feedback that allows students to reap the benefits of feedback while staying actively engaged in monitoring their own learning—in other words, feedback that does not undermine students' progress in becoming independent, self-regulated learners. Giving too little detail in feedback can leave students unclear on what they need to do to improve, whereas giving too much detail can overwhelm them or mislead them as to what aspects are higher priority. Similarly, giving feedback too infrequently can leave students floundering without enough information to direct their learning, whereas giving feedback too frequently can potentially irritate students or lead them to depend on the feedback rather than on themselves.

In addition to balancing the amount and timing of feedback to make it most effective, it is often necessary to pay attention to the practical aspects of giving feedback. For example, the instructor's time in composing or tailoring feedback and the students' time in processing and responding to feedback is a key consideration in guiding how and when to give feedback. We must always consider both the pedagogical and practical consequences of feedback. Also, all feedback need not be tailored to individual students, and it need not all come from the instructor. We discuss a variety of strategies for feedback that are effective and feasible, including peer response, group feedback, and more.

WHAT STRATEGIES DOES THE RESEARCH SUGGEST?

Here we present strategies that can help you provide students with (1) goal-directed practice and (2) targeted feedback. In both cases, the focus is on how to do so in effective and efficient ways.

Strategies Addressing the Need for Goal-Directed Practice

Conduct a Prior Knowledge Assessment to Target an Appropriate Challenge Level   Students come into our classes with a broad range of pre-existing knowledge, skills, and competencies. Giving a prior knowledge assessment (such as a survey, pretest, or early ungraded assignment) can help you gauge students' strengths and weaknesses in order to better target their practice at the right level (based on where they are, not where you wish they were). A performance assessment (for example, actual problems to solve or terms to define) will provide the best indication of what students actually know or can do, while a survey asking them about the level of their knowledge (for example, can they define or apply, do they know when to use) will give you a sense of what students *believe* they know or can do. (See Chapter One for additional, related strategies and Appendix A for more information on incorporating student self-assessments.)

Be More Explicit About Your Goals in Your Course Materials Without specific goals for the course as a whole or for individual assignments, students often rely on their assumptions to decide how they should spend their time. This makes it all the more important to articulate your goals clearly (in your course syllabus and with each specific assignment), so students know what your expectations are and can use them to guide their practice. Students are more likely to use the goals to guide their practice when the goals are stated in terms of what students should be able to *do* at the end of an assignment or the course. (See Appendix D for more information on articulating learning goals.)

Use a Rubric to Specify and Communicate Performance Criteria   When students do not know what the performance criteria are, it is difficult for them to practice appropriately and to monitor their progress and understanding. A common approach to communicating performance criteria is through a *rubric*—a scoring tool that explicitly represents the performance expectations for a given assignment. A rubric divides the assigned work into component parts and provides clear descriptions of the characteristics of high-, medium-, and low-quality work associated with each component. (See Appendix C for more information on rubrics.)

Build in Multiple Opportunities for Practice   Because learning accumulates gradually with practice, multiple assignments of shorter length or smaller scope tend to result in more learning than a single assignment of great length or large scope. With the former, students get more opportunity to practice skills and can refine their approach from assignment to assignment based on feedback they receive. For example, this strategy can free you to think beyond the traditional term paper and be more creative in the variety and number of shorter writing assignments you require (for example, a letter, program notes, or a short policy memo). Bear in mind, however, that a single opportunity to practice a given kind of assignment is likely to be insufficient for students to develop the relevant set of skills, let alone to be able to incorporate your feedback on subsequent, related assignments.

Build Scaffolding into Assignments   In order to adjust a task so that it continues to target an appropriate level of challenge for students, provide scaffolding. Scaffolding refers to the process by which instructors give students instructional supports early in their learning, and then gradually remove these supports as students develop greater mastery and sophistication. One way to

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apply scaffolding to a more complex assignment is to ask students to first practice working on discrete phases of the task and, later, ask students to practice integrating them. (See Chapter Four.)

Set Expectations About Practice   Students can underestimate the amount of time an assignment requires. As a result, it is vital to provide students with guidelines for the amount, type, and level of practice required to master the knowledge or skills at the level you expect. There are at least two ways to help you estimate the time students will need. Some faculty members collect data by asking students, over a number of semesters, how long an assignment took to complete. They can then report to their current students the average and range of time spent by past students. Other faculty members adhere to a general rule of thumb that it takes students approximately three to four times as long as it would take them to complete an assignment. This ratio may vary from situation to situation, however, so it is worthwhile to try multiple strategies for this estimation and to adjust based on one's experience, as necessary.

Give Examples or Models of Target Performance   Building on the previous strategy, it can also be helpful to *show* students examples of what the target performance looks like (such as a model design, an effective paper, or a robust solution to a problem). Sharing samples of past student work can help students see how your performance criteria can be put into practice in an actual assignment. Such examples are even more powerful when you either highlight or annotate for students particular features of the sample assignment that "work."

Show Students What You Do *Not* Want   In addition to sharing exemplary models of target performance, it can be helpful to contrast those with examples of what you do *not* want, by illustrating

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common misinterpretations students have shown in the past or by explaining why some pieces of work do not meet your assignment goals. For example, in the case of writing or giving presentations, it is often helpful to share samples that are annotated to highlight weak features. Such samples can also be used to give students practice at distinguishing between high- and low-quality work. To get students more actively involved and check their understanding, you can ask students to grade a sample assignment by following a rubric (see Appendix C).

Refine Your Goals and Performance Criteria as the Course Progresses As students move through a course practicing various skills, you may need to add new challenges, refine your goals to meet students' continually changing proficiency, or both. For example, once students have acquired competency with a skill, you may want them to be able to apply that skill more quickly, with less effort, or in more diverse contexts. You need to continually articulate the increasingly sophisticated goals you want students to work toward.

