

An Examination of the Relationship Between Online Class Size and Instructor Performance

Chris Sorensen, Ashford University, San Diego, California, USA

Abstract

With no physical walls, the online classroom has the potential to house a large number of students. A concern by some is what happens to the quality of instruction in courses with high enrollments. The purpose of this research was to examine online class size and its relationship to, and potential influence on, an instructor's performance. Results were mixed indicating that class size had a positive relationship with some the variables meant to measure online instructor performance and a negative relationship with others. Online class size was seen as having the most concerning relationship and potential influence on an instructor's ability to provide quality feedback to students and for his/her expertise to be used consistently and effectively.

Keywords: Online class size, Instructor performance, quality instruction, online learning, higher education

INTRODUCTION

Class size has been a topic of debate for some time now. If instructors were asked about their preferences in class size, it probably would not be a surprise to many to find that instructors prefer smaller classes. The rationale being that when there is a smaller student-to-instructor ratio, the instructor has the opportunity to provide more individualized instruction and interaction. This in turn, could result in a more positive and higher quality learning experience for the student. In addition, smaller classes may be seen as easier to manage. As online education has become more

popular, it appeared that a major advantage of this form of learning is that a larger number of students can be taught in a single class. With online education, there are no physical limitations to the number of students who can be put into “a classroom,” as the virtual space is limitless. This scenario has resulted in some educators scrutinizing class sizes of online courses. In general, research examining online class size has been mixed as far as what constitutes the ideal class size that is conducive to teaching and learning.

The purpose of this study was to examine online class size and its relationship to and potential influence on an instructor’s performance, which could be an indication of quality of instruction. Instructor performance was measured by the results from online course peer reviews of faculty in the areas of: fostering critical thinking, providing instructive feedback, maintaining high expectations, establishing relationships, and the use of instructor expertise. Class size was defined as the number of students in the course once the course had ended.

LITERATURE REVIEW

Taft et al (2011) present a summary of several studies examining the recommendations for online class sizes. Results of past studies appear to be mixed. Some studies suggested establishing smaller class sizes that ranged from 4 to 12 (Berry, 2008; Blood-Siegfried et al., 2008; Buckingham, 2003; Rovai, 2002; Schellens and Valcke, 2006). Qiu et al. (2012) found 13 to 15 students to be the optimal class size when examining note reading and writing loads in online graduate-level courses. Some studies suggested instituting slightly larger class sizes that ranged from 20 to 30 (Arbaugh and Benbunan-Fich, 2005; Arbaugh, 2005; Dykman and Davis, 2008; Keeton, 2004). Weick (2014) presents one university’s strategy, which is to keep their online courses similar in size to their “in-seat” courses (approximately 20 students). The university believes that a student-to-faculty ratio around 20 to 1 allows for better faculty

interaction with students. Other studies offered no recommendations (Andersen and Avery, 2008; DiBiase and Rademacher, 2005).

Previous studies have been conducted, which examined online class size in relation to various factors in the online classroom. Orellana (2006) presents a study investigating class size in regards to interaction. Upon surveying 131 instructors, it was found that, on average, a class size of 15.9 was seen by the instructors as optimal for achieving the highest level of interaction. The average class size in this study was 22.8. Ravenna (2012) proposes that larger class sizes can have a negative effect on instructor-student interaction. It is suggested that in courses with large student-to-instructor ratios, smaller groups should be created with a facilitator or group moderator. This will help to simulate a smaller student-to-instructor ratio. As part of a doctoral thesis, Reonieri (2006) examined issues surrounding effective online discussions. When the students and faculty were surveyed on their perception in taking part in online discussions in a class that was too small, 60% of students and 78% of faculty noted that there was a negative effect on the discussion (i.e. there were a limited number of perspectives or too few interactions). When the students and faculty were surveyed on their perception of taking part in online discussions in a class that was too large, 94% of students and 94% of faculty noted that there was a negative effect on the discussions (i.e. being overwhelmed by the number of responses or having difficulty following the discussions). This study defined a small online class as having 5-10 students and a large online class as having 15 or more. Harmon et al. (2014) state that it can be challenging to have meaningful discussions as online class size increases.

