Cooperative Learning Strategies for Effective Teaching and Learning Science Courses in Large Classes

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**INTRODUCTION**

Cooperative learning involves students working in groups on problems or projects such that it fosters positive interdependence, individual accountability, leadership, decision making, communication, and conflict management skills (Johnson, Smith, & Smith, 1991). Felder and Brent (1983) indicate that cooperative learning also enhances short-term mastery, long-term retention, understanding of course material, critical thinking, and problem solving skills. Recent literature suggests a number of cooperative learning strategies; however, many of these strategies may not be as effective or practical in large classes because of the larger number of students. Teaching a large class itself is challenging. Introducing cooperative learning strategies in large classes is even more challenging. Felder has described some innovative techniques including cooperative learning strategies for effectively teaching large classes. This article describes some other cooperative learning strategies that were used in large classes and provides results of student feedback on those strategies. The second section describes the results of a local survey on large class offerings in science education in some institutions in the western part of Nigeria. The third section describes cooperative learning strategies that were used inside or outside of a classroom. The results and conclusions are given in the fourth and fifth sections, respectively.

**LARGE CLASS OFFERINGS IN SCIENCE EDUCATION**

A survey was conducted to determine the prevalence of large class offerings in science education. The survey polled the school/faculty of science representatives to determine large science class offerings on their respective campuses. Campus representatives from six institutions responded to the survey. While the definition of a large class varies, 100 students were set as the threshold for a large class. Responses indicated that 98% of the responding institutions offer one or more science classes with 100 or more students. The class sizes ranged from 75 to 1000 with an average of 150 students. The largest class size in the other 2% of schools ranged from 18 to 75 with an average of 45. While only 98% of the institutions offer large science classes (n>100), the percentage of total students who attend such classes is much larger. Based on survey data, over three-fourths of students at reporting institutions attend large classes. Also, most of these large classes are offered in courses like general courses for computer science, mathematics, physics, integrated science, biology, and so forth.

This survey indicates that a majority of undergraduate science students attend large classes. Thus, improving the teaching-learning process in these large classes would have a significant effect on science education. Recent studies have confirmed that attrition rate among science students is higher during their initial years in college. Hence, improving large first and second year classes has potential for increasing science students’ retention rates.

**COOPERATIVE LEARNING STRATEGIES**

Cooperative learning, as indicated earlier, involves group work. Groups may be organized along informal or formal lines. Wankat and Oreovicz (1994) define
Finding their learning styles and discussing similarities and differences in their learning styles; generating a creative item like a joke, cartoon, or poetry, and coming to a consensus about which is the best item from their group, and designing an optimum sorting technique algorithm.

The formal groups were encouraged to study together and prepare for examinations. The group members also took collaborative quizzes in the class. During such a quiz, the group members discussed how to solve a given quiz problem in the first three to four minutes. At that time, no writing was permitted. This activity greatly enhances their capabilities in problem solving, critical thinking, teamwork, and communication skills. In the next 15 minutes, they solved the quiz problem individually, just as in a regular quiz.

RESULTS

The students in the large computer class were asked for their opinion on integrating soft skills like cooperative learning (teamwork), active learning, problem solving, and critical thinking in all their courses. The
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