

Classroom Assessment Techniques: Concept tests

Concept tests

Concept tests were developed as part of the peer instruction technique used to teach physics (Mazur, 1997). This teaching method has been widely used in physics courses at a range of institutions and has been successfully adopted by faculty in a variety of other disciplines (e.g., chemistry, biology, astronomy; Crouch and Mazur, 2001). Peer instruction divides class time between short lectures and conceptual multiple-choice questions. Concept test questions are designed to evaluate student understanding of the basic concepts behind the lecture material.

Concept tests are not simple content-based multiple-choice questions that rely on the student re-reading their lecture notes or memorizing a fact or definition. Instead, these questions are designed to assess student understanding of the principal concepts underlying the lecture material.

Concept tests generally correspond to the comprehension level of Bloom's taxonomy but may be suitable for application questions.

How to use Concept tests

- 1. Post a question on the chalkboard or screen.** Students should consider the question individually for a short time (30 seconds to 1 minute) and choose an answer. In some cases students may also be given an opportunity to declare their level of confidence in their choice.
- 2. Students indicate their answers.** In the simplest case students could just raise their hands as answer choices are presented by the instructor. This approach is discouraged as it allows some students to simply mimic the most popular answer choice without giving full consideration to the question. An alternative is to have students hold large lettered answer cards in front of themselves (and out of sight of others), to select answers on answer sheets, to use finger signals (holding a number of fingers sideways against their chest) or to use an electronic classroom communication system.
- 3. Instructor evaluates student responses.** The optimal range of correct student responses is 35-70% (Crouch and Mazur, 2001). If less than 35% of the responses are correct, students do not understand the topic well enough to discuss the subject. If more than 70% of the class gets the answer correct in their first response, the question was probably too easy. Additional discussion will not yield much improvement in student answers. The best strategy is to explain the answer and move forward with lecture.
- 4. Peer instruction.** When responses are between 35-70%, students discuss the reasons for their choices with their neighbors (peer instruction) in pairs or small groups before voting again. This process usually results in an increase in the number of correct answers and an increase in student confidence in their answer choices (Mazur, 1997). Allow 1-2 minutes for discussion.
- 5. Poll the class.** Lastly, poll the class to select group spokespersons who can provide a brief explanation of the correct answer. The instructor may decide to summarize these responses for the class.

Further thoughts: The references below discuss the technique further and provide data on its success in improving student learning.

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

Mazur, E., 1997, *Peer instruction: A user's manual*: Prentice Hall, 253p.