

Psychology 210 Redesign Pilot "Flipping" the Classroom

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Dr. Viji Sathy has been teaching PSYC 210, Statistical Principles of Psychological Research, each fall and spring semester for the past four years. The course now enrolls nearly 180 students and meets in a large lecture hall with fixed stadium seating. For the Spring 2013 semester, Dr. Sathy implemented changes to the course in an effort to improve student learning outcomes.

The biggest change was shifting most of the in-class lectures to a series of 5-8 minute recorded online lecture segments that students were responsible for viewing before class. This approach, popularly referred to as "flipping the classroom," allowed Dr. Sathy to devote more class time to active learning methods. She reduced her use of in-class lecture by approximately 75%. Students were required to watch the videos or complete assigned readings in preparation for class, and were quizzed on the content at the beginning of class. See a [short video](#) of a typical in-class assignment for the course.

Table 1 provides an overview of differences between the redesigned course and a Fall 2012 control section taught by Dr. Sathy that made heavier use of traditional lecture-based methods.

Table 1

Course Format Comparison

Format	Semester	Weekly PSYC 210 Structure (by hours)				
		Primary in-class method	Assessments	Number of online videos	Readings or video viewing required	Number of class polls
Traditional	Fall 2012	Lecture	Same (3)	0	No	74
Redesigned	Spring 2013	Problem solving	Same (3)	80	Yes	152

Key Findings

- Students in the redesigned course had higher average scores on the second exam (69.7% vs. 73.7%) and final cumulative exam (72.4% vs. 76.4%). These differences were statistically significant ($p < .05$ and $p < .01$ respectively).
- The percentage of students earning higher final exam grades (A's and B's) nearly doubled in the redesigned course (49.0% vs. 25.7%). This difference was significant ($p < .01$). See Figure 1.
- Students representing populations that have historically underperformed in this course also saw higher scores on the final exam. Small sample sizes limit the scope of statistical analysis for this finding. See Figure 2.
- Student attendance was higher in the redesigned section than in the traditionally taught section. Students attended on average 87.1% of classes in the flipped method and 80.8% of classes in the traditional method. This difference was significant ($p < .01$).

Figure 1

Final Exam Grade Distribution

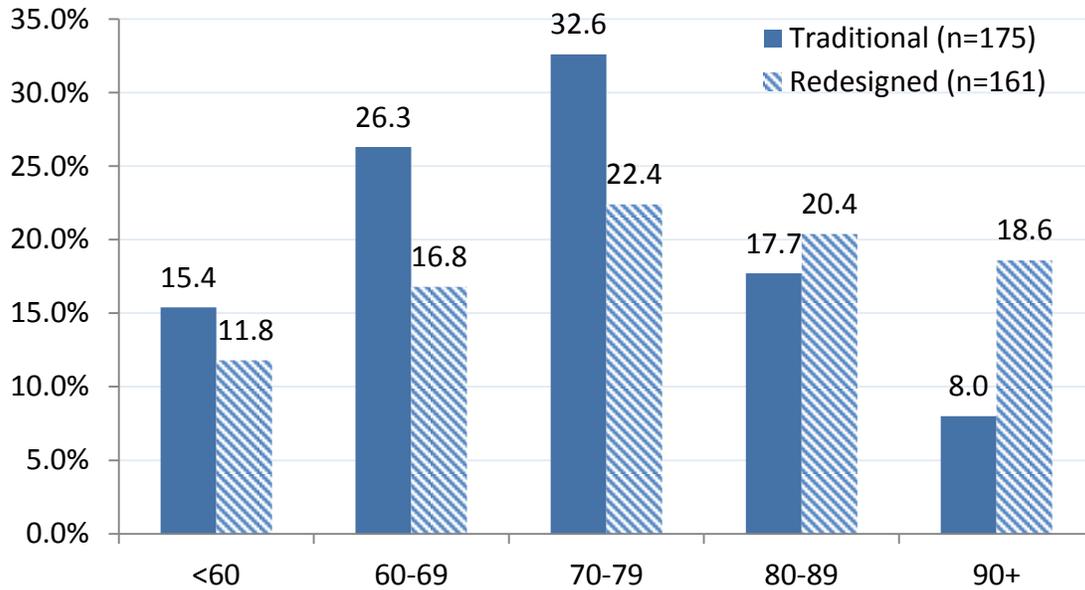
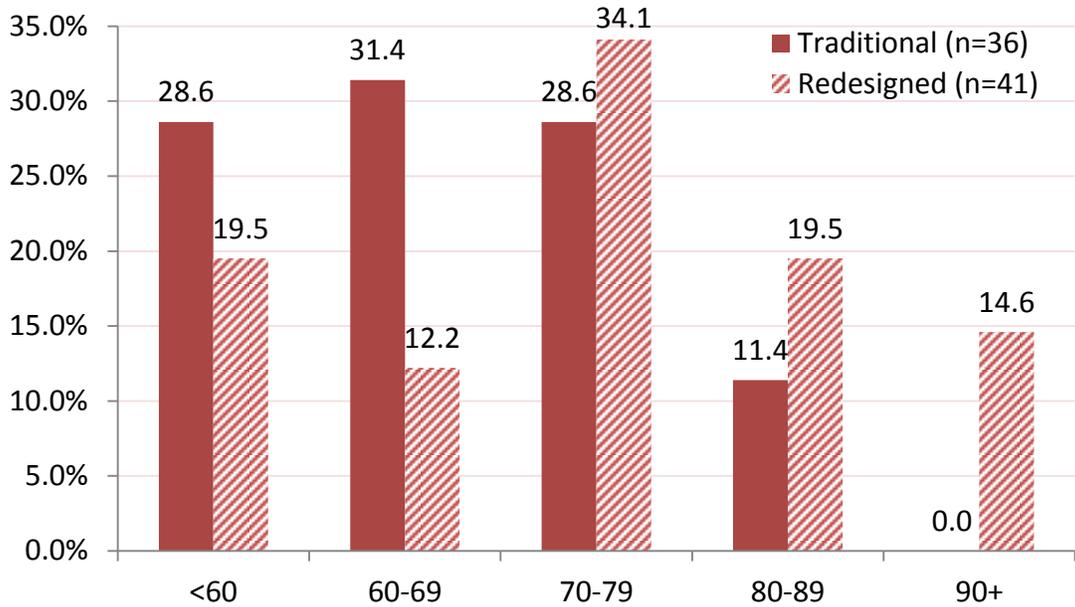


