5.95 In-Class Exercise #2

How Research into Learning Can Inform Teaching*

Below are the major streams of research in learning in higher education that you have read about. For each, two or three salient characteristics and/or major findings are identified, and then several ideas for how those findings can contribute to teaching are provided.

Research Stream	Characteristics/Findings	Contribution to Teaching
1. Cognitive Psychology	a. Knowing = integrating knowledge, skills, procedures in ways useful for interpreting situations & solving problems. b. Chunking information extends working memory. c. Learners actively construct their understanding by trying to connect new information to prior knowledge.	a. Instruction should not define basic knowledge and skills as ends within themselves, but as resources for other activities. b. Put an agenda for the class on the board; chunk information in lecture notes, etc. c. If prior knowledge contains misconceptions, it is hard for the learner to make valid connections.
2. Constructivism	a. Learning is an active process that entails meaning making and model building. b. The *power law of practice* (Pellegrino, p. 85) states requiring a skill takes time and practice. c. The *knowledge of results* (ibid.) states individuals acquire a skill more rapidly if they receive timely feedback.	a. Use interactive engagement (IE) pedagogical methods. [As defined by Hake, IE methods involve "heads on (always), hands on (usually)" activities.] b. Build opportunities for practice into the curriculum. c. So . . . give students timely and concrete feedback that informs them of what they are doing correctly and what they need to improve.
3. Expert/Novice Studies	a. Experts: • Have a better memory for knowledge relevant to the problem • Classify problems according to their underlying principles rather than superficial differences • Use a "physical" approach rather than a mathematical one • Break the problems into parts • Use well-established procedures or rules	a. Explicitly explain and model expert problem solving strategies. In particular, work back and forth between the physical phenomena and the mathematical representation of them.

4. Situated Learning	a. Students need to learn how things are done in the "communities of practice" which they will enter; they need to master ways of seeing, interpreting, and knowing that are practiced by professionals in the field. b. Learning occurs best in contexts that supply interaction and support. (Light's finding: Students who do best in college have a significant relationship with at least one adult.)	a. Use the classroom as an opportunity to model professional practice and to help students learn "the grammar of discourse" in your field. b. Supply interaction and support!
5. Deep vs. Superficial Learning	a. Deep learning is the result of explicit cues given by the instructor. b. Deep learning is the result of the methods of assessment used by the instructor.	a. Set high expectations for your students; ask them to engage in higher order intellectual tasks (see Bloom below). b. Give students assignments, problem sets, and exams that require more than "plug and chug."
6. Perry's Scheme for Intellectual Development & Bloom's Taxonomy	a. Perry (1970) found that students go through a series of states of ethical and intellectual development throughout their college years moving from seeing things discretely to being able to contextualize. b. Bloom (1956) developed his taxonomy to categorize levels of intellectual abilities.	a. Realize where your students are along the continuum and gently move them to more sophisticated ways of knowing. b. Move students up the Bloom "ladder" so that you are helping them to master higher order intellectual skills.
7. Kolb's Learning Cycle	a. Kolb's experiential learning model defined learning as a four-stage cycle: concrete experience is leads to observation and reflection, from which the learner forms abstractions. He/she then tests his/her concepts in new situations and uses them to create new experiences. b. Zull (2002) postulates the Kolb cycle maps well on to how the brain functions.	a. Since experiences stimulate learning, create opportunities for those in your class. b. Since learning is aided by both stimulation and reflection, build periods of both into your curriculum.

*Prepared by Lori Breslow, Director, MIT Teaching and Learning Laboratory for the course, "Teaching College-Level Science" (5.95J), spring semester 2006.