

Editorial

Advances in Applying the Science of Learning and Instruction to Education

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Begin with a commonly held belief about educational practice and follow the evidence to see if the practice is warranted. This is the approach taken by Pashler, McDaniel, Rohrer, and Bjork (this volume) concerning the *learning-styles hypothesis*—the proposal that instructional methods should be aligned with the student's learning style. Although the learning-styles hypothesis is part of the folklore of educational practice, the authors seek to determine whether there is sufficient evidence to justify its implementation.

Accordingly, the most compelling evidence for the learning-styles hypothesis would be a crossover interaction in which type A learners learn better with instructional method A whereas type B learners learn better with instructional method B. For example, according to the learning-styles hypothesis, verbal learners will learn best with verbal methods of instruction (e.g., instruction that emphasizes words) whereas visual learners will learn best with visual methods of instruction (e.g., instruction that emphasizes graphics). In line with a classic review by Cronbach and Snow (1977), this pattern can be called an attribute-by-treatment interaction (or ATI).

As you can see, the learning-styles hypothesis assumes that there are two (or more) kinds of learners (such as verbalizers versus visualizers) and that it is possible to develop instruments that can be used to classify each person's learning style along each learning style dimension. Learning style refers to a person's mode of learning—the kind of cognitive processing someone uses during learning (such as verbalizer versus visualizer style or impulsive versus reflective style). Importantly, learning style—such as verbalizer versus visualizer style—is different from cognitive ability—such as verbal ability or spatial ability (Mayer & Massa, 2003).

In spite of the fact that the learning-styles hypothesis has been proposed for more than 30 years (Jonassen & Grabowski, 1993;

Sternberg & Zhang, 2001), Pashler and colleagues were able to find only a handful of scientifically rigorous experimental tests. In a careful and balanced review of the literature, Pashler and colleagues were forced to conclude that there was not sufficient evidence for crossover interactions in which one kind of learner benefited more from one kind of instructional method whereas another kind of learner benefited more from another kind of instructional method. For example, in the domain of visualizer versus verbalizer style, there is not strong evidence of ATIs in which visualizers learn better with pictorial methods of instruction and verbalizers learn better with text-based methods of instruction (Massa & Mayer, 2006). In short, when the authors followed the evidence, they could not offer support for the learning-styles hypothesis.

This report provides an excellent example of what it means to apply the science of learning and instruction to education (Mayer, in press). From the very beginning of scientific research in education (Thorndike, 1906), psychologists and educators have sought to base educational practice on research evidence about which instructional methods work best under which circumstances (i.e., the science of instruction) and on a research-based theory of how people learn (i.e., the science of learning). Thorndike (1906) offered a vision of a future in which “leaders in education direct their choices of methods by the results of scientific investigation rather than general opinion” (p. 206). Today, the call for *evidence-based practice* reflects the consensus view among educational researchers (Shavelson & Towne, 2002). Pashler and colleagues' clear and concise review provides an important step toward fulfilling Thorndike's 100-year-old call for evidence-based practice.

This kind of work is particularly noteworthy because it contributes to both improvements in educational practice (i.e., it has an applied goal) and to a more authentic theory of how people learn (i.e., it has a basic research goal). Thus, research on the learning styles hypothesis is situated within what Stokes (1997) calls Pasteur's Quadrant—that is, “use inspired basic research” (p. 1). In short, examining research on the learning styles

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hypothesis helps to reinvigorate both educational practice and learning theory.

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