Students' perceptions of instructor interaction, feedback, and course effectiveness in a large class environment

Raymond J Elson
Valdosta State University

Sanjay Gupta
Valdosta State University

Jonathan Krispin
Valdosta State University

ABSTRACT

Given the pressures on colleges and universities to use large classes as a means to leverage resources while maintaining or even improving student and graduation rates, the present study seeks to identify several key factors that influence student perceptions of course effectiveness in large classes. Students from large sections of a Principles of Managerial Accounting class were surveyed at the end of the semester and across three successive semesters. Survey results were factor analyzed, leading to the development of scales relating to student perceptions of the timeliness of feedback provided on course assignments, instructor-student interactions, and course effectiveness. Timeliness of feedback on course assignments was significantly correlated with perceptions of course effectiveness, as was the perceptions of instructor-student interactions within the classroom. Interestingly, instructor-student interactions outside of the classroom were not significantly correlated with perceptions of course effectiveness, suggesting that efforts to create meaningful interactions between students and instructors should be focused within the classroom.

Keywords: feedback, instructor-student interaction, course effectiveness, large class

INTRODUCTION

Limited resources and the pressure to increase retention and graduation rates are forcing colleges and universities to move to larger class sizes especially in the introductory or foundation courses. Chapman & Ludlow (2010) note that while such action presents a relatively seductive and easy way to save money, it may introduce a burden to learning that is difficult for students and instructors to overcome despite their best efforts.

College administrators and course instructors are rightly concerned about the impact of these larger class sizes (generally greater than 100 students) on student learning and/or instructor performance. Large class sizes have inherent limitations such as the feelings of isolation amongst students, a lack of communication between lecturers and students; and the inability to offer frequent testing and feedback (Allais, 2014). However, as noted in the next section, the research on larger class sizes notes no effect and sometimes even positive impact on learning when compared to more traditional class sizes.

Large Class Sizes

Diette & Raghav (2015) found that grades of students decrease as class size increases and that vulnerable students, such as first-years or those with low SAT scores, experience on average larger negative effects from increases in class sizes. The researchers suggest that attempts to control costs by moving to large class sizes, may harm students, particularly those least likely to graduate. Arias & Walker (2004) found statistically significant evidence that small class size had a positive impact on student performance. A recent study by Gupta and Elson (2013) found that only 24% of students enrolled in large classes indicate a willingness to enroll in another large class. Students also reported less interaction with the professor in the large class versus small class setting, and they were neutral about the learning effectiveness in a large class.

Hill (1998) found no statistically significant differences between student performance in small sections and student performance in large sections of introductory accounting. However, the researcher reported that lower attendance may be a negative result of large sections. Gleason (2012), comparing medium-size and large-size classes, found that there was a negative effect of increased class size on student engagement but it had limited effect on student achievement. Lazari & Reid (2013) also found no statistical differences in the retention rate of students in large classes versus traditional classes. They also noted that a large class can be as successful, if not more so, than a traditional class if care is taken in how the course is managed and the material presented. Furthermore, to be successful, the instructor has to be willing to personalize the course so that the student does not feel like a number, and care must be taken to keep all students involved and to make sure that assignments are completed.

Guber, Malliaris, & Jalilvand (2009) found that the transition to larger class sizes was a successful experiment for their school of business. In addition, through better and greater use of technology and training of faculty, moving to larger class sizes was not detrimental for faculty or students. Karakaya, Ainscough & Chopoorian (2001) concluded from their study of two classes at a medium-sized university that class size had no effect on student final scores as measured by overall course grades. In an earlier study of accounting students by Mary (1998), the author also found that class size had no effect on students' interests in the subject matter or in the overall perception of the professor's effectiveness. Students did note that the large class size was not ideal for the subject matter and they attended fewer class sessions.

The movement to large class sizes requires a different pedagogical approach. One of the earlier approaches was the use of audience response systems or clickers (Caldwell, 2007). However, Danker (2015) suggests the use of more active learning such as flipped classrooms. Jungić, et al (2015) notes that the flipped classroom model encourages students to take a more active role in the learning process before and during the class time, and that it increased interactions among students and between students and the instructor. An alternative pedagogy is the use of a blended approach involving online resources. Allais (2014) notes that providing a variety of online learning activities in conjunction with traditional face-to-face lectures and small-group tutorials was much appreciated and used by students. However, to be effective, online components need to be deeply integrated into the course.

Feedback

Feedback is multi-dimensional involving various parties including the teacher to student, the student to student, and the student to teacher (Elson & Gupta, 2010). Often the critical feedback is considered to be from student to teacher, since this is an effective tool for the teacher's formative evaluation (Husain & Khan, 2016). However, providing timely and useful feedback to students is critical as the migration to larger classes continues. To be effective, the feedback should be communicated in a manner that is constructive and emotionally sensitive (Eraut, 2006); helpful, clear and understandable (Reese-Durham, 2005); prompt, meaningful and give students an opportunity to rethink and rework the errors of their efforts (Helterbran, 2005).

Feedback can be achieved in a variety of ways in the large class room but it must be timely. Cunningham (2011) noted that the sooner graded exams are handed back to students, the more students will be able to learn from their mistakes. The increased usage of homework management systems also provides opportunities for timely feedback. Gerard (2015) reports that students responded positively to the use of a homework management system since it provided instant feedback, linked access to resources, and had around-the-clock availability. To ensure effective feedback, Gupta and Elson (2013) recommend that universities using larger classes explore pedagogy that will encourage more classroom interactions between students and professors.

