

## The Educational Value of Course-level Learning Objectives/Outcomes

There are multiple pathways along which learning objectives promote student learning, and thus a strong case to be made for objectives on the basis of learning research.

First, **clearly articulated learning objectives help students to differentiate among types of knowledge.** Among the types of knowledge that have been identified in the research literature (Anderson & Krothwahl, 2001; Anderson, 1983; Alexander, Schallert, & Hare, 1991; deJong & Ferguson-Hessler, 1996), two kinds emerge clearly. One is *declarative knowledge*, or the knowledge of facts and concepts that can be stated or declared. Declarative knowledge can be thought of as “knowing what.” The ability to name the parts of the circulatory system, describe the characteristics of hunter-gatherer social structure, or explain Newton’s Third Law are examples of declarative knowledge. A second type of knowledge is often referred to as *procedural knowledge*, because it involves knowing how and knowing when to apply various procedures, methods, theories, styles, or approaches. The ability to calculate integrals, draw with 3-D perspective, and calibrate lab equipment—as well as the knowledge of when these skills are and are not applicable—fall into the category of procedural knowledge.

Declarative and procedural knowledge are not the same, nor do they enable the same kinds of performance. It is common, for instance, for students to know facts and concepts but not know how or when to apply them. In fact, research on science learning demonstrates that even when students can state scientific facts (for example, “force equals mass times acceleration”), they are often weak at applying those facts to solve problems, interpret data, and draw conclusions (Clement, 1982). Studies have also shown that students can perform procedural tasks without being able to articulate what they are doing or why (Berry & Broadbent, 1988; Reber & Kotovsky, 1997; Sun, Merrill, & Peterson, 2000). For example, business students may be able to apply formulas to solve finance problems but not explain their logic or the principles underlying their solutions. Similarly, design students may know how to execute a particular design without being able to explain or justify the choices they have made. So when learning objectives are undefined or not clear (e.g., a list of topics to be covered), students cannot tell what type of knowledge they should be developing. Faced with this ambiguity, students naturally interpret their learning goal in terms of the “easier” level/type of knowledge, which may be rather different from what the instructor intends.

Second, **articulating learning objectives helps to ensure that students are practicing the “right” skills – that is, those things that you want them to learn.** Research has shown that learning and performance are best fostered when students engage in practice that (a) focuses on a specific goal or criterion for performance (again, learning objectives/outcomes), (b) targets an appropriate level of challenge relative to students’ current performance, and (c) is of sufficient quantity and frequency to meet the performance criteria. Specifically, research shows that the amount of time someone spends in *deliberate practice* is what predicts continued learning in a given field, rather than time spent in more generic practice (Ericsson, Krampe, & Tescher-Romer, 2003). One of the key features of deliberate practice is that it involves working toward specific goals (aka learning objectives/outcomes). As an illustration of the power of such goal-oriented practice, research shows that world-class musicians spend much of their time engaging in rather demanding practice activities, continually monitoring their performance toward a particular goal and then, once it is achieved, pushing themselves to strive for a new goal (Ericsson & Lehmann, 1996; Ericsson & Charness, 1994). In contrast, we all know of people who have studied a musical instrument—even spending considerable time practicing it—but who do not

achieve a very high level of performance. Ericsson's explanation of these contrasting paths is that those who spend their considerable practice time working deliberately toward a specific goal tend to go on to be expert musicians, whereas those who do not engage in such deliberate practice do not. So goals/outcomes/objectives provide students with a focus for their learning, which leads to more time and energy going to that area of focus. Consistent with this, Rothkopf and Billington (1979) found that students who had specific goals when they were learning from a text paid more attention to passages that were relevant to their goals and hence learned those passages better.

Third, **articulating learning objectives helps to ensure that your course balances independence with guidance in a way that is appropriate for students' level.** As instructors, we want our students to become independent, self-directing learners. However, getting there is a developmental process, beginning with the acquisition of basic content knowledge and disciplinary skills, and evolving to encompass greater creativity, risk-taking, and autonomy. Because what novices need to learn is not necessarily what advanced students need, it is critical to set course objectives that provide the appropriate balance of guidance and autonomy for students' level of sophistication. Research on learning supports the conclusion that novice to intermediate learners benefit from direct, strong instructional guidance, while advanced learners may benefit from more autonomy and opportunities for exploration (Kyllonen and Lajoie, 2003; Cronbach and Snow, 1977; Klahr & Nigam, 2004). Indeed, one meta-analysis (encompassing 70 smaller studies) showed that novice students who were given tasks with insufficient guidance and instruction showed not only lack of learning gains but actual learning losses (Clark, 1989). On the other hand, studies also suggest that providing too much direct instruction to advanced students can interfere with learning by creating split-attention and redundancy effects (Kalyuga, Ayres, Chandler, & Sweller, 2003). These studies indicate that student level matters profoundly when determining appropriate instruction. For example, what might constitute "spoon-feeding" to an advanced student may be a necessary and systematic building of skills to a relative novice. Thus, a benefit to articulating clear learning objectives is to identify the appropriate level of independence for students at a given level.