Another potential factor affected by class size is the amount of time required by instructors to devote to an online course. It has been suggested that online courses require more time (Bair, 2011; Berge & Muilenburg, 2001; Cho & Berge, 2002; Meyer, 2012; Mupinga &

Maughan, 2008; Sword, 2012). Bender, Wood, and Vredevoogd (2004) compared time-on-task for instructors teaching a traditional face-to-face course versus an online version of the same course. There were 111 students enrolled in the traditional course (facilitated by 38 undergraduate teaching assistants) and 18 in the online course (facilitated by five teaching assistants). Results revealed more total time was spent in the traditional course due to the higher number of students; however, when the results were analyzed on a per student basis, time-on-task was higher in the online course. Mupinga and Maughan (2008) present an exploratory study examining common practices on the treatment of workload issues at higher education institutions with a particular focus on online instructors. Among the workload issues was class size. It was found that class size varies depending on the institution. Many institutions had similar online class sizes as compared to their face-to-face counterparts while others had a cap on class size (most ranging from 20 to 50). Despite the class size, it was found that faculty would spend more hours attending to online courses than face-to-face courses.

Providing quality instruction will often take more time. For most instructors in higher education, teaching is just a component of what they do on a daily basis. It is also believed by some instructors that the quality of online instruction is questionable for large class sizes (Parker, 2003; University of Illinois, 1999 as cited in Orellana, 2006). If teaching an online course does require more time and instructors are teaching an online course with a higher number of students, instructors might be tempted to “water down” the quality of instruction so that they can complete their teaching duties (i.e. grading assignments) in a timely manner.

Research Questions

The following served as research questions for this study:

- I. What correlations exist between class size and an instructor’s overall peer review score?

- II. What correlations exist between class size and:
 - a. Fostering Critical Thinking
 - b. Instructive Feedback
 - c. High Expectations
 - d. Establishing Relationships
 - e. Instructor Expertise

- III. To what degree might online class size predict performance in:
 - a. Fostering Critical Thinking
 - b. Instructive Feedback
 - c. High Expectations
 - d. Establishing Relationships
 - e. Instructor Expertise
 - f. The average peer review score

METHODS

This study was non-experimental in nature and utilized data that was collected during the College of Education (COE) 2013 Peer Reviews of part-time online instructors at a large for-profit University. Prior to carrying out the study, it underwent a review by the Institutional Review Board of the researcher's affiliated university. The methods were deemed appropriate given the study's purpose and research questions and there were no ethical concerns identified.

The sample size consisted of 380 part-time online instructors. Data was collected via classroom walk-through observations of the online instructor's courses. The classroom walk-through observations would be equivalent to more traditional qualitative data collection methods centered on participant observation. To facilitate the classroom walk-through observations, a

peer review rubric was used. The rubric, developed by a committee consisting of the university's administrators and faculty, was specifically created for evaluating online instructor performance at the for-profit university. The rubric criteria and definitions emerged as a result of research that was conducted around the best practices in online teaching. Five criterion were developed that the committee felt addressed key areas reflecting online teaching (Fostering Critical Thinking, Instructive Feedback, High Expectations, Establishing Relationships, and Instructor Expertise) along with five levels of performances (Not Observed, Beginning, Developing, Proficient, Distinguished). Each level of performance had a description of what an instructor's performance would look like at that level for each criterion. Table 1 presents the general rubric structure.