Instructor Interactions

Elson & Gupta (2010) noted that the teacher-to-student feedback and student-to-teacher feedback (or interactions) are effective tools that can be used to improve student learning. This is also supported by the literature. For instance, Mitchell & Hughes (2014) examined the relationship between community college students' demographics and instructor interactions as they relate to intention to persist in college. The researchers found that instructor-student interaction and student-instructor interaction were two of the factors that distinguished between those students who were most likely to persist in their studies and those who were not.

Waples (2016) suggested that instructor interactions should include assessing learners' emotional state and that instructors use various methods to explain course content. These methods included incorporating class exercises that involve interpersonal communication (e.g., group work) and introspection (e.g., self-assessment surveys or journaling) that taps into the emotional components of learning.

Instructor interaction is moving beyond the physical classroom into the online learning environment and is proving to be effective. For instance, Kang & Im (2013), in a study of learners in an online university, showed that factors related to instructional interaction predicted perceived learning achievement and satisfaction. McAuthur & Bostedo-Conway (2012) showed significant positive correlations between students' use of an online tool (Twitter) and positive perceptions of instructors' behaviors. Gasaymeh & Qablan (2013) also showed positive students' perceptions towards the use of short message service (SMS) as an out of class student-teacher interaction tool.

While research findings seem to clearly demonstrate that feedback and instructor-student interactions are factors related to perceptions of course effectiveness, research has not been done to see if this relationship holds for the larger class sizes that are often experienced by students in higher-education. Consequently, the purpose of the present study was to extend the body of knowledge by examining these factors within the context of larger class sizes (greater than 100 students) when compared with smaller class sizes. The authors of this current study re-analyzed data collected in a previous study (Gupta & Elson, 2013) toward that end.

DATA COLLECTION

Students from three large sections (sizes ranging from 130-145 students) of Principles of Managerial Accounting at a comprehensive regional university participated in the present study. Data was collected in three across three semesters in Spring 2010, Fall 2010, and Spring 2011. Students were given a period of three days during the last two weeks of each semester within which they could complete the survey, which was administered online. Each student who completed the survey in its entirety received a nominal extra credit incentive.

The survey as utilized in the present study contained 18 questions. Seven of these questions addressed variables related to student demographic information (age, gender, student status (part-time versus full-time), etc.), as well as questions inquiring about student in-class experiences, focused particularly on student perceptions of interactions with the instructor, feedback, and learning effectiveness (eleven questions). Prior to administering the survey on a large scale, the survey was piloted to ensure that the format of the survey was easily understood and could be completed in a manageable length of time. The average length of time needed to complete the survey was seven minutes.

266 of the 420 students enrolled in the three sections provided usable responses (63.33%). Of these responses 44.46% were male and 55.64% were female. 93.61% of the respondents were traditional students (defined as being ≤ 25 years of age), while 6.39% of the respondents were non-traditional students (over 25 years of age). 97.34% of the students were full-time students, while 2.63% were part-time students. 84.96% had not previously taken a large class (defined as $\geq$100 students). The respondents had a median GPA of 3.0 and an average GPA of 3.03. A majority of the respondents worked part-time (54.13%), while 13.16% of the respondents worked full-time, and 32.71% did not work at all. The majority of the respondents were US Citizens (92.48%), while 7.14% were international students; one respondent did not provide a nationality.

Given that the course in which the surveys were administered was a core course required for all majors within the business school, it is not surprising that the respondents represented a variety of majors. Among respondents, management majors were the most prevalent (25.19%), followed by accounting (23.68%), marketing (19.55%), finance (8.65%), and economics

(3.76%). The remaining respondents had not declared a major at the time the survey was given (19.17%)

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PROCEDURE

Items in the survey were placed into subscales using a principal components factor analysis with a varimax rotation as guide for developing the factors (Loehlin, 1992; Nunnally, 1978), keeping factors with eigenvalues greater than one, following the Kaiser-Guttman rule (Kaiser, 1991). This resulted in a factor structure consisting of four factors accounting for 68.42% of the variance in the data. Survey questions were then assigned to the factors based on their highest factor loadings calculated in the component matrix of the factor solution (see Appendix 1 for factors and associated items). The factors were named based on the conceptual similarity of survey items on which the factors loaded strongly and uniquely. The factor names and the reliability coefficients of the four scales developed from these factors are as follows: Course Effectiveness (α = .849, four items), Instructor Interaction, Large versus Small Class (α = .762, two items), Instructor Interaction Overall (α = .581, three items), and Assignment Feedback (α = .490, two items).

Given that Nunally (1978) suggests that the minimum acceptable value of Cronbach's coefficient alpha for demonstrating adequate internal reliability for a predictive tests and hypothesized measures of a construct in the early stages of development is .70, the Course Effectiveness and Instructor Interaction, Large versus Small Class scales demonstrate adequate internal reliability to be considered as scales. However, the Instructor Interaction Overall (items assessing the level of professor interaction both in class and out-of-class), and Assignment Feedback (two items asking students to rate the timing with which they received feedback on assignments, tests, and quizzes overall and in comparison with the timing of feedback received in classes with fewer than 100 students) scales fall short of this criteria and will therefore be not be treated as scales in further discussion, but will rather be considered as individual items.

