

**TEACHING NATURAL SCIENCE TO NONMAJORS:
A COMPARISON OF TWO DIFFERENT COURSE FORMATS,
THE “TEAM OF EXPERTS” VERSUS THE “INDIVIDUAL INSTRUCTOR”
APPROACHES**

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At Berea College, a large required general education curriculum has been in place for a number of years. Part of this curriculum includes a course aimed at non-science majors called Natural Science that satisfies part of the science requirement in general education. Beginning in 1984 the course was taught in a large class format using multiple instructors. Each instructor delivered several lectures in his or her own area of expertise and was responsible for small recitation classes following the major lectures. Although a great amount of time was spent by participating instructors on constructing, administering, and evaluating the class, the format was more characteristic of what has been termed “turn teaching” rather than “team teaching” (Hinton and Downing, 1998).

The course continued in this manner for more than 15 years. Consistent complaints from students indicated that there was too much material presented too quickly. Although the science faculty discussed the class on a continuous basis and looked for ways to improve it over the years, a stalemate developed about how best to conduct the course. Finally, the science faculty “agreed to disagree” about how the course should be taught and entered into an experimental phase in which the course

would be taught in smaller classes (typically 20 students) by individuals or in small team-taught sections. As this new format developed, some faculty members still expressed reservations that students would not be afforded the subject-specific expertise needed to understand an area if it were taught using an individual instructor format.

Starting with the assumption that assessment works best when it is faculty driven (Palomba and Banta, 1999; Strada, 2001) as well as directly supported and encouraged by administration (Sorenson, 1996; Hadden and Davies, 2002), the Associate Dean for General Education asked the science faculty to evaluate the change in format. Working with the Director of Institutional Research and Assessment, the instructors of the natural science course designed a tentative assessment plan to evaluate the effects of the change. The plan included the following elements:

1) A “pre” and “post” course attitudinal survey for students was to be constructed and administered in the Fall Term 1999 course (“old” format) and subsequent courses starting in Spring Term 2000 (“new” format). The instrument was to be designed to compare the two formats in terms of how helpful the course was in reaching particular learning goals. This component of the assessment work took place and construction of the instrument involved using input from all instructors in the course.

2) In addition, instructors who participated in the summer workshops agreed to evaluate the cognitive component of students’ learning (“old” versus “new” format) by constructing two common final exam items to be used in all sections taught in the Fall Term 1999 (“old” format) and Spring Term 2000 (“new” format). This part of the assessment plan, however, did not come to fruition for various reasons.

3.) The Natural Science faculty agreed to meet every two weeks during the academic year 1999-2000 and discuss specific ways to address various issues involved in the course. This ongoing engagement of faculty was to serve as a continuous *formative assessment* of the “new format” course. The meetings took place and discussions focused on topics of sharing resources, examining syllabi and assignments, and describing in-class demonstrations. In addition, a one-day faculty development workshop was held in the summer of 2001.

4) Individual section assessment activities were also encouraged. Several faculty members made use of various types of classroom assessments designed to elicit feedback

on lectures, assignments, and other experiences. Others constructed and used cognitive measures of performance in conjunction with the usual final exam in the course.

5.) Finally, the overall assessment plan called for gathering feedback from Natural Science instructors themselves comparing the benefits and limitations of the two formats (“old” versus “new”). This assessment took place in Fall Term 2001.

In addition to the activities outlined in the assessment plan above, the Berea College Instructor Evaluation Questionnaire (IEQ) results were used to compare the “old” versus “new” formats of the course. The IEQ is the end-of-course student evaluation required of all instructors to evaluate perceptions of teaching.

In Fall Term 1999, 62 students enrolled in the “old” format of the Natural Science course completed both the beginning and ending assessment forms. One hundred and fifty-six (156) students enrolled in the “new” format of the Natural Science course during the Spring and Fall Terms 2000 and Spring Term 2001 completed both assessment forms. The results of these two groups were compared.

Overall, the attitudinal survey results indicated that the “new” format students were more positive in several ways. On both the beginning and ending assessments, “new” course format students rated all structured items more positively. “New” format students entered and left the class with more positive views about science. Furthermore, the “new” format students rated the course they took more positively in terms of helping them fulfil the six core learning goals.

The knowledge or cognitive component of the assessment plan involved only a few instructors using a shared final exam question aimed at ascertaining the conceptual “level” at which students were operating. It was completed only in selected sections of the “new” format of the course. Student responses to shared final exam questions were judged based on three levels of thinking (nominal, application, and synthesis). Results indicated that students were performing at acceptable levels on the nominal and application portions of the assessment but not at acceptable levels on the synthesis portion of the assessment. Because comparative data were not available for the “old” format course, the effect of changing the course format could not be determined. Nevertheless, the results indicated that instruction in the course needs to focus more on the *relationships* among topics within and ideally beyond the sciences.

Analyses of the Instructor Evaluation Questionnaire revealed that “new format” students rated several items statistically significantly more positive than did “old format” students (in fact, all changes were positive but not all were statistically significant).

Feedback from the participating faculty was generally positive (smaller class size of the “new” format course allowed faculty to know students better, encourage student engagement, and control the pace according to student needs). Other feedback from faculty indicated that there was a sense of loss (teaching with other faculty members with expertise was very informative) and some worried that exposure to details of a subject had been sacrificed in favor of faculty autonomy.

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