Table 1

General Structure of the Peer Review Rubric

Criteria	Not Observed	Beginning	Developing	Proficient	Distinguished
Fostering Critical Thinking	Description of performance				
Instructive Feedback	Description of performance				
High Expectations	Description of performance				
Establishing Relationships	Description of performance				
Instructor Expertise	Description of performance				

To provide an idea as to what the performance descriptions look like, Table 2 presents the descriptions for each of the criteria at the Distinguished level on the peer review rubric

(Wardlow et al., 2011):

Table 2

Distinguished Descriptions for the Peer Review Criteria

Criteria	Distinguished Descriptions
Foster Critical Thinking	Challenging students to elaborate on their thoughts, question their assumptions, examine biases, communicate in a clear and concise manner, and defend their positions throughout the course.
Instructive Feedback	Providing feedback that challenges and inspires students, while providing specific suggestions to improve the quality of their work and thinking.
High Expectations	Demonstrating high expectations throughout the course, while holding students accountable for insightful exchanges and high quality performance on assignments, and promoting active engagement in their own learning.
Establishing Relationships	Creatively uses available tools (Announcements, Instructor Guidance, Faculty Expectations, Ask Your Instructor, Emails, Discussion Forum) and strategies to enhance relationships, creating a community of learners willing to take risks and actively engage with one another.
Instructor Expertise	Effectively and consistently utilizes expertise in subject matter by providing personal experiences, connecting course knowledge to real-world examples. Enhances course content and resources to encourage student comprehension and application of course learning outcomes.

Of the 380 courses that were reviewed, 217 were undergraduate courses and 163 were graduate courses. All courses were taught within the COE. The following presents an overview of the peer review process and how numerical peer review scores were determined based on the classroom walk-through observations:

Step 1: Each part-time instructor being reviewed was assigned to two full-time faculty members. Twenty-four full-time faculty members were involved in the 2013 COE Peer Reviews. Peer reviews occurred on a monthly basis throughout 2013 and each full-time faculty member would typically conduct four to six peer reviews a month. Occasionally a faculty member might have been asked to conduct as many as eight or as few as one. Peer reviewers participated in at least one training workshop and all full-time faculty were experienced online instructors. In

addition, resources such as check lists, exemplars, and rubrics were made available to the faculty.

Step 2: Each full-time faculty member individually reviewed the part-time instructor's course using the COE Peer Review Rubric. On average, the review of a single course took about an hour. For each criterion, a level of performance was noted. Levels of performance were then translated into a numerical score (0= Not Observed, 1= Beginning, 2= Developing, 3= Proficient, 4= Distinguished) for each criterion. The five numerical scores were then averaged together to create a single overall peer review score.

Step 3: After reviewing the course, the two full-time faculty members scheduled and conducted a phone call, usually 30 to 40 minutes, to discuss the part-time instructor's performance and determine a single agreed upon score for each of the five criteria on the peer review rubric. No averages were calculated for the individual criteria. For example, if one full-time faculty member scored foster critical thinking at a 2 and the other full-time faculty member scored foster critical thinking at a 3, they would have to come to a consensus on either 2 or 3 (not 2.5). Once a single a score was agreed upon and assigned to each of the five criteria, the five scores were averaged together to create a single overall peer review score. In the end, each part-time instructor had six scores, one for each of the rubric criteria and one overall average score.

Results

The program PASW Statistics 18 was used in the data analysis. The following statistical analyses were used to answer the research questions: Descriptive Statistics, Pearson Correlation

Coefficients, and Linear Regression. For the purpose of data analysis, the following abbreviations were used for each of the variables: CS (class size), CT (fostering critical thinking), IF (instructive feedback), HE (high expectations), ER (establishing relationships), IE (instructor expertise), and Avg (overall average peer review score). In assessing the reliability of the five rubric peer review scores (CT, IF, HE, ER, IE) a Cronbach's Alpha of .87 was calculated. This would suggest high reliability in the scores that were determined by the full-time faculty.

Tables 3 and 4 present the descriptive statistics and correlations for the variables being examined.

