

## CCI Recommends . . . Five articles with data on improving student achievement

Crouch, C.H., and Mazur, E., 2001, *Peer Instruction: Ten years of experience and results*. American Journal of Physics, v. 69, p. 970-977.

Results of ten years of educational research in Harvard introductory physics courses shows greater improvement of student conceptual understanding in classes taught using the peer instruction (PI) technique. Five different instructors showed greater improvement on student achievement in comparison to traditional classes through the use of PI. Students scored higher on standardized tests (Force Concept Inventory; Mechanics Baseline Test) and on problem-solving questions.

Hake, R.R., 1998, *Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses*. American Journal of Physics, v. 66, p.64-74. (see also, Hake, R.R.,2002, Conservation Ecology, v. 5 (2): p. on-line.)

Data reported from 62 introductory physics courses taught at a broad range of institutions with over 6,000 students clearly show that students in courses that employed active learning (interactive engagement) methods outperformed students in traditional classes.

Lord, T. 1997. *A comparison between traditional and constructivist teaching in General Biology*. Innovative Higher Education v. 21(3), p. 197-216.

Describes collaborative learning methods used in an introductory biology course and compares scores on exams taught by same instructor using different methods. Students in collaborative classes outperformed those in traditional sections.

Paulson, D.R., 1999, *Active learning and cooperative learning in the organic chemistry lecture class*. Journal of Chemical Education, v. 76, p.1136-1140.

Describes improvements in learning through introduction of active learning strategies in a three-class cycle of organic chemistry courses. 38% of students successfully completed the three-class sequence (grade of C or better in each course) in the traditional lecture classes. The proportion of students successfully completing all three classes jumped to 75% for the active learning sequence. Other scores and course retention also improved in the active learning sections.

Udovic, D., Morris, D., Dickman, A., Postlethwait, J., Wetherwax, P., 2002, *Workshop Biology: Demonstrating the effectiveness of active learning in an introductory biology course*. BioScience, v. 52 (3): p. 272-281.

Workshop biology involved three approaches to teaching/learning: 1. Conceptual change; 2. Science as inquiry; and 3. Science in context. Authors compared results of workshop biology course with traditional lecture course. A common pretest/posttest was administered. Students in Workshop sections did much better, whereas scores declined for some questions in traditional sections.