

# Instructional Practices in Introductory Geoscience Courses: Results of a National Faculty Survey (ED41A-0242)

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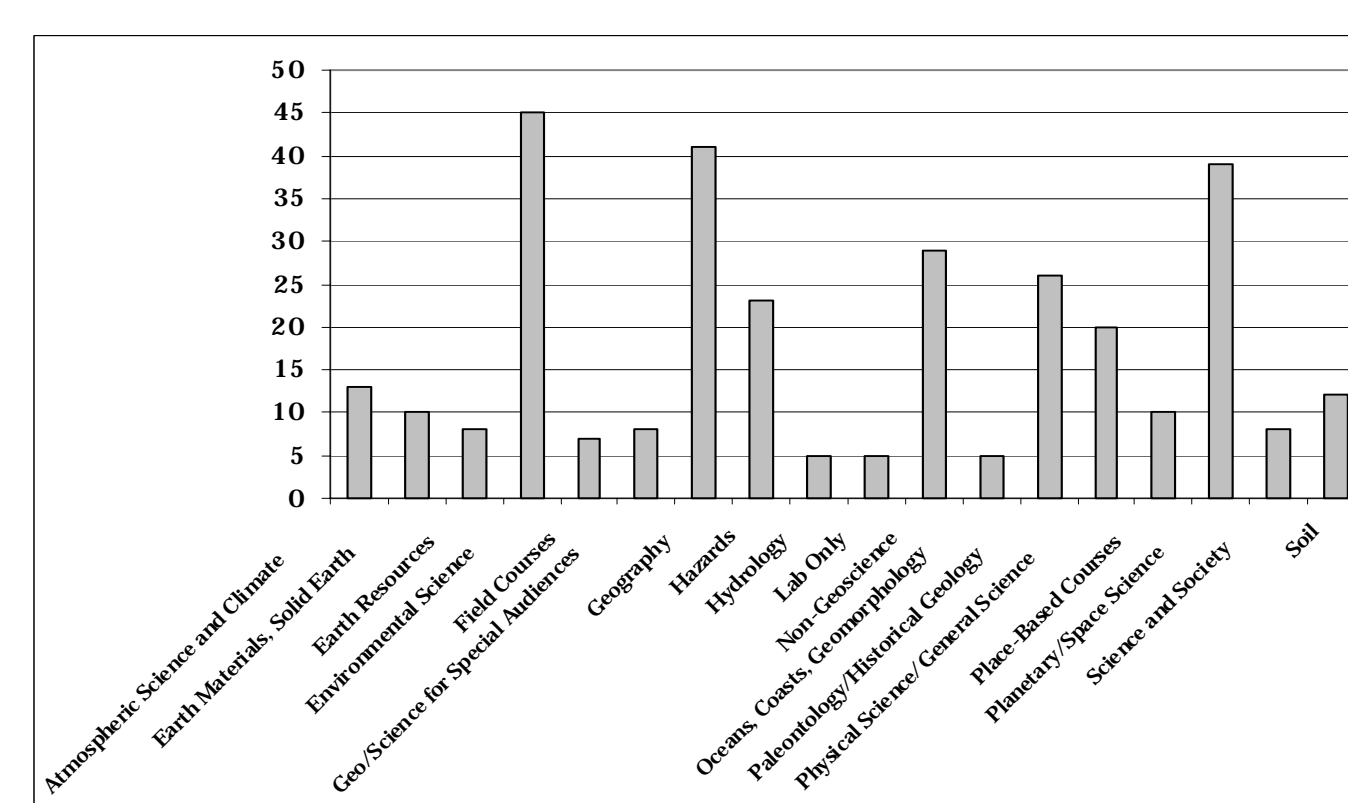
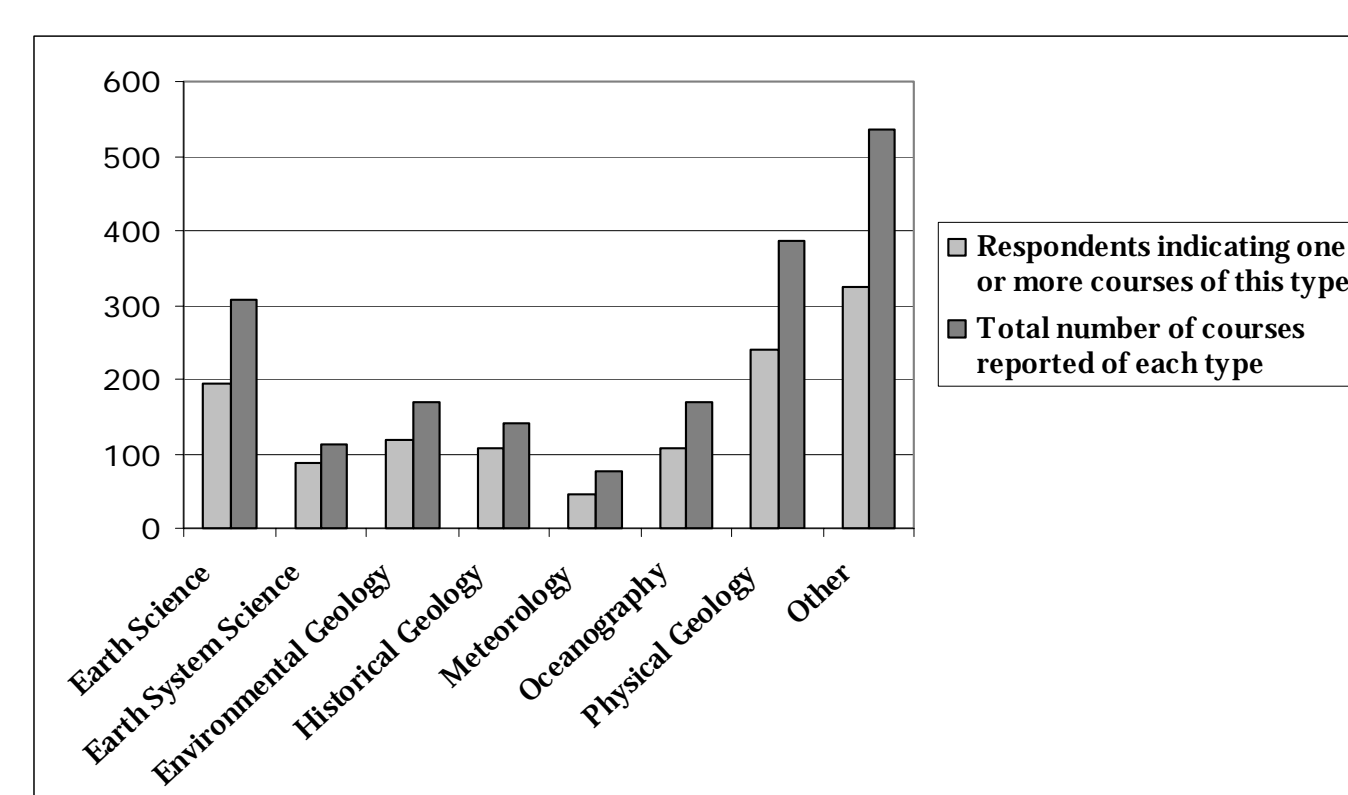
## Introduction