Table 3

Descriptive Statistics for Class Size, Fostering Critical Thinking, Instructive Feedback, High Expectations, Establishing Relationships, Instructor Expertise, and Average Peer Review Score

Variables	n	Min	Max	M (SD)
CS	380	1	29	15.88 (7.02)
CT	380	1	4	2.52 (.75)
IF	380	0	4	2.48 (.80)
HE	380	1	4	2.68 (.76)
ER	380	0	4	2.75 (.77)
IE	380	1	4	2.74 (.77)
Avg	380	.8	4	2.63 (.63)

Table 4

Correlations between Class Size, Fostering Critical Thinking, Instructive Feedback, High Expectations, Establishing Relationships, Instructor Expertise, and Average Peer Review Score

Variables	1	2	3	4	5	6	7
1. CS	--						
2. CT	.008	--					
3. IF	-.055	.599**	--				
4. HE	.008	.622**	.697**	--			
5. ER	.024	.563**	.523**	.624**	--		
6. IE	-.081	.527**	.510**	.573**	.583**	--	
7. Avg	-.024	.809**	.820**	.862**	.806**	.782**	--

^aNote. N = 380

^b** Correlation is significant at the 0.01 level

A series of linear regression models were conducted to estimate the predictive affects of CS on CT, IF, HE, ER, IE, and Avg. Based on the results of the linear regressions, equations were constructed that could be used to predict values for each of the variables based on CS.

Tables 5, 6, and 7 summarize these results.

Table 5

A Summary of the Variance (R^2) that is Accounted for by CS in each of the Dependent Variables

Dependent Variables	R	R^2	Adjusted R^2	Std. Error of the Estimate
CT	.008	.000	-.003	.747
IF	.055	.003	.000	.803
HE	.008	.000	-.003	.764
ER	.024	.001	-.002	.768
IE	.081	.007	.004	.769
Avg	.024	.001	-.002	.629

^aNote. N = 380

Table 6

A Summary of the Linear Regression Models with Class Size Predicting Fostering Critical Thinking, Instructive Feedback, High Expectations, Establishing Relationships, Instructor Expertise, and Average Peer Review Score

Dependent Variable		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
CT	(constant)	2.05	.095		26.393	.000
	CS	.001	.005	.008	.155	.877
IF	(constant)	2.577	.102		25.237	.000
	CS	-.006	.006	-.055	-1.075	.283
HE	(constant)	2.665	.097		27.443	.000
	CS	.001	.006	.008	.152	.879
ER	(constant)	2.708	.098		27.741	.000
	CS	.003	.006	.024	.467	.641
IE	(constant)	2.883	.097		29.519	.000
	CS	-.009	.006	-.081	-1.575	.116
Avg	(constant)	2.668	.080		33.377	.000
	CS	-.002	.005	-.024	-.472	.637

Table 7

Equations Constructed Using Class Size to Predict Fostering Critical Thinking, Instructive Feedback, High Expectations, Establishing Relationships, Instructor Expertise, and Average Peer Review Score

Dependent Variable	Equation
CT	$Y = 2.505 + (.001)X$, where Y is the predicted CT score and X is the CS
IF	$Y = 2.577 + (-.006)X$, where Y is the predicted IF score and X is the CS
HE	$Y = 2.665 + (.001)X$, where Y is the predicted HE score and X is the CS
ER	$Y = 2.708 + (.003)X$, where Y is the predicted HR score and X is the CS
IE	$Y = 2.883 + (-.009)X$, where Y is the predicted IE score and X is the CS
AVG	$Y = 2.668 + (-.002)X$, where Y is the predicted Avg score and X is the CS

Discussion

Based on Table 3, it is seen that the average class size was 15.88 students with the smallest class consisting of one student and the largest class consisting of 29 students. When examining the five variables meant to measure instructor performance, the lowest average was associated with instructor feedback (approximately 2.48) and the highest average was seen with establishing relationships (approximately 2.75). The overall average peer review score for the 380 part-time online faculty members that were reviewed was 2.63, with the lowest individual average being a 0.8 and the highest individual average being 4.0. All of the averages scores presented in Table 3 would indicate that the average instructor performance in each area was between developing and proficient on the rubric used to evaluate them.

