

Teaching Workshop: Helping Students Learn

12 How to teach and how to learn effectively: A review of the recent literature. M. A. Wattiaux*¹, A. Faciola², and C. C. Williams³, ¹*University of Wisconsin-Madison, Madison, WI*, ²*University of Nevada, Reno, NV*, ³*Louisiana State University, Baton Rouge, LA*.

Our objective was to review factors influencing students' learning, the maximization of which is the ultimate goal of any college classroom. The instructor (I), the students (S), and the course content (C) are the 3 fundamental parts of a college classroom. Thus one could conceivably predict learning (L) as a multiple regression including these 3 factors and their interactions: $L = I + S + C + I \times S + I \times C + S \times C + I \times S \times C + \text{error}$. Arguably, instructional effectiveness (I, $I \times S$, $I \times C$, and $I \times S \times C$ in the equation) can be measured with tools meant to determine students' performance relative to stated learning goals. Grades and failure rates have been used as metrics of effectiveness in large enrollment classes; however other non-graded assessments might also shed light on students' perception of learning. Allegedly a more subjective (and controversial) mode of evaluating instructional effectiveness is the end-of-semester course evaluation. It is incumbent to administrative units to determine

whether the instrument used is valid and reliable. Contribution of students to their learning (S in the equation) can be found in the literature on motivation, diversity, and achievement gaps. A recent review of learning techniques ($S \times C$ in the equation) has indicated high utility for practice testing (self-testing or taking practice tests) and distributed practice (scheduling study activities over time) and moderate utility for elaborative interrogation (generating an explanation), self-explanation (connecting to known information, or explaining steps in problem solving), and interleaved practices (mixing different kinds of materials or problems, within a single study session). The most effective modes of teaching within a discipline or a profession (C in the equation) have been captured in the research on "pedagogical content knowledge" (e.g., nutrition and genetics are taught and learned differently) and "signature pedagogy" (e.g., future lawyers and medical doctors are taught from distinct professional paradigms). Careful and deliberate planning of the interactions among the 3 fundamental parts of a college classroom may be paramount to maximize the learning of each student.

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