Hypothesis 1: Ratings on the Instructor Interactions, Large versus Small Class Scale will be positively correlated with ratings on the Course Effectiveness Scale.

Hypothesis 2: Ratings on items relating to Instructor Interactions Overall (three items rating in-class interactions with the professor and out-of-class interactions with the professor and the graduate assistant) will be positively correlated with ratings on the Course Effectiveness scale.

H2a: Ratings of in-class interactions with the professor will be positively correlated with ratings on the Course Effectiveness Scale.

H2b: Ratings of out-of-class interactions with the professor will be positively correlated with ratings on the Course Effectiveness Scale.

H2c: Ratings of out-of-class interactions with the graduate assistant will be positively correlated with ratings on the Course Effectiveness Scale.

Hypothesis 3: Ratings on items relating to Assignment Feedback (two items rating the timeliness of feedback received on assignments, tests, and quizzes both overall, and in comparison to the timeliness of feedback on assignments compared to smaller classes (less than 100 students)), will be positively correlated with ratings on the Course Effectiveness scale.

H3a: Ratings of feedback on assignments/tests/quizzes, etc. will be positively correlated with ratings on the Course Effectiveness Scale.

H3b: Ratings of feedback on assignments/tests/quizzes, etc., when compared to feedback that students have received on assignments in small classes (<100 students), will be positively correlated with ratings on the Course Effectiveness Scale.

STATISTICS

Comparisons on demographic categories were conducted using Chi-Square comparisons for individual items, independent-sample t-tests to compare dichotomous demographic variables (like Student Status, which compares the ratings of full-time students to part-time students) and One-way ANOVA to compare demographic variables with more than two categories (like Major) on the two scales (Instructor Interaction, Large versus Small Class, and Course Effectiveness. In all cases, the p-values reported are two-tailed due to the fact that no directional hypotheses were made.

Hypothesis One was tested by calculating Pearson's *r* coefficients between two variables for the Instructor Interactions, Large versus Small Class scale and the Course Effectiveness scale. Hypotheses Two and Three were tested by calculating Spearman's rank-order correlation coefficient between the items associated with Instructor Interactions Overall and the Course Effectiveness scale, and between the items associated with Assignment Feedback and the Course Effectiveness scale.

RESULTS

Demographics

The descriptive statistics (mean and standard deviation) for each individual item and each scale mentioned in the hypotheses above, analyzed overall and by the various demographic categories, are displayed in Table 1 through Table 8 (Appendix 2). The results from inferential statistical analyses of these demographic variables are presented in Table 8 (Appendix 2). Overall, while there were isolated comparisons that reached significance across the demographic variables, there were no clear patterns that emerged. Gender differences were evident in three of the survey items. Males were more likely than females to rate the level of interaction with the professor as more frequent overall ($X^2(4)=9.66$, p(two-tailed)=.047). Males were also more likely to report the timing of feedback on assignments, tests, and quizzes as faster than females both overall ($X^2(4)=22.47$, p(two-tailed)=.000) and when compared to a class-size of less than 100 students ($X^2(4)=14.21$, p(two-tailed)=.007).

Traditional students (≤25 years old) were more likely to report the timing of feedback on assignments, tests, and quizzes overall as faster than non-traditional students (greater than 25 years old, $X^2(4)=10.37$, p(two-tailed)=.035). There were also differences on the perceived timeliness of feedback overall among the majors ($X^2(20)=35.94$, p(two-tailed)=.016. Among the various majors, 90% of the Economics majors and 85.5% of the Accounting majors participating in the study rated the timeliness of feedback on assignments as either quick or very quick. In contrast, only 60.7% of the Finance majors rated the timeliness of feedback on assignments as either quick or very quick.

On the two subscales, the only comparison that demonstrated a significant difference was the independent-sample t-test that was conducted to compare U.S. versus International students on the Instructor Interaction Large versus Small Class ($t(264)=2.574$, p(two-tailed)=.011).

International students rated the level of interaction with the instructor to be more frequent than did U.S. students on this scale.

Hypotheses

Hypothesis 1: Support was found for hypothesis 1 that ratings on the Instructor Interactions, Large versus Small Class scale will be positively correlated ratings on the Course Effectiveness scale (r=.263, p<.001, n=266), exhibiting a moderate effect size.

Hypothesis 2: Partial support was found for hypothesis 2 that ratings on items relating to Instructor Interactions Overall (three items rating in-class interactions with the professor, and out-of-class interactions with the professor and the graduate assistant) will be positively correlated with on the Course Effectiveness scale. The correlation between in-class professor interaction ratings and the Course Effectiveness scale (Hypothesis H2a) was significant (r_s=.277, p<.001, n=266), a moderate effect size. However, the correlations between the Course Effectiveness scale and out-of-class interaction ratings with either the professor (Hypothesis H2b, r_s=.090, p=.142, n=266) or the graduate assistant for the course (Hypothesis H2c, r_s=.019, p=.752, n=266) failed to reach significance.