In the same vein, though perhaps less obviously, learning objectives can help to foster creativity. As researchers of artistic mastery have observed, artistic excellence involves both technical proficiency and creative expression (Sloboda, 1996). Technical proficiency is necessary for creative expression, yet expression is not reducible to technique. Therefore, it is important for instructors who have the long-term goal of developing creative expression to define objectives for novice and intermediate students that focus on building technical skills and knowledge, while defining objectives for advanced students that emphasize creativity and innovation. When thoughtfully articulated, high-level objectives can set a high and consistent standard without limiting the creativity with which students go about meeting it. So, for example, while novice dance students might be expected to "recognize and reproduce particular dance styles," more advanced students could reasonably be expected to "interpret and embody those styles according to their own vision".

Fourth, and perhaps most importantly for many of the upper level courses we teach, **clearly articulated learning objectives will help our students to learn new material in such a way that they can flexibly and appropriately use it in a variety of contexts, both in the short term and down the road.** Cognitive scientists call this "transfer," and it is one of the key markers of deep learning (for a discussion of different dimensions of transfer, see Barnett & Ceci, 2002). Nevertheless, transfer is a significant challenge for students to achieve. Indeed, most research has found that (a) transfer occurs neither often nor automatically, and (b) the more dissimilar the learning and transfer contexts, the less likely successful transfer will occur. In other words, much as we would like them to, students often do not successfully apply relevant skills or knowledge in novel contexts (Singley & Anderson, 1989; McKeough, Lupart, & Marini, 1995; Thorndike & Woodworth, 1901; Reed, Ernst, & Banerji, 1974; Singley, 1995; Cognition

and Technology Group at Vanderbilt, 1994; Singley & Anderson, 1989; Holyoak & Koh, 1987). So, if one of the learning objectives/outcomes for a course is that students learn to “use the concepts flexibly, in a variety of different contexts,” and they know that, and the practice opportunities reinforce that goal, then students will be able to monitor their ability to do so as the course progresses, with a good chance of success.

Finally, **articulating learning objectives helps students build metacognitive skills**. Metacognition refers to “the process of reflecting on and directing one’s own thinking” (National Research Council, 2001, p. 78). To become self-directed learners, students must learn to (a) assess the demands of the task (in other words, the learning objectives/outcomes), (b) evaluate their own knowledge and skills, (c) plan their approach, (d) monitor their progress (which they can only do if they understand the type of knowledge they are expected to gain), and (e) adjust their strategies as needed. Unfortunately, students are remarkably poor at assessing their own skills and knowledge (Kruger and Dunning, 1999) and one of the major intellectual challenges students face upon entering college is managing their own learning (Pascarella & Terenzini, 2005).

The issue of self-monitoring is an important one. Students who naturally monitor their own progress and try to explain to themselves what they are learning along the way generally show greater learning gains as compared to students who engage less often in self-monitoring and self-explanation activities (Chi et al., 1989; 1994; Bielaczyc, Pirolli, & Brown, 1995; Palinscar & Brown, 1984). We also know from a variety of expert-novice studies that one of the characteristics that distinguishes experts from novices is that experts have strong self-monitoring skills – they are more aware than novices of when they make errors, why they fail to comprehend, and when they need to check their solutions (Chi, Glaser, & Farr, 1988 highlight a lot of these studies in their book, *The Nature of Expertise*). Now, there are a variety of reasons this is true (e.g., experts have greater domain knowledge and solid representations of that knowledge), but one of the instructional strategies that mitigates novices’ difficulty in self-monitoring is giving students clear goals to which they can compare their current performance. Because knowing the goals or objectives of a course can help students monitor their progress in relation to it, there is a strong case to be made for the importance of learning objectives in helping students gain metacognitive ability.

*Bibliography available upon request.*