When addressing research question one, “What correlations exist between class size and instructor’s overall peer review score?,” analysis revealed the correlation to be $-.024$ (see Table 4). This value was found to be statically non-significant. What is important to note is that the correlation is negative. This suggests that, as class size increases, the instructor’s overall peer review score representing the instructor’s overall performance and an indication of the quality of

instruction, decreases. The negative relationship seen here is in par with previous research which revealed negative results such as increased class sizes having a negative effect on discussion interactions (Reonieri, 2006) or the increased time needed to devote to an online course (Berge & Muilenburg, 2001; Cho & Berge, 2002; Mupinga & Maughan, 2008) which could be further magnified by a larger class size.

Research question two asks, “What correlations exist between class size and: Fostering Critical Thinking, Instructive Feedback, High Expectations, Establishing Relationships, and Instructor Expertise?” When viewing Table 4, class size was seen to have the following correlations with the five variables being examined: .008 (CT), -.055 (IF), .008 (HE), .024 (ER), and -.081 (IE). Like the correlation between class size and the average peer review scores, these five correlations were also found to be statistically non-significant. What may be of interest are the negative correlations that were observed between particular variables and class size, namely instructor feedback and instructor expertise. Again, although not statistically significant, the negative correlations suggest that as class size increases, the instructor’s performance in the areas of instructor feedback and instructor expertise decreases. These results provide support for previous research that questioned the quality of online instruction in classes with larger class sizes (Parker, 2003; University of Illinois, 1999 as cited in Orellana, 2006; Taft et al., 2011)

Although not directly related to a research question, it is worth mentioning that all correlations between the five rubric-based variables (CT, IF, HE, ER, IE) were positive (as one increases the other increases) and all correlations were found to be statistically significant at the .01 level. This suggests that there is a strong relationship between the five variables, with the strongest correlation existing between instructor feedback and high expectation (.697). One

might conclude that online instructors who hold higher expectations for their students also provide higher quality feedback.

At the University where this study was conducted, there are caps placed on class sizes for both undergraduate and graduate courses with the upper limit being 30 students. As a result, this raises the question, “What would the correlations look like with either an increased upper limit or no limit?” Would the same results be seen in courses that had 40, 50, or 60 students? With no physical limitations, it could be very tempting to enroll as many students as possible into one online course.

Research question 3, “To what degree might online class size predict: Fostering Critical Thinking, Instructive Feedback, High Expectations, Establishing Relationships, and Instructor Expertise, and the overall Average Peer review score?,” addresses the predictability of CT, IF, HE, ER, IE, and Avg based on CS. When the R^2 values in Table 5 are examined, it is seen that very little variability in any of the peer review scores is accounted for by class size. Class size accounted for approximately 0.3% of the variability in IF, 0.1% of the variability in ER, 0.7% of the variability in IE, and 0.1% of the variability in Avg. As far as CT and HE, class size accounted for 0% of the variability. Based on this, it can be suggested there may be other variables that have a greater influence on the variability of the CT, IF, HE, ER, IE, and Avg peer review scores. If these results are interpreted as is within the context of this study, it can be said that variability due to class size was seen the most in IE, followed by IF, then ER and Avg, and finally no variability in CT and HE.

Table 6 presents the results of the linear regression models and the predicted change in the dependent variables by CS. For every one unit change in CS (i.e. one student), the following changes are predicted in each of the scores for the dependent variables: .001 (CT), -.006

(IF), .001 (HE), .003 (ER), -.009 (IE), and -.002 (Avg). Six equations (See Table 7) were constructed from the linear regression results. Table 8 presents hypothetical predictions using the six equations based on a class containing 10 students versus 50 students to help illustrate the application of the equations. For example, if an instructor had an online course with 10 students, the instructor's CT score would be predicted to be 2.52. If the same instructor taught the same online course but had 50 students, his/her CT score would be predicted to be 2.55. Based on the rubric that was used in this study during the peer review process, both of these scores would indicate that the instructor was performing between Developing (2) and Proficient (3) in the area of CT.

