Chapter 6

Study More! Study Harder! Students' and Teachers' Faulty Beliefs About How People Learn

Stephen L. Chew
Samford University

In his book, What the Best College Teachers Do, Ken Bain (2004) identified and studied a sample of outstanding college teachers. He made this observation about their approaches to teaching:

> "[T]he people we analyzed have generally cobbled together from their own experiences working with students conceptions of human learning that are remarkably similar to some ideas that have emerged in the research and theoretical literature on cognition, motivation, and human development" (Bain, 2004, pp. 25-26).

What Bain is saying is that the best college teachers learn through experience what most psychologists typically learn as a matter of course in graduate school. If that is the case, then why aren't psychologists the best teachers of any field? I'm going to argue that the primary reason is that many psychologists fail to apply the psychology of how people learn to their teaching. Somehow we separate the psychological knowledge, theory and skills relevant to understanding the most effective ways to have people learn from the knowledge, theory and skills we use to teach psychology. At the very least, most of us fail to fully apply what we know about learning to our teaching.

I am certainly not exempting myself from this criticism. When I first started teaching, my attitude was summed up in the following way: "Even at its best, teaching can only be an invitation to learn." I believed that my role as a teacher was to present current, accurate information to students in as clear and engaging a way as possible, whether the presentation was through lecture, video, problems, demonstrations or activities. Whether students learned anything was really their responsibility. I searched for teaching tips on how to capture and hold students' interest, such as making the information fun or relevant to their lives. At teaching conferences, I heard about the importance of making learning "active," avoiding lecture, and acting as a facilitator and guide rather than an expert.

The beliefs and practices I learned about reminded me of psychology's radical behaviorist past, with its emphasis on stimulus materials and presentation. The learner really plays a minor role, basically receiving information, following directions, and devoting sufficient study time. Despite the minor role, learners bear most of the responsibility for learning. Students who are struggling in class are told to "study more" and "study harder." Students either need to increase the amount of time or number of repetitions that they study material, or they need to become more engaged and pay closer attention than they currently do. This is certainly good advice for some students, but I often encounter many students who are struggling even though they attend class regularly and devote a great deal of time to study.

As a psychologist, I had nagging doubts about this approach to teaching. Lecture can be engaging and effective under certain circumstances. Discussions can be pointless or worse, serve to reinforce incorrect beliefs. Activities can be fun and engaging but not lead to learning. Work in levels of processing makes clear that just because a learner is active or expends effort is no assurance of better learning. In some cases, it is most effective for the teacher to be the expert while in others the teacher should allow the students to come to their own conclusions.

I could not reconcile the assumptions I made about teaching with what I knew to be true about learning. I realized that teaching requires a mental model of how people learn. Most teachers cannot articulate their model of learning, but they have one. That model determines the teaching methods and approaches we use. The better the model, the more effective the teacher. The more inadequate or flawed the model, the less effective the teacher. Students' behavior, of course, also flows from their models of how people learn. They base their decisions on whether or not they need to go to class, how best to tackle assignments, and how much and in what way they study on how they believe they learn best.

The model of learning I used for teaching was different than the model of learning I used as a psychologist. The former was based on untested assumptions and simplistic beliefs. The latter was informed by research and subject to continuous test and refinement. The two were often in conflict. For example, as psychologists we know more about unintentional learning, persuasion, motivation and social influence than any other field, yet as teachers we often let ourselves believe we have no control over our students' learning behavior.

I do not, however, blame teachers for basing their methods on intuition, because a strong empirical foundation for teaching is still lacking. Historically, most research on human learning has been too simple or artificial to be of much use to teachers. For example, research has generally looked at whether or not simple information is recalled, rather than examining sophisticated comprehension and understanding. Furthermore, until recently there has been little training for teaching in graduate programs. Many new psychology teachers are just as unaware of research related to teaching as teachers in other fields.

In the last 10 years, there has been a proliferation of research that is directly relevant to teaching (e.g., Bransford, Brown, & Cocking, 1999), and much of it challenges commonly held beliefs about teaching and learning.