Hypothesis 3: Support was found for hypothesis 3 that ratings on items relating to Feedback on Assignments (two items rating the timeliness of feedback received on assignments, tests, and quizzes both overall, and in comparison to the timeliness of feedback on assignments compared to smaller classes (less than 100 students), will be positively correlated with ratings on the Course Effectiveness scale. The correlations between the Course Effectiveness scale and ratings on the timeliness of feedback on assignments overall (Hypothesis H3a, r_s=.295, p<.001, n=266) and feedback on assignments compared to smaller courses (Hypothesis H3b, <100 students, r_s=.226, p<.001, n=266) were both significant and of a moderate effect size.

LIMITATIONS AND IMPLICATIONS FOR FUTURE RESEARCH

The results of this study are based on a student demographic of a regional school and are also limited to students enrolled in a Principles of Managerial Accounting course in the College of Business. To the extent that student demographics and student majors may have an effect on student perceptions and expectations of learning this may limit the ability of the results to be generalized across institutions and across majors. Second, while the overall sample of 266 student responses may be sufficient for data reliability and validity, the fact that a majority of the students were traditional (94%) and had not previously taken a large class (85%) may have had a bearing on the results and may not be representative of other schools. As large classes get increasingly popular due to budget constraints, and as the non-traditional student population continues to increase, it would be interesting to see if the results of this study still hold true. Third, while prior research does support the finding that larger class sizes does not negatively impact student learning, and, in fact, sometimes even has a positive impact on student learning, there are some findings that indicate that students tend to interact less with the professor in large classes and also tend to have a lower attendance in large classes. To the extent that these impact student retention, a matrix that educational institutions are increasingly focused on, future studies may want to look at these variables more closely.

A final limitation that must be mentioned is that the data in the current study was collected nearly eight years ago. In the time that has passed since the data was collected, the

utilization of larger class sizes in higher education has continued, as have the pressures to utilize resources efficiently and control costs. While the technologies that may be used to facilitate feedback and instructor-student interactions both inside and outside of the classroom may have changed significantly in that same timeframe, the factors themselves are likely still relevant. However, further research is also needed to confirm whether or not this is the case.

The results of the current study provide evidence suggesting that interactions with the primary instructor and feedback on assignments to students are key factors related to perceptions of course effectiveness in the eyes of students. Student expectations on these factors don't appear to vary based on class size, so it becomes critical for instructors of large classes to find ways to meet expectations that may become more difficult for them to achieve in classes with a larger number of students.

The present study focused on the role that timely feedback on course assignments plays in perceptions of course effectiveness. The evidence presented suggests that those respondents that rate the feedback that they received as being faster had higher ratings of course effectiveness, and also suggests that those that felt that the timeliness of the feedback they received was as good or better than what they would have expected to receive in a small class also had higher perceptions of course effectiveness. As was noted above, feedback is a multi-dimensional construct (Elson & Gupta, 2010), and timeliness is just one aspect of the feedback that is provided. While technological tools like the learning management systems that are becoming increasingly common can facilitate timely feedback on assignments in large classes, further research is needed to clarify the relationships between other dimensions of feedback and perceptions of course effectiveness in the context of larger classes.

DISCUSSION

While the reports of many research projects often exclude insignificant results, the practical implications of these findings made it meaningful to report these results in the present study. When looking for ways to structure courses so as to make them more effective, it is often helpful to know not only what should be done, but also to know what factors may be eliminated as an area of potential concern. The lack of clear patterns of significance in the demographic analyses undertaken in this study indicate that instructors need not be concerned with such demographic distinctions as they design their course approach in a large-class setting. If the demographic analyses had revealed patterns of significant findings in these demographic areas, structuring an effective course in a large-class setting that accommodated these differences would make an already-challenging task even more difficult.

Interestingly, the respondents in the present study that had higher ratings of their interactions with the instructor inside of the classroom had better perceptions of course effectiveness, but this relationship did not carry over to interactions with instructors outside of the classroom. This differentiation helps to emphasize the importance of creating opportunities for interactions between instructors and students in an environment that might not be as conducive to those interactions. Fortunately, there has been a proliferation of tools that enable just such interactions. Technologies that facilitate the engagement of students in the classroom began with clickers (Caldwell, 2007), but have advanced to include less-costly and easy-to-use applications that can be hosted on the smart phones that are ubiquitous in the hands of today's college students. These applications might include Socrative, Kahoot!, Poll Everywhere, and others. As Jungić, et al (2015) noted, approaches like flipping the classroom may also provide an

increase in the number of opportunities for instructors and students to interact, particularly within the context of larger classes.

One of the authors of this article has used this approach with some success, flipping the classroom in large sections of a small business management course. Students were placed in small groups (5-6 students) and tasked with doing an in-depth analysis of a small business of their choice, and the class time was restructured into a learning-laboratory, allowing the primary instructor to interact with students on a much more intimate level than would have been possible in a traditional, lecture format. The instructor provided recorded lectures and required students to review the textbook material outside of class-time in order to free-up the in-class environment for other activities.

Another interesting finding of the present study was that subjects did not differentiate between out-of-class interactions with professor as compared to the graduate assistant. This helps to clarify some of the most beneficial ways to leverage the contribution of a graduate assistant in a large-course environment. First, these findings suggest, for example, that graduate assistants can be utilized to offer expanded office-hours opportunities for the students of the class, without impacting student perceptions of course effectiveness. Second, when paired with the clear indication that timely feedback on course assignments does directly impact perceptions of course effectiveness, another way that graduate students may be effectively used might include performing grading functions so as to provide the timely feedback that students prefer.

