Can We Do More With Less?
Examining Factors Influencing Student Ratings of Instruction

Kristin A. Kovar, Department of Agricultural Education, University of Missouri
Anna L. Henry, Department of Agricultural Education, University of Missouri
Michael J. Monson, Department of Agricultural and Applied Economics, University of Missouri

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Introduction

Undergraduate enrollments at universities and colleges across the United States are booming. More than 70 percent of the members of the high school graduating class of 2009 enrolled in college, which is the highest portion of individuals on record, dating back to 1959 (U.S. Department of Education, 2009). While enrollment trends decreased slightly in 2010, 68% of students graduating high school still entered higher education. Faculty teaching loads have increased accordingly. Specifically at the University of Missouri, the student to faculty ratio from 2007-2011 increased from 17.2:1 to 21.6:1 (MU System, 2011). Higher enrollments at universities and colleges coupled with fewer faculty poses unique challenges to maintaining quality and student satisfaction under the constraints of shrinking resources.

While not without their own problems in the literature, student ratings of instruction are an important instructional outcome. Student ratings have been collected for end of semester course evaluations and overall instructor evaluations as early as 1900 in college classes (Guthrie, 1954). Thus, student ratings are one of the earliest and most consistently documented forms of instructional outcomes for college teaching. A large body of research has been conducted in higher education regarding the validity of end of semester student ratings of instruction, and it has been widely accepted that as one form of information, student ratings can be considered valid (Cohen, 1981; Kulik, 2001). End of semester evaluations of teaching effectiveness and overall course effectiveness provide valid insights into learning, student satisfaction, and ways in which instructors can improve a course.

This study was conceptualized around the psychological literature regarding environmental stress and how stressors of course and classroom crowding can impact students' perceptions of instructional effectiveness (Gifford, 2007). Environmental stress can be caused by factors such as noise, crowding, and temperature (Evans, 1982). For this study, it was conceptualized that the number of students enrolled in a class, the physical crowding of a classroom in terms of actual number of seats available, and the enrollment capacity of a course could have an impact on student perceptions of instructional quality in a course, as translated by the ratings they give on end of semester evaluations.

In an early meta-analysis by Glass and Smith (1979) regarding class size and student achievement, the researchers concluded, "there is little doubt that, other things equal, more is learned in smaller classes" (p. 15). Large, lecture style classes have been noted to be less conducive to critical thinking and advanced problem solving (Whittington, Stup, Bish, & Allen, 1997), whereas higher-order thinking is more easily achieved in smaller class settings (Persky & Pollack, 2010). Furthermore, it has been widely concluded in the literature on student ratings of instruction that class size has a negative impact on course evaluations (Monks & Schmidt, 2010).

Yet, specific repercussions, as they translate to student ratings of instruction, of teaching more students with decreased classroom space and decreased instructor capacity is unknown. In short, when a college class is over-crowded both physically, as indicated by classroom capacity, and psychologically, as indicated by course enrollment capacity, what is the outcome on student ratings of teaching? What are specific repercussions, as noted in student end of semester ratings of instruction, of trying to include more students into a course than the room or the instructor can capacitate?

Purpose/Objectives

The purpose of this study was to examine the relationships between class size, classroom capacity and enrollment capacity for specific agricultural economics and agricultural education courses on end of semester ratings of instruction. The study addresses Priority 4 of the 2011-2015 National Research Agenda for the American Association for Agricultural Education regarding meaningful and engaged learning in all environments (Doerfert, 2011). The following research objectives guided the stated purpose of the study:

1. Describe the characteristics of selected agricultural education and agricultural economics courses in regard to class size, room capacity, and enrollment capacity
2. Explain the variance in student ratings of teacher effectiveness that can be explained by room capacity and enrollment capacity when controlling for class size.
3. Explain the variance in student ratings of course as a whole that can be explained by room capacity and enrollment capacity when controlling for class size.

Methodology

This study utilized a descriptive-correlational research design. The population for the study was all undergraduate courses in agricultural education and agricultural economics at the University of Missouri taught between 2000 and 2010, with adjustments made for duplications in the data frame, courses that were problems or seminar in nature, and courses with missing course evaluation data (n=393).

As a time and place sample this sample should not be considered representative, and some caution should be noted when interpreting the results. The data collection instrument was the course evaluation data from end of semester course evaluations as well as university and departmental enrollment records. Dependent variables for ratings of instruction were two major end-of-semester evaluation items including “course as a whole” and “teaching effectiveness.” These items were reported as mean scores on a 5-point scale. End of course evaluations have been utilized by the university reporting measures and are publicly available to students per state law mandate, Missouri Senate Bill 389. The independent variables, collected from the university enrollment system, were the enrollment capacity of the course (how many students at which the department caps the course), and the room capacity (how many students the university says the room will accommodate). Hierarchical multiple linear regression was utilized to describe the variance in student ratings of instruction contributed by enrollment capacity and room capacity when controlling for class size. An alpha level of .05 was set *a priori*.

