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Class size, student behaviors and educational outcomes

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Abstract

Purpose – While many business schools use large classes for the sake of efficiency, faculty and students tend to perceive large classes as an impediment to learning. Although class size is a contested issue, research on its impact is inconclusive, mainly focusing on academic performance outcomes such as test scores and does not address classroom dynamics. This study aims to expand the focus of class size research to include classroom dynamics and subjective educational outcomes (e.g. student learning outcomes and satisfaction).

Design/methodology/approach – Using Finn et al.'s (2003) theoretical framework and research conducted in introductory business classes, this study investigates how student academic and social engagement influence educational outcomes in different class sizes.

Findings – Results highlight the critical role that student involvement and teacher interaction play on student success and student satisfaction regardless of class sizes. In addition, the results indicate that students perceive lower levels of teacher interaction and satisfaction in larger classes.

Originality/value – This study applies Finn's framework of student engagement in the classroom to understand the dynamics of class size in business education. The results reveal the influential roles of academic and social engagements on educational outcomes. Practical strategies are offered to improve learning outcomes and student satisfaction in large classes.

Keywords Class size, Large class teaching, Student satisfaction, Assessment of learning, Business education outcomes, Retention, Student learning outcomes

Paper type Research paper

Introduction

According to the 2017 Inside Higher Ed Survey, 71% of 409 chief business officers agreed that higher education institutions were facing significant financial difficulties (Jaschik, 2017). Many business schools use large classes to address the challenges of shrinking resources. Large classes may enable institutions to deploy faculty more efficiently and accommodate more students, especially when it is not feasible to expand facilities or increase hiring (Guseman, 1985). Nevertheless, large class size is a contested issue for

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students and instructors because it is thought to affect student success (Blatchford et al., 2009; Maringe & Sing, 2014).

Most studies on class size focus on student academic performance, but the results are inconclusive. At the elementary and secondary levels, some studies suggest that smaller classes positively impact academic performance (Glass & Smith, 1978; Robinson, 1990). Others indicate that class size has limited or no impact on performance (Hanushek, 1986; Hoxby, 2000). Similarly, in higher education, some studies indicate no difference on course grades between large and small classes (Guseman, 1985; Raimondo et al., 1990; Karakaya et al., 2001) and others report negative effects on academic performance (Paola et al., 2013; Maringe & Sing, 2014). Moreover, there is a dearth of research explaining how and why class size influences student behaviors and educational outcomes. Additional research is needed to better understand classroom dynamics related to class size (Anderson, 2000; Finn et al., 2003); Blatchford et al., 2009).

Another issue in the class size literature is that most studies focus on grades or standardized test scores as the primary measure of student success. Thus, research that examines the relationship between class size and educational outcomes beyond academic performance should be included in learning assessment. For example, the Association to Advance Collegiate Schools of Business (AACSB, 2021) endorses the use of "well-documented assurance of learning (AoL) processes that include direct and indirect measures for ensuring the quality of all degree programs that are deemed in scope for accreditation purposes." In addition, the shift from teacher-directed to student-centered pedagogy means that student perception of learning has become an important educational outcome (Maher, 2004; Adam, 2004). Today, student satisfaction is recognized as critical factor in attracting and retaining students (Santini et al., 2017).

This study aims to fill the aforementioned gaps in the literature by applying Finn et al.'s (2003) theoretical framework of student engagement in the classroom. They suggest that student academic and social engagement with peers and teachers may influence academic achievement. This study uses Finn's framework to investigate how student learning and social behaviors influence relevant educational outcomes in different class sizes. The purpose of the study is twofold: to better understand the dynamics of class size in business education and to provide practical strategies to improve educational outcomes and student satisfaction in large and small classes.

Theoretical background

Although business schools typically consider class size a factor in determining teaching loads, there is no accepted definition of a large class. Mateo and Fernandez (1996) propose a numerical taxonomy. For example, a large class contains between 60 and 149 students. Maringe and Sing (2014) define large class size qualitatively as "any class where the number of students poses both perceived and real challenges in the delivery of quality and equal learning opportunities to all students in the classroom" (p. 763). In practice, class size norms vary greatly across institutions and disciplines, with some business schools considering sections of 25–35 students to be small and between 200 and 350 to be large (Raimondo et al., 1990).