Figure 2

Final Exam Grade Distribution: African-American, Hispanic, Native American Students



Methodology

The course was taught in the traditional lecture-based method in the Fall 2012 semester and the redesigned course was introduced in the Spring 2013 semester. Aside from the teaching method, nearly all other aspects of the course were comparable (identical exams, assignments, quizzes, grading

policies, pre-test and engagement measures, TA's, email correspondence, etc.). Because the primary points of comparison for evaluation of teaching methods were the exams, all exams were kept secure.¹

Finally, it was important to evaluate potential differences in cohorts that might explain performance differences outside of teaching methodology. Students in both terms completed a pre-course survey prior to the first class meeting and a short statistics pre-test on the first day of class. The groups were similar demographically (gender, ethnic background, English as primary language). Students were comparable in their academic performance and math course experiences (high school GPA, college GPA, number of math or statistics courses taken). Students were also similar in their attitudes pertaining to statistics, with the Spring group showing slightly more hesitation to enroll in a statistics class if it were not required. In both terms, the majority of students (90% or higher) were either sophomores or juniors with the Fall group having more juniors (50.0%) than the Spring group (38.2%), indicating that the Spring group was a slightly less experienced/younger group. Most notably, the performance on the statistics pre-test was not significantly different across groups².

Student Attitudes

While previous research has shown that instructor evaluations can suffer when the course moves too far from lecture-based methods, student satisfaction with this course was consistent across the traditional and redesigned courses, with marginally higher ratings in the redesigned course. Several students reported that the video lecture format used in the redesigned course allowed them to view materials at their own pace, whereas finding a pace that suited most students in the traditional lecture format was typically a challenge. Students with learning disabilities also found this helpful.



Furthermore, students in the redesigned course were more likely to come to class prepared [$t(307) = 2.09, p < .05, d = .24$], and report working with their peers more in class [$t(307) = 6.21, p < .001, d = .71$]. Based on a battery of questions measuring sense of community, students in the redesigned course were more likely than students in the traditional section to help one another and to value interactions with their peers³. Finally, while students in the redesigned course were slightly more likely to express reluctance in taking a statistics course at the beginning of the semester⁴, by the end of the semester they were significantly more likely to agree with the statement: "It is important for me to learn the material in this course," [$t(305) = 3.63, p < .001, d = .41$].

¹ Both terms, students had supervised access to review exams during office hours and they were not allowed to copy exam materials. When exams were distributed, only one copy was distributed per student and every student had to return both the exam and scantron for grading. To discourage cheating, there were four versions of the exams (identical questions, but order varied.)

² Base-level knowledge about statistics were comparable across terms. Fall: 45.4% vs. Spring: 46.2%, $t(323) = .49, p = .63, d = .05$.

³ Students reported their level of agreement for the statement: "Students in this class help one another (e.g., sharing notes, working together to solve problems)", $t(304) = 5.75, p < .001, d = .65$.

⁴ They were more likely to report disagreement with the statement: "If you weren't required to do so, how likely is it that you would have taken a statistics class at UNC?," $t(336) = 2.15, p < .05, d = .23$.

Instructor Comments

Dr. Sathy was satisfied with the initial implementation of her flipped class. Creating the video lectures required a significant amount of work, but she feels the overall investment was worthwhile. By relying less on lecture during class time, she had more opportunity to interact with students. “I liked hearing for the first time, my students’ rationale for problems,” says Sathy. “I had been so consumed with “covering” material that I hadn’t had much opportunity to listen to them think out loud.” She established higher expectations among her students about their preparation for class, and was thus able to spend less class time on foundational concepts. “The emphasis was on higher order thinking,” said Sathy.

Next Steps

Dr. Sathy plans to explore additional interventions for students who continue to struggle with the course content. For example, she is interested in the use of structured learning groups and new instruments that may help address stereotype threat and other metacognitive barriers to learning. She also plans to collect at least one more semester of data on the redesign this fall.

For more information about the project evaluation, please contact Dr. Viji Sathy (viji.sathy@unc.edu).