Universities are moving to large class sizes and other learning environment such as online classes to control costs and leverage resources, address retention and graduation concerns, all while meeting student expectations. The results from the current study support the importance of instructor interactions with students in such large class settings and are consistent with prior studies done in other contexts (Kang & Im, 2013; McArthur & Bostedo-Conway, 2012). In order to ensure favorable interaction, the study supports the importance of using in-class tools and learning techniques that foster interaction between students and the instructor, as well as the importance of providing timely feedback to students. Again, this is consistent with research on the importance of feedback provided in other educational contexts (Cunningham, 2011; Gerard, 2015). Technological advances have created a number of tools that can generate greater student engagement in large class settings; but more is not always better. More research is clearly needed to understand the key dimensions, in addition to timely feedback and instructor-student interactions, that are positively related with course effectiveness in the context of large class sizes.

REFERENCES

Allais, S. (2014). A critical perspective on large class teaching: the political economy of massification and the sociology of knowledge. *Higher Education*, *67*(6), 721-734.

Arias, J. J., & Walker, D. M. (2004). Additional evidence on the relationship between class size and student performance. *Journal of Economic Education, 35*(4), 311-329.

Caldwell, J. (2007). Clickers in the large classroom: Current research and best-practice tips. *CBE Life Sciences Education, 6(1),* 9-20.

Chapman, L., & Ludlow, L. (2010). Can Downsizing College Class Sizes Augment Student Outcomes? An Investigation of the Effects of Class Size on Student Learning. *JGE: The Journal of General Education*, *59*(2), 105-123.

Cunningham, B. M. (2011). Introductory accounting as theater: A look behind the scenes of large-lecture production. *Issues in Accounting Education suppl. Special Issue on the First Course in Accounting, 26*(4), 815-833.

Danker, B. (2015). Using Flipped Classroom Approach to Explore Deep Learning in Large Classrooms. *IAFOR Journal Of Education*, *3*(1), 171-186.

Diette, T. M., & Raghav, M. (2015). Class size matters: Heterogeneous effects of larger classes on college student learning. *Eastern Economic Journal, 41*(2), 273-283.

Elson, R & Gupta, S. (2010, winter) Formal and Informal Feedback Tools to Enhance the Student Learning Process. *The Accounting Instructors' Report*.
Available online at http://cengagesites.com/academic/?site=3099&section=18

Eraut, M. (2006). Feedback. *Learning in Health & Social Care, 5*(3). 111-118.

Gasaymeh, A. M., & Qablan, B. M. (2013). SMS as Out-of-Class, Student-Instructor Interaction Tool: A Case Study of Jordanian Graduate Students' Perceptions and Usage. *International Education Studies*, *6*(8), 147-160.

Gerard, J. A. (2015). Effectiveness of a Homework Management System on Exam Performance in a Managerial Accounting Course. *Journal Of The Academy Of Business Education*, *16*, 306-318.

Gleason, J. (2012). Using Technology-Assisted Instruction and Assessment to Reduce the Effect of Class Size on Student Outcomes in Undergraduate Mathematics Courses. *College Teaching*, *60*(3), 87-94.

Guber, F., Malliaris, M. & Jalilvand, A. (2009). Changing the culture of a school: The effect of class size on instructor and student performance. *American Journal of Business Education, 2(9),* 83-88.

Gupta, S. & Elson, R (2013) Students' perceptions of learning and technology in a large class environment: An exploratory study. The National Accounting Journal, 15(1), 35-42.

Helterbran, V. (2005). Lifelong or school long learning a daily choice. *The clearing house*, *78*(6), 261-263.

Hill, M. C. (1998). Class Size and Student Performance in Introductory Accounting Courses: Further Evidence. *Issues In Accounting Education*, *13*(1), 47-64.

Husain, M., & Khan, S. (2016). Students' feedback: An effective tool in teachers' evaluation system. *International Journal Of Applied & Basic Medical Research*, *6*(3), 178-181.

Jungić, V., Kaur, H., Mulholland, J., & Xin, C. (2015). On flipping the classroom in large first year calculus courses. *International Journal of Mathematical Education In Science & Technology*, *46*(4), 508-520.

Kaiser, H. F. (1991). Coefficient alpha for a principal component and the Kaiser-Guttman rule. *Psychological Reports, 68,*855-858.

Kang, M., & Im, T. (2013). Factors of learner-instructor interaction which predict perceived learning outcomes in online learning environment. *Journal of Computer Assisted Learning*, *29*(3), 292-301.

Karakaya, F., Ainscough, T. & Chopoorian, J. (2001). The effects of class size and learning style on student performance in a multimedia-based marketing course. *Journal of Marketing Education, 23*(2), 84-90.

Lazari, A., & Reid, D. (2013). COLLEGE ALGEBRA - LARGE SECTION VERSUS TRADITIONAL SIZE. *Georgia Journal of Science*, *71*(2), 102-107.

Loehlin, J. C. (1992). *Latent Variable Models.* (2nd ed.) Hillsdale, NJ; Lawrence Erlbaum Associates.

Mary, C. H. (1998). Class size and student performance in introductory accounting courses: Further evidence. *Issues in Accounting Education, 13*(1), 47-64.