A common misconception among students is their overconfidence in their mastery of material. In a comprehensive review of student self-assessment, Dunning, Heath, and Suls (2004) reported only a modest correlation between what students believe their level of understanding is and actual exam performance. The correlation is weakest for students in introductory courses but improves for advanced students. Furthermore, the discrepancy is greatest for weaker students who remain grossly overconfident even in the face of repeated contradictory evidence. These are the students who do poorly on an exam and say things like, "But I really thought I knew the material" or "I studied so hard for this test."

Dweck (2002) has demonstrated how a belief that intelligence is a fixed trait, a view often inadvertently reinforced by parents and teachers, can lead to learning avoidance and self-defeating decisions in students. She has shown that changing beliefs to a view that intelligence is a product of effort can improve student performance.

If we want students to be lifelong learners, then making them aware of their own lack of awareness and faulty beliefs should be a priority. An overconfident student feels no need to study or learn, either in school or after graduation. Poor self-assessment and

faulty, malicious beliefs point to the importance of formative assessment and for finding ways to correct these tenacious misconceptions (Chew, 2006a).

A common belief among teachers that has been challenged by research is that the harder students work, the more they will learn. The more they struggle to complete an assignment, the more beneficial it will be. Such a belief is contrary to Cognitive Load Theory (CLT) as described by van Merrienboer and Sweller (2005). CLT states that mental effort or concentration is a limited resource. People possess a limited amount of concentration or mental effort that they can devote to one difficult task or distribute across many simpler tasks. If the combined demand for mental effort, or cognitive load, exceed available mental effort, however, performance suffers.

Any instructional task includes three kinds of cognitive load: intrinsic cognitive load, germane cognitive load, and extraneous cognitive load. Intrinsic cognitive load refers to the minimum amount of mental effort a learner must exert in order to understand a concept. Some concepts are inherently harder to understand, that is, have higher intrinsic load, than others. The intrinsic load is fixed for a learner to master a particular concept. Germane cognitive load is the load imposed by instruction that is relevant to mastering a concept. Different teaching methods impose different levels of germane load. Teachers must optimize germane load (i.e., minimizing load while maximizing learning). Finally, there is extraneous cognitive load, which is the load imposed by activities that are not relevant to mastering a concept. This category includes tangential or irrelevant information from the teacher and any tasks the learner must do in order to complete and activity that aren't relevant to learning. Teachers must minimize extraneous load. It is easy to design activities with combined cognitive load that exceeds the mental effort of students, and few teachers make an effort to manage or optimize it.

Not only must the cognitive demands of instruction not exceed the mental effort of the student, but there must be enough spare mental effort available to allow the student to reflect on and learn from the instruction. Sweller, van Merrienboer, and Paas (1998) reviewed how students may successfully complete an activity and learn nothing from it because all available mental effort was used to complete the task and none was available for learning from the task. But don't students have plenty of mental effort available to them? Not necessarily. Piolat, Thierry, and Kellogg (2005) have shown that note taking, an activity we expect students to do, carries a heavy cognitive load, tantamount to writing an original paper. Therefore, students who are taking notes during instruction have only limited amounts of mental effort available for learning.

We as teachers want our students to think deeply about the material we present. The problem is that deep processing is highly effortful. If students process everything we say deeply, then it is likely that the cognitive load will be too heavy and comprehension of critical information will suffer. Furthermore, not everything we say in class is equally important; some information is central to a concept, some is secondary and some is not intended to be taken seriously at all. Students, however, cannot discriminate among core, tangential and unrelated information. Deep processing of tangential and irrelevant information increases extraneous cognitive load and subtracts from the mental effort available for learning key concepts. When we fail to indicate to students what information they should process deeply and what is tangential, learning of the key concepts suffers (Chew & Baughman, 2006).

We as teachers must realize that sometimes students fail at tasks because of overwhelming cognitive load and not for lack of motivation or effort. Sometimes students can successfully complete a task and learn nothing from it. Because of cognitive load, a more complex activity may be less effective for learning than a simpler one. Finally, we teachers may grossly underestimate the cognitive load of a task because we have so much experience with the task that it has become automatic for us.

We need to think about teaching in psychological terms. I have changed my view from teaching as a matter of engagement and presentation to teaching as a problem in applied psychology (Chew, 2006b). The former is easy, and anyone can do it with minimal training. The latter is so challenging that it takes a whole career to master. We in psychology, more than any other field, should understand how difficult teaching really is.

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