Results/Findings

As illustrated in Table 1, there were a total of 17,541 students enrolled across 393 undergraduate courses offered from 2000-2010 in agricultural education and agricultural economics representing 55 unique instructors. According to the descriptive statistics of class size, enrollment capacity, and room capacity it was determined that the number of students in a class ranged from 6 to 441 with a mean of 61.3 students (SD= 71). Enrollment capacity ranged from 14.5% full to 168% over capacity for the number of students that should be allowed in a class. The mean was 74.5% (SD= 25.6%), or at three-fourths full enrollment capacity. Room capacity ranged from 20.8% full to 200% over capacity of how many students were in a classroom, based on what the room should physically accommodate. The mean was 79.9% (SD= 28.5%) or at just over three-fourths of the full room capacity. The average instructional rating for the course as a whole for all 393 courses was a 3.9 on a 5.0 scale (SD=.57) and the average instructional rating for instructor teaching effectiveness was a 3.8 on a 5.0 scale (SD=.58).

Table 1
Summary of Descriptive Statistics (n=393)

	M	*SD*	Range
Class size	61.3	71	6 - 441
Enrollment Capacity (%)	74.5	25.6	14.5 - 168
Room Capacity (%)	79.9	28.5	20.8 - 200
Teacher Effectiveness	3.8	0.58	2.2 - 5.0
Course as a Whole	3.9	0.57	2.1 - 5.0

Research objectives two and three attempted to explain the variance in student end of semester ratings of teacher effectiveness and course as a whole attributed to room capacity and course capacity when controlling for class size. Initially, a Pearson's product correlation was run to determine if there was an association between the dependent variables. It was determined that there was a high correlation (r = .819) between dependent variables. Even with the high correlation, it was necessary to complete two separate hierarchical multiple linear regression models to examine the two dependent variables and examine possible differences between them. The research on student ratings of instruction indicates that it is difficult to differentiate between 'instructor as a whole' and 'course as a whole' mean ratings and thus, separate models, while overlapping, would be more comprehensive in explaining the entire scope of variance in student end course evaluations (Cohen, 1982). Additionally, during assumption testing, enrollment was expressed as curvilinear on the Q-Q plot and therefore, enrollment was transformed using log10. The Q-Q plot of the transformed variable indicated linearity. All other assumptions were tested and met.

Specifically, research objective two sought to explain the variance in student ratings of teacher effectiveness attributed to room capacity and course capacity when controlling for class size. The hierarchical regression model (see Table 2) for enrollment capacity, room capacity and class size predicted approximately 7.4% of the total variance (R = .273, R^2 = .074) in the student ratings of teaching effectiveness. The model was found to be significant (F (3, 392) = 10.979; $p \leq .05$). When controlling for class size, enrollment capacity and room capacity explained approximately 7.8% of the unique variance and were significant (p=.000).

Table 2
Hierarchical Regression of Crowding Variables on Student Ratings of Teaching Effectiveness (n=393)

Variable	R^2	Adjusted R Square	β	*t*	*p*
Control Variable	.004	.001			
Class Size			-.240	-4.113	.000
Variables of Interest	.078	.071			
Enrollment Capacity			.228	4.036	.000
Room Capacity			.288	5.139	.000

Finally, research objective three sought to explain the variance in student ratings of course as a whole attributed to room capacity and course capacity when controlling for class size. The hierarchical regression model for enrollment capacity, room capacity and class size explained approximately 9.3% of the variance associated with the course as a whole rating of instruction. The model was found to be significant ($F(3, 392) = 16.056$, $p \leq .05$). When controlling for class size, enrollment capacity and room capacity were found to be significant (p=.000), and uniquely contributed approximately 11% of the total variance in the course as a whole rating of instruction (see Table 3).

Table 3
Hierarchical Regression of Crowding Variables on Student Ratings of Course as a Whole (n=393)

Variable	R^2	Adjusted R Square	β	*t*	*p*
Control Variable	.017	.015			
Class Size			-.334	-5.814	.000
Variables of Interest	.110	.103			
Enrollment Capacity			.307	5.526	.000
Room Capacity			.280	5.084	.000

Conclusions/Implications/Recommendations

Based on the findings in this study, it was concluded that enrollment capacity, room capacity, and class size contributed to the statistical variance in student ratings of teaching effectiveness (7.4%) in a course and of the course as a whole (9.3%). It was further was concluded that when controlling for class size, enrollment capacity and room capacity were statistically significant, however, neither model explained a great deal of the variance in student ratings of instruction from a practical perspective. This finding is inconsistent with Gifford's (2007) findings, suggesting that crowding adds environmental stress and thus negative outcomes in a classroom.

Furthermore, class size alone hardly contributed to the overall models. This finding is inconsistent with the large body of literature that purports consistently lower ratings of instruction in larger courses (Monks & Schmidt, 2010). The findings imply that instructors can

be effective, as perceived by students, in larger classes. Considering the breadth of research indicating negative impacts class size has on end-of-course student ratings of instruction, findings of this study suggest that, at least for these courses, some factor(s) other than class size impacted student ratings of instruction to a greater extent. While relative crowding within a class, as attributed to enrollment and room capacity, is associated with instructional ratings, this association is minimal.

Findings from this study suggest that departments in this particular setting are finding ways to "do more with less." Perhaps they are more efficient in coping with increased enrollment. Perhaps they are placing instructors in large classes who are more capable of teaching larger class sizes. It could be that instructors of the courses are more adept to adjusting their instruction to accommodate more students. This study illustrated that students can still be satisfied in courses with more students, however the study did not pinpoint the major source of that student satisfaction. It is recommended that researchers continue to explore sources of student satisfaction as well as instructor capacities. Further research in this area is warranted to better explain the remaining variance in student ratings of instruction.

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