McArthur, J. A., & Bostedo-Conway, K. (2012). Exploring the Relationship between Student-Instructor Interaction on Twitter and Student Perceptions of Teacher Behaviors. *International Journal of Teaching and Learning in Higher Education*, *24*(3), 286-292.

Mitchell, Y. F., & Hughes, G. D. (2014). Demographic and Instructor-Student Interaction Factors Associated with Community College Students' Intent to Persist. *Journal of Research in Education*, *24*(2), 63-78.

Nunnally, J. C. (1978). *Psychometric Theory.* (2nd ed.) New York; McGraw-Hill.

Reese-Durham, N. (2005). Peer evaluation as an active learning technique. *Journal of instructional psychology,* 32(4), 338-345.

Waples, J. A. (2016). Building emotional rapport with students in statistics courses. *Scholarship of Teaching and Learning in Psychology. 2*(4), 285-293.

APPENDIX 1

FACTORS AND ASSOCIATED SURVEY ITEMS

Instructor Interaction, Overall (α = .581, three items. Items analyzed individually rather than as a scale)

1. Rate the level of your in-class interaction with the professor on a scale of 1 - 5 (with 1 representing no interaction and 5 representing interaction in every class meeting). Interaction is defined as asking or answering a question and/or participating in class discussion.

2. Rate the level of your interaction with the professor outside class on a scale of 1 - 5 (with 1 representing no interaction and 5 representing very frequent interaction).

3. Rate the level of your interaction with the graduate assistant outside class on a scale of 1 - 5 (with 1 representing no interaction and 5 representing very frequent interaction).

Assignment Feedback (α = .490, two items. Items analyzed individually rather than as a scale)

1. Rate the feedback you have received on assignments/tests/quizzes etc. in this class on a scale of 1-5 (with 1 representing very delayed feedback and 5 representing very quick feedback)

2. Rate the feedback you have received on assignments/tests/quizzes etc. in this class compared to feedback received in a small class size (<100 students)

Instructor Interaction, Large versus Small Class (α = .762, two items)

1. Rate the level of your in-class interaction with the professor compared to your in-class interaction with a professor in a small size class (<100 students)

2. Rate the level of your interaction with the professor outside class compared to your interaction with a professor outside class in a small size class (<100 students)

Course Effectiveness (α = .849, four items)

1. Rate the likelihood of enrolling in another large class (>100 students) based on your experience on a scale of 1 - 5 (with 1 representing not at all likely and 5 representing extremely likely)

2. Rate the likelihood of recommending a large class (>100 students) to a friend based on your experience on a scale of 1 - 5 (with 1 representing not at all likely and 5 representing extremely likely)

3. State the overall learning effectiveness in a large class (>100 students) on a scale of 1 - 5 with 1 representing extremely ineffective and 5 representing extremely effective

4. State the overall learning effectiveness in a large class (>100 students) compared to a small class (<100 students)

APPENDIX 2 – TABLES

Table 1

Descriptive statistics for gender on individual items and by scale

	Overall (n=266)	Male (n=118)	Female (n=148)
In-class interaction (professor)	$\bar{x}$=2.63, s=1.27	$\bar{x}$=2.49, s=1.25	$\bar{x}$=2.74, s=1.29
Out-of-class interaction (professor)	$\bar{x}$=1.99, s=1.16	$\bar{x}$=1.93, s=1.14	$\bar{x}$=2.04, s=1.18
Out-of-class interaction (graduate student)	$\bar{x}$=1.47, s=0.93	$\bar{x}$=1.44, s=0.91	$\bar{x}$=1.50, s=0.94
Assignment feedback (overall)	$\bar{x}$=4.11, s=1.08	$\bar{x}$=4.43, s=0.82	$\bar{x}$=3.84, s=1.19
Assignment feedback (compared to small class)	$\bar{x}$=3.16, s=0.85	$\bar{x}$=3.28, s=0.73	$\bar{x}$=3.06, s=0.93
Instructor Interaction (compared to <100) Scale	$\bar{x}$=5.03, s=2.03	$\bar{x}$=4.94, s=1.96	$\bar{x}$=5.09, s=2.10
Course Effectiveness Scale	$\bar{x}$=10.86, s=3.51	$\bar{x}$=11.12, s=3.69	$\bar{x}$=10.64, s=3.36

Table 2

Descriptive statistics for traditional (<25 years old) versus non-traditional (≥25 years old) students on individual items and by scale

	Overall (n=266)	<25 (n=148)	≥25 (n=118)
In-class interaction (professor)	$\bar{x}$=2.63, s=1.27	$\bar{x}$=2.61, s=1.26	$\bar{x}$=2.94, s=1.44
Out-of-class interaction (professor)	$\bar{x}$=1.99, s=1.16	$\bar{x}$=2.00, s=1.15	$\bar{x}$=1.88, s=1.32
Out-of-class interaction (graduate student)	$\bar{x}$=1.47, s=0.93	$\bar{x}$=1.43, s=0.87	$\bar{x}$=2.06, s=1.44
Assignment feedback (overall)	$\bar{x}$=4.11, s=1.08	$\bar{x}$=4.07, s=1.08	$\bar{x}$=4.65, s=1.00
Assignment feedback (compared to small class)	$\bar{x}$=3.16, s=0.85	$\bar{x}$=3.13, s=0.83	$\bar{x}$=3.59, s=1.00
Instructor Interaction (compared to <100) Scale	$\bar{x}$=5.03, s=2.03	$\bar{x}$=5.00, s=2.04	$\bar{x}$=5.35, s=2.03
Course Effectiveness Scale	$\bar{x}$=10.86, s=3.51	$\bar{x}$=10.80, s=3.52	$\bar{x}$=11.76, s=3.33