The NAGT professional development program *On the Cutting Edge* recently surveyed all geoscience faculty in the United States to develop a snapshot of current instructional practices in undergraduate geoscience courses, faculty strategies for learning new content and new teaching approaches, and faculty involvement in the geoscience education community.

The Statistical Research Center of the American Institute of Physics developed the survey instrument, administered the survey, and did the initial analysis of results. We received 2207 responses, a response rate of 39% based on 5700 initial requests.

We asked respondents to describe methods in a specific course that they had taught recently. They were allowed to submit data from more than one course if they chose to do so. With this design, the course, not the faculty member, is the central unit of measure in our findings, and the results are presented as the percentages of courses in which students experience different types of teaching methods, activities, or assessments.

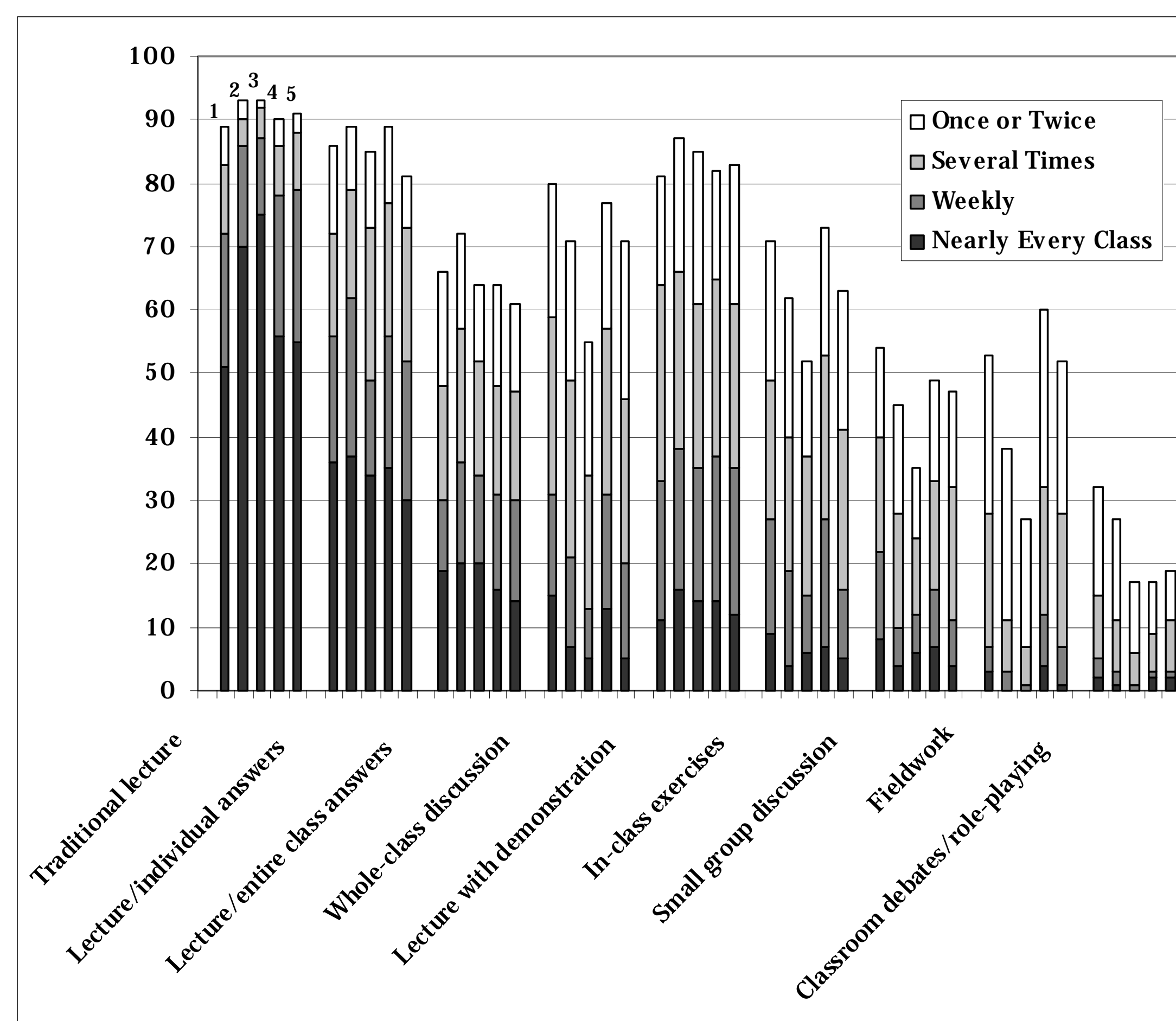
## What Courses are Geoscience Faculty Teaching?



Types of introductory courses taught by faculty during spring 2003 and fall 2003. Lower figure shows courses in the "other" category.

The geoscience curriculum is characterized by diversity. In addition to the geoscience courses that typically are considered mainstays of the curriculum, faculty also report a rich array of courses that explore Earth in exciting and novel ways. Thematic courses that address issues of relevance to students as well as topics that are at the cutting edge of research are represented in the titles.

