.
Do not interrupt learner with feedback if the learner is actively engaged.	Interrupting a student who is immersed in a task—trying to solve a problem or task on his or her own—can be disruptive to the student and impede learning (Corno & Snow, 1986).

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<i>Prescription</i>	<i>Description and references</i>
Avoid using progressive hints that always terminate with the correct answer.	Although hints can be facilitative, they can also be abused, so if they are employed to scaffold learners, provisions to prevent their abuse should be made (e.g., Alevén & Koedinger, 2000; Shute, Woltz, & Regian, 1989). Consider using prompts and cues (i.e., more specific kinds of hints).
Do not limit the mode of feedback presentation to text.	Exploit the potential of multimedia to avoid cognitive overload due to modality effects (e.g., Mayer & Moreno, 2002) and do not default to presenting feedback messages as text. Instead, consider alternative modes of presentation (e.g., acoustic, visual).
Minimize use of extensive error analyses and diagnosis.	In line with findings by Sleeman et al. (1989) and VanLehn et al. (2005), the cost of conducting extensive error analyses and cognitive diagnosis may not provide sufficient benefit to learning. Furthermore, error analyses are rarely complete and not always accurate, thus only helpful in a subset of circumstances.

TABLE 4

Formative feedback guidelines in relation to timing issues

<i>Prescription</i>	<i>Description and references</i>
Design timing of feedback to align with desired outcome.	Feedback can be delivered (or obtained) either immediately or delayed. Immediate feedback can help fix errors in real time, producing greater immediate gains and more efficient learning (Corbett & Anderson, 2001; Mason & Bruning, 2001), but delayed feedback has been associated with better transfer of learning (e.g., Schroth, 1992).
For difficult tasks, use immediate feedback.	When a student is learning a difficult new task (where "difficult" is relative to the learner's capabilities), it is better to use immediate feedback, at least initially (Clariana, 1990). This provides a helpful safety net for the learner so she does not get bogged down and frustrated (Knoblauch & Brannon, 1981).
For relatively simple tasks, use delayed feedback.	When a student is learning a relatively simple task (again, relative to capabilities), it is better to delay feedback to prevent feelings of feedback intrusion and possibly annoyance (Clariana, 1990; Corno, & Snow, 1986).
For retention of procedural or conceptual knowledge, use immediate feedback.	In general, there is wide support for use of immediate feedback to promote learning and performance on verbal, procedural, and even tasks requiring motor skills (Anderson et al., 2001; Azevedo & Bernard, 1995; Corbett & Anderson, 1989, 2001; Dihoff et al., 2003; Phye & Andre, 1989).

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