Table 3

Descriptive Statistics for student enrollment status on individual items and by scale

	Overall (n=266)	Full-Time (n=259)	Part-Time (n=7)
In-class interaction (professor)	$\bar{x}$=2.63, s=1.27	$\bar{x}$=2.63, s=1.27	$\bar{x}$=2.71, s=1.25
Out-of-class interaction (professor)	$\bar{x}$=1.99, s=1.16	$\bar{x}$=2.00, s=1.17	$\bar{x}$=1.57, s=0.79
Out-of-class interaction (graduate student)	$\bar{x}$=1.47, s=0.93	$\bar{x}$=1.47, s=0.93	$\bar{x}$=1.43, s=0.79
Assignment feedback (overall)	$\bar{x}$=4.11, s=1.08	$\bar{x}$=4.10, s=1.08	$\bar{x}$=4.14, s=1.22
Assignment feedback (compared to small class)	$\bar{x}$=3.16, s=0.85	$\bar{x}$=3.15, s=0.85	$\bar{x}$=3.43, s=0.79
Instructor Interaction (compared to <100) Scale	$\bar{x}$=5.03, s=2.03	$\bar{x}$=5.02, s=2.04	$\bar{x}$=5.43, s=1.90
Course Effectiveness Scale	$\bar{x}$=10.86, s=3.51	$\bar{x}$=10.79, s=3.47	$\bar{x}$=13.28, s=4.46

Table 4

Descriptive statistics for comparing perceptions of those who had previously enrolled in a large class (> 100 students) to those who had not on individual items and by scale

	Overall (n=266)	Previously enrolled (n=226)	Not previously enrolled (n=40)
In-class interaction (professor)	$\bar{x}$=2.63, s=1.27	$\bar{x}$=2.62, s=1.27	$\bar{x}$=2.65, s=1.29
Out-of-class interaction (professor)	$\bar{x}$=1.99, s=1.16	$\bar{x}$=1.96, s=1.14	$\bar{x}$=2.15, s=1.25
Out-of-class interaction (graduate student)	$\bar{x}$=1.47, s=0.93	$\bar{x}$=1.50, s=0.96	$\bar{x}$=1.35, s=0.74
Assignment feedback (overall)	$\bar{x}$=4.11, s=1.08	$\bar{x}$=4.10, s=1.08	$\bar{x}$=4.13, s=1.11
Assignment feedback (compared to small class)	$\bar{x}$=3.16, s=0.85	$\bar{x}$=3.14, s=0.85	$\bar{x}$=3.25, s=0.87
Instructor Interaction (compared to <100) Scale	$\bar{x}$=5.03, s=2.03	$\bar{x}$=5.00, s=2.07	$\bar{x}$=5.18, s=1.82
Course Effectiveness Scale	$\bar{x}$=10.86, s=3.51	$\bar{x}$=10.89, s=3.58	$\bar{x}$=10.68, s=3.08

Table 5

Descriptive statistics for work status on individual items and by scale

	Overall (n=265)	Not-Working (n=87)	Part-Time (n=143)	Full-Time (n=35)
In-class interaction (professor)	$\bar{x}$=2.63, s=1.27	$\bar{x}$=2.55, s=1.18	$\bar{x}$=2.71, s=1.31	$\bar{x}$=2.51, s=1.31
Out-of-class interaction (professor)	$\bar{x}$=1.99, s=1.16	$\bar{x}$=1.97, s=1.22	$\bar{x}$=2.00, s=1.15	$\bar{x}$=2.06, s=1.08
Out-of-class interaction (graduate student)	$\bar{x}$=1.47, s=0.93	$\bar{x}$=1.64, s=1.10	$\bar{x}$=1.39, s=0.86	$\bar{x}$=1.40, s=0.70
Assignment feedback (overall)	$\bar{x}$=4.11, s=1.08	$\bar{x}$=4.05, s=1.13	$\bar{x}$=4.12, s=1.03	$\bar{x}$=4.23, s=1.19
Assignment feedback (compared to small class)	$\bar{x}$=3.16, s=0.85	$\bar{x}$=3.17, s=0.99	$\bar{x}$=3.14, s=0.76	$\bar{x}$=3.20, s=0.87
Instructor Interaction (compared to <100) Scale	$\bar{x}$=5.03, s=2.03	$\bar{x}$=5.28, s=2.17	$\bar{x}$=4.83, s=1.98	$\bar{x}$=5.23, s=1.90
Course Effectiveness Scale	$\bar{x}$=10.86, s=3.508	$\bar{x}$=11.18, s=3.64	$\bar{x}$=10.45, s=3.30	$\bar{x}$=11.69, s=3.89

