

## Academy of Distinguished Teachers - April 27, 2009

### Outcomes of Using Immediate Feedback Assessment Tests (IF-AT)

Mary Brakke ([brakk001@umn.edu](mailto:brakk001@umn.edu)) and Kevin Smith ([smith376@umn.edu](mailto:smith376@umn.edu)),

#### BACKGROUND

*Biology of Plant Food Systems and the Environment* is an introductory-level biology course with emphasis on plant biology, food production and the environment. The course largely serves nonmajors.

In 2000 we began using problem-based learning (PBL). The PBL approach uses a discipline relevant, ill-defined problem as a stimulus for learning and seeks to simulate essential aspects of the problem-solving. It has been reported that PBL results in better conceptual understanding and retention of content and skills, contributes to problem solving skills and leads to greater awareness of, and motivation for, learning (Coles, 1991; Dochy et al., 2003; Beers and Bowden, 2005; Spiro et al., 1988).

Collaborative learning is an integral part of PBL. As such the benefits ascribed to PBL are dependent in part on group dynamics. The PBL process we use involves:

- Introduction of a compelling problem
- Class brainstorming where students offer insights
- Small group discussion to identify knowledge gaps
- Identification of personally meaningful question and outside research
- Debriefing of individual research in small groups
- Small group discussion and work to understand the problem, identify and evaluate solutions and make recommendations

#### THE PROBLEM

While some students enjoy working and learning in groups, many are averse to the format. Comments from course surveys reflect:

- a lack of confidence in learning from peers
- a perception by some that group activities are of minimal value
- complaints about logistics of group papers or presentations

In addition, group work reduces class time for content delivery and requires that students complete assigned reading outside of class. Many students (and some instructors) object to group work on this basis as well.

We identified the following as key factors to address in order to enhance the perceived value of group work:

- student preparation for group discussions
- appropriate learning objectives for groups
- demonstration of the benefits of collaborative learning

To encourage student preparation for group discussions, a test on assigned reading and lecture material took place during the second week of each four- to six-week long PBL unit. On test day students completed a 20-question, multiple choice test and subsequently completed the same test as a group using Immediate Feedback-Assessment Test forms (IF-AT).

Immediate Feedback Assessment Tests (IF-AT) utilize a bubble sheet with waxy covering on answer spaces. Students scratch off the covering until they obtain a mark that indicates the correct answer. Students' scores are the total of the individual plus group scores.

## CONCLUSIONS

- **Student preparation for individual and collaborative tests early in a PBL unit contributes to positive group experiences and does not impair performance on final exams.**

Early tests on background material placed greater responsibility on students to prepare outside of class and may have facilitated a deeper understanding of material. As students researched and discussed the problem during the remainder of the unit, they were able to use concepts and terms that were introduced earlier.

Because less time in lecture was needed for presentation of basic material, additional time was available for group activities including discussions and collaborative testing.

One disadvantage of early testing was the need to gear test questions to the appropriate level of understanding. Hence, questions focused on lower levels of cognition, primarily recall and comprehension. These questions often lack the complexity that makes for good group discussions. We assessed higher levels of cognition (analysis, synthesis and evaluation) through group papers.

- **Students' attitudes toward group work improved when we included comprehension of basic terminology and concepts as an objective of group work.**

Collaborative tests on basic concepts and terminology may have helped to reinforce correct understanding and allowed misconceptions to be addressed before the final exam. This approach combines aspects of formative and summative assessment. Formative assessment has been shown to be an important aspect of learning and to improve performance on summative assessment. It has previously been reported that IF-AT improves retention of knowledge through reinforcement of correct understanding (Epstein et al., 2002). The desire to perform well in front of peers during collaborative group testing may have provided an additional incentive for students' to learn material.

- **Students' perceptions of the value of group work improved during years when learning in groups involved collaborative testing.**

Higher scores on collaborative tests provided clear evidence of one advantage of group work. For some students this may serve to improve their trust in the process of collaborative learning. Trust in the value of sharing information, understanding and viewpoints is essential for learning in a group.

We plan to continue the use of early testing and collaborative tests and will work to identify other ways improve students' attitudes toward collaborative learning.

## LITERATURE

- Beers, G. W. and Bowden, Susan. 2005. The effect of teaching method on long-term knowledge retention. *Journal of Nursing Education* 44:511-513.
- Coles, C. "Is Problem-Based Learning the Only Way?" In D. Boud and G. Feletti (eds.), *The Challenge of Problem-Based Learning*. New York: St. Martin's Press, 1991.
- Dochy, F., M. Segers, P. Van den Bossche and Gijbels. 2003. Effects of problem-based learning: a meta-analysis. *Learning and Instruction* 13:533-568.
- Epstein, M.L., A. D. Lazarus, T. B. Calvano, K. A. Matthews, R.A. Hendel, B.B. Epstein, and G.M. Brosvic. 2002. Immediate feedback assessment technique promotes learning and corrects inaccurate first responses. *The Psychological Record* 52:187-201
- Spiro, R. J., Coulson, R.L., Feltovich, P.J., and Anderson, D.K. 1988. Cognitive flexibility theory: Advanced knowledge acquisition in ill-structured domains. *Proceedings of the 10th annual conference of the Cognitive Science Society*. Hillsdale, NJ: Lawrence Erlbaum.