## What teaching methods are faculty using?



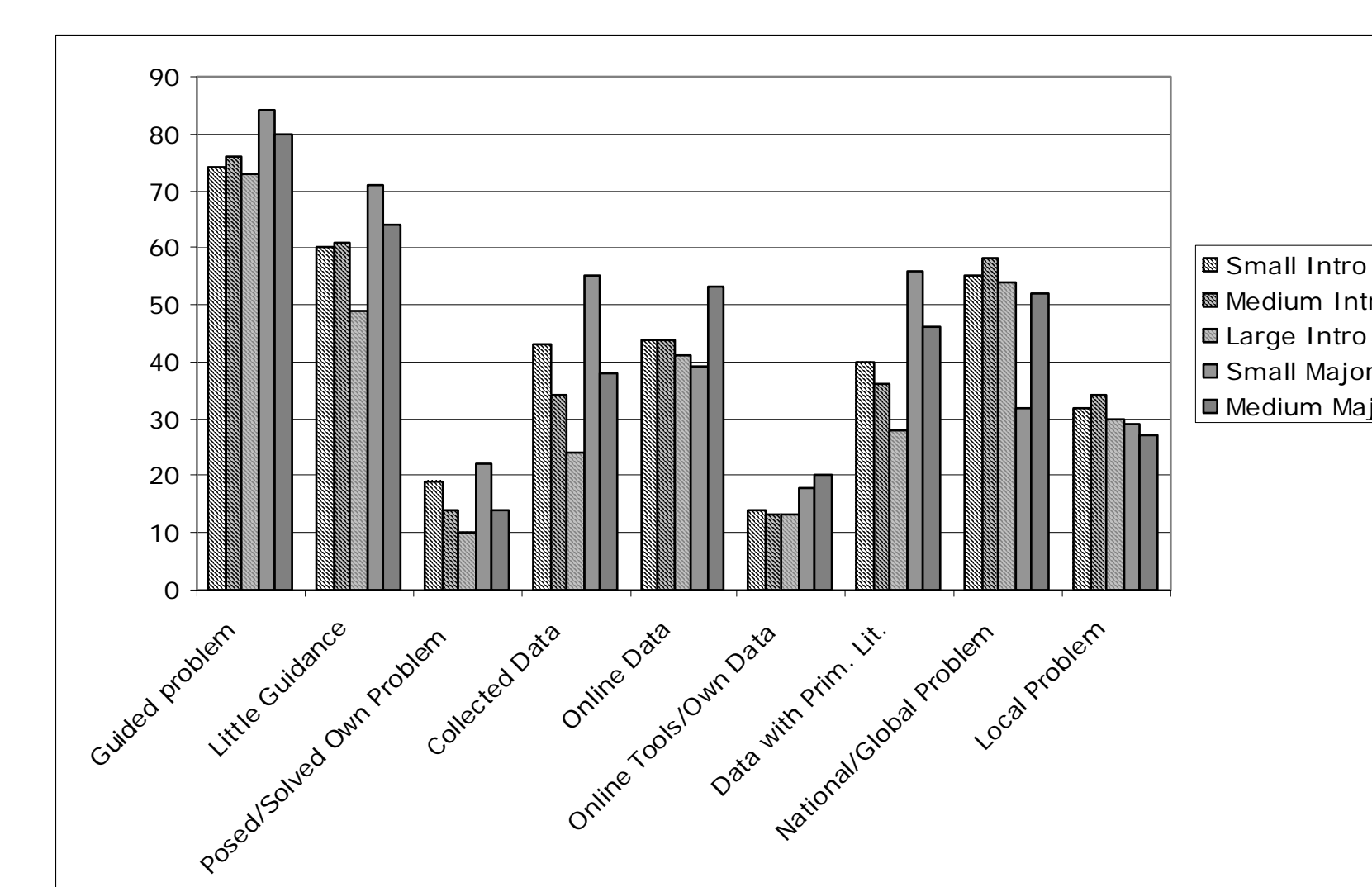
Faculty use of teaching strategies for introductory and majors classes, as percent. Columns are grouped in fives, and indicate the following classes for all strategies: 1: Small Introductory Class (30 students or fewer), 2: Medium Introductory Class (31-80 students), 3: Large Introductory Class (81 students or more), 4: Small Majors Class (30 students or fewer), 5: Medium Majors Class (31-80 students).

While lecture dominates undergraduate geoscience teaching, the data indicate that most faculty incorporate some interactive activities into the lecture portion of the class.

Although faculty who teach large introductory courses use interactive techniques much less frequently than faculty who teach smaller courses, we are struck by the number who *do* use what many consider to be "impossible" techniques in large courses. Of those teaching large classes, 55% use all-class discussion at least once a term, 52% use in-class exercises at least once a term, and 17% even use classroom debates and role-playing at least once a term.

