Math 118 Redesign Pilot

Teaching a Large Class for the First Time

Mark McCombs, Mathematics Department

Mark McCombs has been teaching undergraduate math courses at UNC for nearly 25 years. None of the courses he had taught previously had enrollments of more than 35 students. For the Fall 2012 semester, he was asked to teach a large section of Math 118, Topics in Mathematics, enrolling 140 students. Four additional sections enrolling 25-35 students were taught by graduate instructors. The Department’s goal, driven by budget cuts, was to consolidate four of the eight smaller sections into one large section without negatively impacting student learning outcomes.

The biggest difference in course format between McCombs’ large section and the smaller sections was use of a recitation section. The recitation replaced one of the three weekly lectures in the large section. Enrollment in each of the recitation sections was capped at 35. Students spent an estimated 95% of their time in the recitations engaged in peer-to-peer learning activities. Student groups of six worked on higher order problems sets that sometimes required multiple class sessions to complete. Students in the large section were also required to complete assigned readings in preparation for class; online quizzes related to each assignment were due before each class.

Table 1 provides an overview of differences between the large and small sections of Math 118 taught during Fall 2012 semester.

Table 1

<table>
<thead>
<tr>
<th>Format</th>
<th>Semester</th>
<th>Course characteristics</th>
<th>Primary in-class method</th>
<th>Recitation</th>
<th>Incentives to complete readings before class</th>
<th>Regular use of group activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large section</td>
<td>Fall 2012</td>
<td>Lecture and problem-solving</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Small sections</td>
<td>Fall 2012</td>
<td>Lecture</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Key Findings

- There was no significant difference between learning outcomes for students in the large and small sections (met Departmental goal).
- Students in the large section were more likely than students in the small sections to help one another and to value interactions with their peers.
- Compared to all but one of the smaller course sections, students in the large section were more likely to come to class having completed their homework.
Methodology

Common assessments were used to compare learning outcomes for students enrolled in the large course section with those enrolled in the small sections. Students in all course sections were administered the same first exam and 8 identical questions were included on the final exam. Students in the large section and three of the four smaller sections were also asked to provide some demographic information and share their attitudes about the course via an end-of-semester survey. There were no significant differences among the students on most of the demographic questions. A higher percentage of students in the large section had not taken a calculus-level math course. There was a significant relationship between the highest math course completed and the final exam grade across all sections. Students in the large section also scored lower overall on motivation questions.

Student Attitudes

The end-of-semester student survey results also underscored some of the challenges that instructors face moving from a seminar-sized class to a large class. Establishing a class structure and methods that engage students in a large lecture hall is one such challenge. For the Math 118 redesign, the group-based recitation provided students in the large enrollment section with opportunities to interact that they clearly valued. However, fewer of those same students reported participating during the lecture sessions for the course. A higher percentage of students in the large section also said it was possible to do well in the course without attending lecture.

Instructor Comments

McCombs said he struggled his first semester teaching in the large course format. Students with whom he was used to interacting directly in the small sections now felt distant. He tried to lead one class session without a microphone and lost his voice. He said class often felt more like a performance than an interaction with students. “The first semester I wasn’t good enough at it….I never felt caught up”, says McCombs. A year after his initial experience teaching the large section of Math 118, he now has much more confidence in the large class format. “Pleasantly astonished”, he says of his experience this semester.

“I finally feel like I am providing students with a meaningful experience without lowering standards.”

Next Steps

Mr. McCombs is not yet satisfied with the level of participation in the large lecture sessions for his Math 118 course. Although he continues to break up the lecture portion of the class by having students solve problems together, he would like to get more aggregate feedback on student understanding of key course concepts. He plans to begin experimenting with class response systems next semester. He also wants to continue to monitor the effectiveness of the course redesign and will administer the same student survey used during the Fall 2012 semester again this fall.

For more information about the project evaluation, please contact Andrea Reubens at the Center for Faculty Excellence (reubens@email.unc.edu).