Table 6

Descriptive statistics for citizenship status on individual items and by scale

	Overall (n=265)	US (n=246)	International (n=19)
In-class interaction (professor)	$\bar{x}$=2.63, s=1.27	$\bar{x}$=2.61, s=1.28	$\bar{x}$=2.79. s=1.18
Out-of-class interaction (professor)	$\bar{x}$=1.99, s=1.16	$\bar{x}$=1.95, s=1.12	$\bar{x}$=2.58, s=1.50
Out-of-class interaction (graduate student)	$\bar{x}$=1.47, s=0.93	$\bar{x}$=1.43, s=0.87	$\bar{x}$=2.00, s=1.45
Assignment feedback (overall)	$\bar{x}$=4.11, s=1.08	$\bar{x}$=4.12, s=1.07	$\bar{x}$=3.89, s=1.24
Assignment feedback (compared to small class)	$\bar{x}$=3.16, s=0.85	$\bar{x}$=3.16, s=0.84	$\bar{x}$=3.05, s=0.97
Instructor Interaction (compared to <100) Scale	$\bar{x}$=5.03, s=2.03	$\bar{x}$=4.93, s=2.02	$\bar{x}$=6.16, s=1.83
Course Effectiveness Scale	$\bar{x}$=10.86, s=3.51	$\bar{x}$=10.87, s=3.51	$\bar{x}$=10.68, s=4.04

Table 7

Descriptive statistics for major area of study on individual items and by scale

	Accounting (n=63)	Economics (n=10)	Finance (n=23)	Management (n=67)	Marketing (n=52)	Other (n=51)
In-class interaction (professor)	$\bar{x}$=2.59, s=1.23	$\bar{x}$=2.70, s=1.57	$\bar{x}$=3.13, s=1.36	$\bar{x}$=2.60, s=1.29	$\bar{x}$=2.35, s=1.14	$\bar{x}$=2.76, s=1.31
Out-of-class interaction (professor)	$\bar{x}$=2.13, s=1.26	$\bar{x}$=2.10, s=1.66	$\bar{x}$=2.35, s=1.47	$\bar{x}$=1.99, s=0.99	$\bar{x}$=1.81, s=1.07	$\bar{x}$=1.84, s=1.05
Out-of-class interaction (graduate student)	$\bar{x}$=1.30, s=0.80	$\bar{x}$=2.00, s=1.70	$\bar{x}$=1.65, s=1.15	$\bar{x}$=1.46, s=0.80	$\bar{x}$=1.35, s=0.68	$\bar{x}$=1.65, s=1.09
Assignment feedback (overall)	$\bar{x}$=4.44, s=0.86	$\bar{x}$=4.30, s=0.68	$\bar{x}$=4.00, s=1.21	$\bar{x}$=4.13, s=1.11	$\bar{x}$=3.88, s=1.11	$\bar{x}$=3.88, s=1.19
Assignment feedback (compared to small class)	$\bar{x}$= 3.22, s=0.91	$\bar{x}$=3.30, s=0.82	$\bar{x}$=3.17, s=0.78	$\bar{x}$=3.07, s=0.72	$\bar{x}$=3.12, s=0.92	$\bar{x}$=3.20, s=0.92
Instructor Interaction (compared to <100) Scale	$\bar{x}$=4.81, s=1.83	$\bar{x}$=5.10, s=1.79	$\bar{x}$=5.00, s=2.04	$\bar{x}$=4.94, s=1.99	$\bar{x}$=5.10, s=2.20	$\bar{x}$=5.33, s=2.24
Course Effectiveness Scale	$\bar{x}$=10.90, s=3.80	$\bar{x}$=11.30, s=3.59	$\bar{x}$=11.13, s=3.67	$\bar{x}$=10.62, s=3.27	$\bar{x}$=10.63, s=3.61	$\bar{x}$=11.12, s=3.37

Table 8

Chi-square analyses of demographic categories by individual item and t-tests and ANOVA analyses of demographic categories by scale.

	Gender	Age (<25, ≥25)	Major	Student Status	Work Status	US/Intl Student	Previously Enrolled in lg. class
In-class interaction (prof.)	X^2= 9.66*	X^2=3.95	X^2= 19.68	X^2=2.07	X^2=7.29	X^2=5.50	X^2=0.87
Out-of-class Interaction (prof.)	X^2=5.20	X^2=3.12	X^2= 23.68	X^2=1.02	X^2=6.46	X^2= 11.10	X^2=1.92
Out-of-class Interaction (GA)	X^2=.49	X^2=8.18	X^2= 29.26	X^2=.99	X^2=8.47	X^2= 10.72	X^2=1.70
Assignment feedback Overall	X^2= 22.43**	X^2= 10.37*	X^2= 35.94*	X^2=0.93	X^2=16.03	X^2=9.33	X^2=4.04
Assignment Feedback (compared to <100)	X^2= 14.21**	X^2=9.03	X^2=9.27	X^2=1.61	X^2=12.21	X^2=9.86	X^2=4.60
Instructor Interaction (compared to <100) Scale	t(264)= -0.61	t(264)= -0.68	F=0.91	t(264)= -.529	F=0.84	t(264)= 2.574*	F=1.24
Course Effectiveness Scale	t(264)= 1.086	t(264)= -1.10	F=1.40	t(264)= -1.87	F=0.30	t(264)= -0.22	F=0.48

n=266 for all tests. *significant at p<.05, two-tailed. **significant at p<.01, two-tailed.