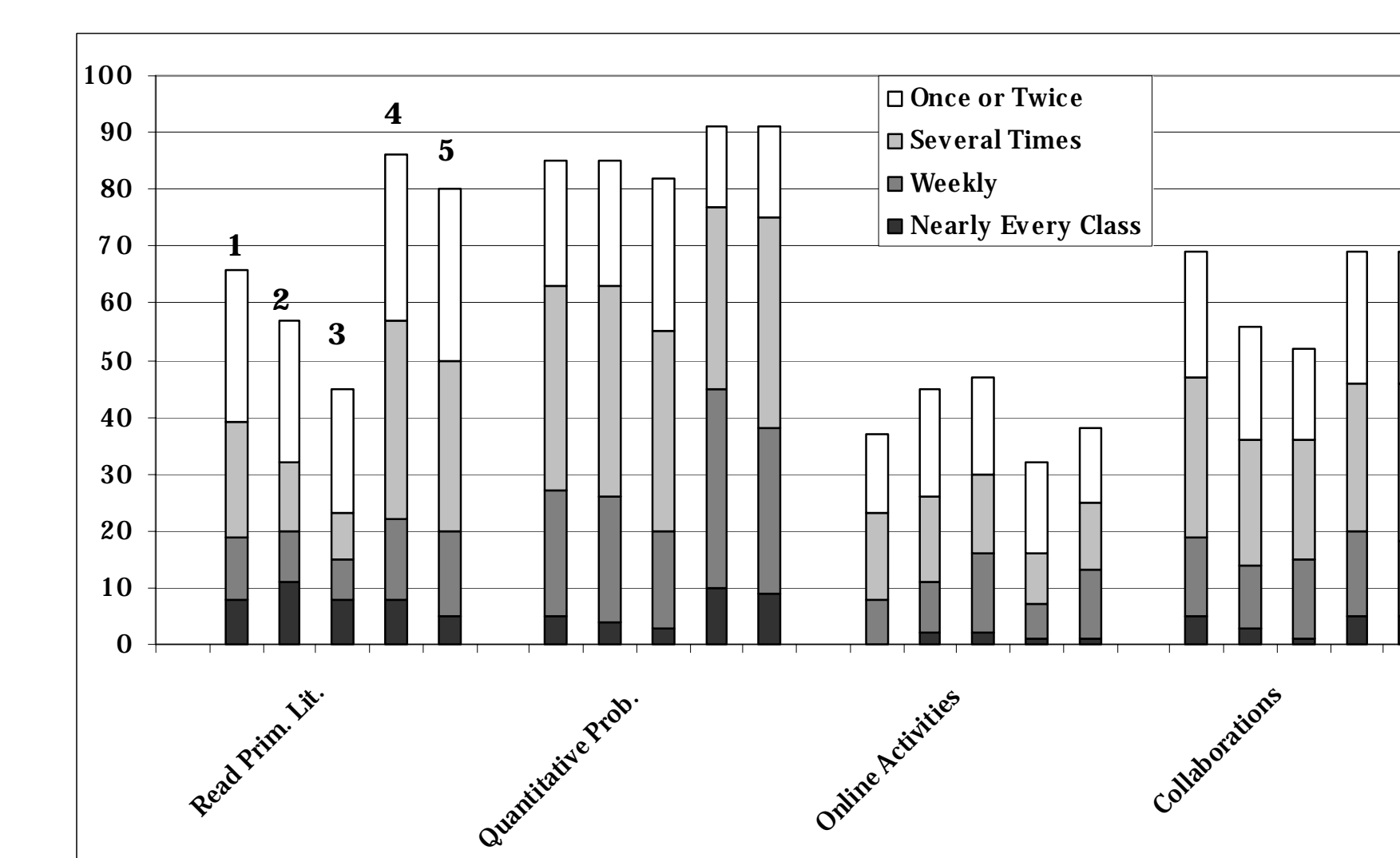
In many cases, these activities are not reported as a regular part of students' classroom experiences suggesting that while faculty are aware of these techniques, they are facing barriers to widespread incorporation in their teaching.