Strategies Addressing the Need for Targeted Feedback

Look for Patterns of Errors in Student Work Within a class, students can often share common errors or misconceptions that only are revealed when you make a concerted effort to look for patterns. For example, you might identify an exam question that many students missed or a homework assignment that was particularly difficult for many students. You may also notice that during your office hours multiple students are asking the same type of question or are making the same kind of mistake. If you are grading student work, you have access to this information and can seek out the patterns of errors. If you have TAs grading, ask

them to summarize any major patterns of errors or misconceptions and report these to you. Once you have identified common patterns across students, you can provide feedback to the class as a whole using the following strategies.

Prioritize Your Feedback   The question of exactly what information feedback should include is dependent on many aspects of the course context: your learning objectives (for the course and the particular assignment), level of students, what they most need to improve, and the time you have available. So the key to being efficient while still providing effective feedback is to think carefully about what information will be most useful to students at a particular point in time and to prioritize that information in your feedback. In many cases, it is not necessary or even best to give feedback on all aspects of students' performance but rather focus your feedback on key aspects of the assignment. One way to do this is to offer feedback on a single dimension at a time (for example, one aspect of presenting an argument, one piece of the design process, or one step in problem solving). This strategy avoids overwhelming students with too much feedback and enables them to engage in targeted practice—that is, with a specific goal in mind.

Balance Strengths and Weaknesses in Your Feedback Students are often unaware of the progress they are making, so communicating to them the areas where they are doing well or have improved is just as important as communicating to them the areas where they lack understanding or need further improvement. The positive feedback indicates which aspects of their knowledge and performance should be maintained and built upon, whereas the negative feedback indicates what aspects should be adjusted (and, ideally, how). Moreover, beginning with targeted feedback that is positive can increase students' sense of efficacy

and hence enhance their motivation. How you balance positive versus negative feedback for a given class or for a particular student should depend on your priorities and their needs.

Design Frequent Opportunities to Give Feedback   The prerequisite to giving frequent feedback is to provide multiple opportunities for students to practice using their knowledge and skills. More tasks of shorter length or smaller scope provide the frequency of feedback that allows students to refine their understanding. This also makes a more manageable workload for you and your students. As indicated in other strategies in this section, not all feedback needs to be focused on individual students or come from the instructor. These strategies reduce the load on instructors in giving frequent feedback.

Provide Feedback at the Group Level   Not all feedback has to be individual to be valuable. Although you might want to write notes on individual assignments (which takes more time and hence decreases how quickly you can get feedback to students), you might at times identify the most common errors that students committed, provide the group with this list, and discuss those errors. In a similar vein, you can show the group two examples of high-quality performance and discuss the features that make this work "A" level.

Provide Real-Time Feedback at the Group Level   In a classroom situation, especially large lectures, instructors often assume that it is impossible to give effective feedback. However, by posing questions to the class in a format that allows easy collection of their responses, instructors can overcome this challenge. You can collect students' responses quickly in a paper-based way (with color-coded index cards) or with interactive technology (often called personal response systems, or "clickers"). In either case, the

instructor poses a question and students respond (either by raising the index card corresponding to their answer or by submitting their answer choices via clicker). The instructor can then easily glean the proportion of correct/incorrect answers (either by scanning the room for the different colors of index cards or viewing the computer screen that tallies the clicker responses). Based on this information, the instructor can decide how to give appropriate feedback to the class as a whole. For example, the instructor may simply indicate that there was a high proportion of incorrect answers and ask students to discuss the question in small groups before polling them again. Alternatively, the instructor might recognize a common misconception in students' responses and provide further explanation or examples, depending on the nature of the misconception.

Incorporate Peer Feedback Not all feedback has to come from you to be valuable. With explicit guidelines, criteria, or a rubric, students can provide constructive feedback on each other's work. This can also help students become better at identifying the qualities of good work and diagnosing their own problems. Besides the advantages to students, peer feedback allows you to increase the frequency of feedback without increasing your load. Keep in mind, however, that for peer feedback to be effective, you need to clearly explain what it is, the rationale behind it, how students should engage in it, and—as this chapter attests—give students adequate practice with feedback on it for it to reach its potential. (For more information, see Appendix H.)

Require Students to Specify How They Used Feedback in Subsequent Work Feedback is most valuable when students have the opportunity to reflect on it so they can effectively incorporate it into future practice, performance, or both. Because students often do not see the connection between or among

assignments, projects, exams, and so on, asking students to explicitly note how a piece of feedback impacted their practice or performance helps them see and experience the "complete" learning cycle. For example, some instructors who assign multiple drafts of papers require students to submit with each subsequent draft their commented-on prior draft with a paragraph describing how they incorporated the feedback. An analogous approach could be applied to a project assignment that included multiple milestones.

SUMMARY

In this chapter, we have tried to move beyond simple maxims such as "practice makes perfect" or "the more feedback, the better" in order to hone in on the critical features that make practice and feedback most effective. Key features of effective practice include (a) focusing on a specific goal or criterion for performance, (b) targeting an appropriate level of challenge relative to students' current performance, and (c) being of sufficient quantity and frequency so students' skills and knowledge have time to develop. Key features of effective feedback are that it (a) communicates to students where they are relative to the stated goals and what they need to do to improve and (b) provides this information to students when they can make the most use of it. Together, then, practice and feedback can work together such that students are continuing to work toward a focused goal and incorporating feedback received in a way that promotes further development toward the goal. When practice and feedback are carefully designed with all these features in mind, we can prioritize them appropriately and help make the learning-teaching process not only more effective but also more efficient.