Table 8

Examples of Applying the Linear Regression Equations

Outcome Variables	Hypothetical Class Size and Predicted Scores		The Difference in Scores
	10 Students	50 Students	
CT	2.52	2.55	0.03
IF	2.52	2.28	-0.24
HE	2.68	2.72	0.04
ER	2.74	2.86	0.12
IE	2.79	2.43	-0.36
Avg	2.65	2.57	-0.08

As presented in Table 8, the only areas where there is a decrease in scores and an increase in CS are with IF, IE, and Avg. These predictions coincide with the correlations between these variables and class size, which were all found to be negative. Furthermore, when we look at the magnitude of the changes and the individual equations (see Tables 6 and 7), IF and IE had the two largest changes for each one unit change in CS (-.006 and -.009 respectively). This is also illustrated in Table 8 where the largest difference in scores between a class with 10 students and

a class with 50 is seen in IF and IE. These results may indicate that CS has a greater influence on IF and IE as compared to the other three rubric variables meant to measure performance.

Limitations

There are a few potential limitations to this study. First, data was collected from part-time faculty. These instructors could be employed elsewhere and thus may not have placed teaching their online course at this particular university as a high priority. This in turn could be reflected in the instructor's peer review scores. Second, data was collected from a large for-profit University and only included courses within the COE. As a result, it might be difficult to generalize the results to any institution that offers online courses. Third, the value for class size reflected the number of students present at the end of the course. There may have been students who were actively participating early on but, for some reason, dropped the course. In addition, there may have been students who missed the drop date and stayed in the course but did not participate (i.e. stopped completing assignments but remained on the roster). Both of these situations could have created inconsistent instructor performance. Fourth, there was a class size limit placed on the courses that were reviewed as part of the peer review. This may affect the ability to apply the predications to online courses that exceed 30 students.

CONCLUSION

This study, like previous ones, revealed mixed results with online class sizes having a positive relationship with some variables and a negative relationship with others. As with any correlation, we cannot conclude a causal relationship between class size and any of the five variables that were examined from the overall peer review scores in this study. Based on the non-significant correlations, we can conclude that there is not enough evidence in this particular sample to show a statistical significant correlation between class size, the five rubric-based

variables, or the overall peer review score meant to represent instructor performance and quality of teaching.

What may provide practical significance and be of interest to individuals working to improve the quality of online learning are the results that indicate negative relationships. It was found that changes in CS predicted the greatest change in IE and IF (both being negative) when compared to CT, HE, and ER, which were all seen as positive. Furthermore, CS accounted for more variability in the individual IE and IF scores when compared to CT, HE, and ER scores. This study revealed that as the class size of an online class increases, an instructor's expertise may not be used as effectively or consistently, the quality of feedback that the instructor provides to students may decrease, and the instructor's overall performance is seen as decreasing. This could raise concern for some, as feedback and expertise are two critical areas that support student learning. It is through feedback and the sharing of expertise that an online instructor can clear up misunderstandings in course content, guide students in acquiring new knowledge, and address those "teachable moments" that are often referred to in classroom teaching.

Recommendations and Future Studies

There are several recommendations for future studies examining online class size and instructor performance based on the results of this study. First, conduct similar studies with online class size that have caps that exceed 30 students. The courses that were part of the peer review in this study had a class size limit of 30 students and as a result, the equations constructed to predict instructor performance may have been influenced by this limitation. Although table 8 presented an example of the predicted peer review scores in a course with 50 students, research should be conducted with class sizes over 30 students to confirm or dispute the results of this study. Second, conduct similar studies that include full-time faculty, universities that are not-for

profit, and/or courses that are taught in other colleges outside of the COE. This study included part-time instructors at a for-profit university teaching online courses within the COE. Based on this, the generalizability of the results could be limited. Third explore the relationships that were seen as positive. For example, as CS increases, what may account for the increase in an instructor's peer review scores in the areas of CT, HE, and ER? One might have expected to see a similar negative relationship that was seen with IF, IE, and Avg.

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