## What kinds of activities do faculty ask their students to do?



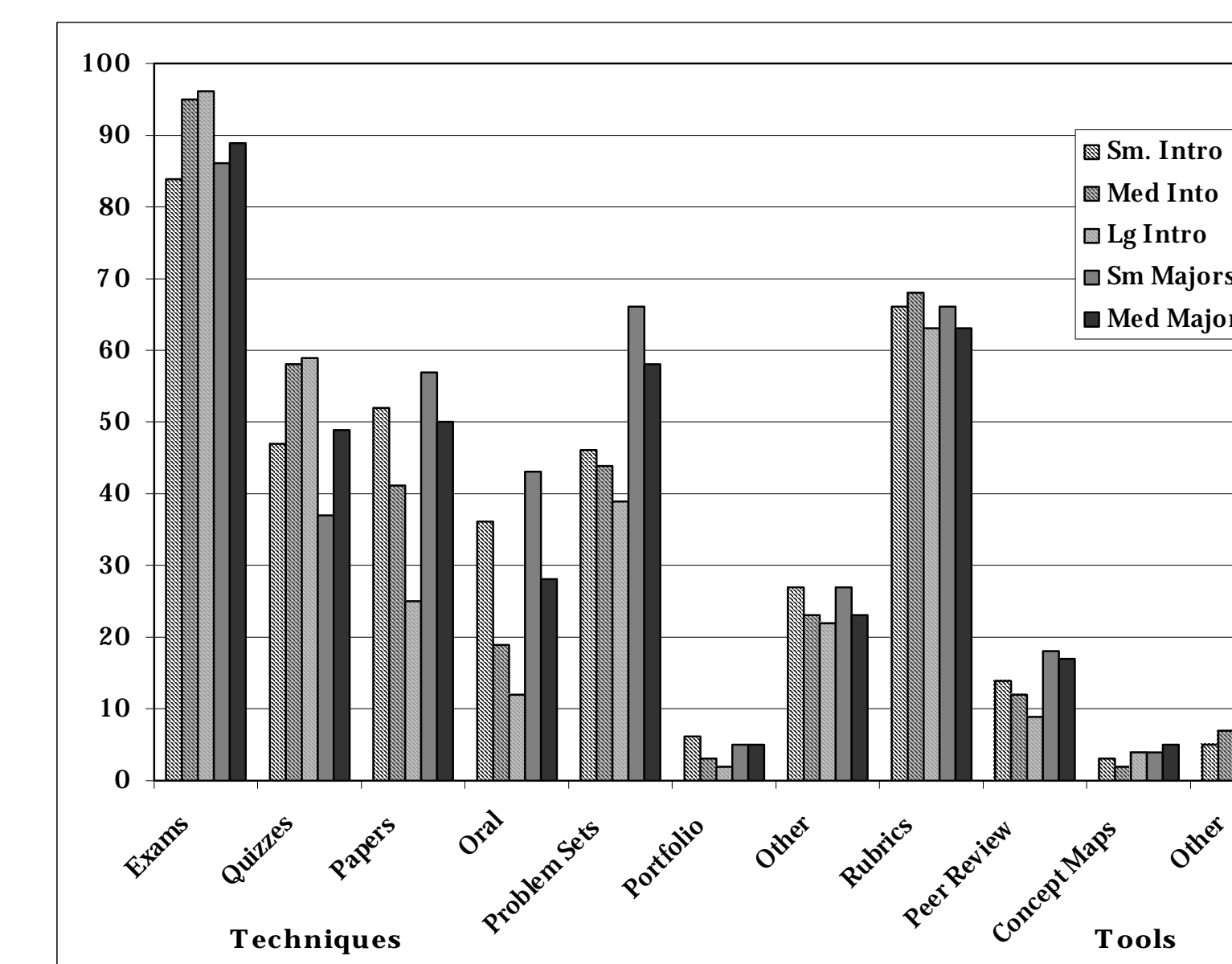
Types of problem solving activities completed in introductory courses and courses for majors reported as percent.

Problem solving activities, including those that are quantitative, are widespread in geoscience courses. In introductory courses, these problem solving activities more frequently address national or global problems, suggesting that this context is seen as a way to motivate learning. The primary literature is introduced in many introductory courses. Structured collaborations are widely used to support students in problem solving activities.



Frequency of faculty use of other classroom activities (reading primary literature, solving quantitative problems, solving online problem sets and/or using structured collaboration to solve problems) in introductory and majors courses.

## What kinds of assessment strategies do faculty use?



Assessment techniques and grading tools used by faculty in introductory courses and majors courses as percent.

While exams and quizzes are still heavily relied upon in geoscience courses, particularly large ones, a wide range of other techniques are also used. Papers are used in courses of all sizes including large introductory courses.

## Conclusions

The survey data contain substantial evidence that faculty are implementing creative solutions to engaging their students in learning, problem solving, and higher level thinking. Papers are widely-employed in introductory courses and their use in large introductory courses is notable. The use of problem solving, including activities that address problems of local, national, and global interest, suggests that faculty understand that students are motivated to learn by real world problems. Faculty engage students with the primary literature and in interpretation of data to address these problems. Most faculty appear to be engaged in trying techniques beyond lecture to engage students in learning.

On the other hand, there is room for growth. Most faculty are still experimenting infrequently with these techniques. These results strongly support the continued offering of professional development activities that both bring new ideas to faculty and address the practicalities of widespread implementation of these techniques.

For more information about *On the Cutting Edge* visit

<http://serc.carleton.edu/NAGTWorkshops/>

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