Conceptual model

Finn et al. (2003) suggest student academic achievement is influenced by a combination of academic and social engagement in the learning process. Academic engagement refers to student learning behaviors related directly to the learning process, such as class participation. Social engagement is student social interactions with classmates and the instructor. Using

group theory, Finn et al. (2003) argue that students in small classes are more visible and more likely to engage in learning and social behaviors during class. Conversely, large classes permit students to reduce their visibility. Also, smaller classes encourage participation or interaction as students may receive more support from classmates. Because social and academic interactions are the focal point of the higher education, these classroom dynamics are critical to positive learning outcomes (Demaris and Kritsonis, 2008).

Blatchford et al. (2009) suggest that a negative relationship exists between class size and classroom processes. Class size differences may impact classroom processes, which in turn influence student attentiveness and active involvement with teachers and peers. Teachers in small classes are more likely to give individual attention to students, effectively control and manage the classroom and build better relationships with students. Similarly, students in small classes may be more engaged in classroom and more likely to interact with teachers and peers (Blatchford et al., 2009).

Consistent with Finn et al. (2003) and Blatchford et al. (2009), this study proposes a research model in Figure 1 suggesting how class size affects student learning and social behaviors, as well as learning outcomes. It includes perceived learning outcomes and satisfaction as additional educational outcomes.

Research hypotheses

In terms of academic engagement (Finn et al., 2003), this study uses student attentiveness, involvement and class participation as the student learning behaviors. Student attentiveness refers to concentration in the learning process (Blatchford et al., 2009) and may be adversely impacted by disruptive behavior of students or poor classroom management, which may be more likely in large class environments (Leufer, 2007; Wulff et al., 1987). Thus, the larger the class size, the greater the potential for distraction.

H1. Student attentiveness level will be higher in small classes than in large classes.

Involvement is a motivational construct. In the context of advertising, Zaichkowsky (1994) defines advertising involvement as an individual's perception of the relevance of the

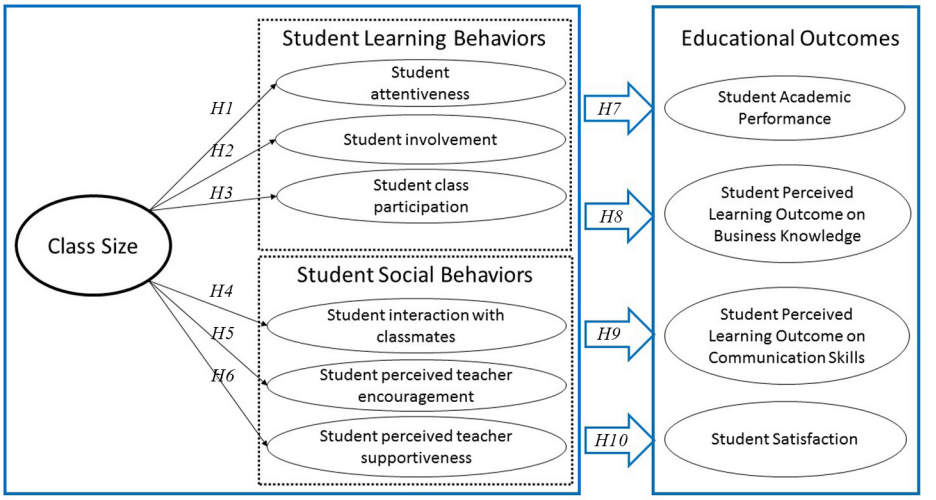

Figure 1.
Research model

advertisement's message based on inherent needs, values and interests. Following this logic, student involvement with the course is defined as the extent to which a student perceives the relevance of the course subject based on inherent needs, values and interests. Wulff et al. (1987) found that students in larger classes reported lower involvement:

H2. Student involvement level with the course will be higher in small classes than in large classes.

Weaver and Qi (2005) define classroom participation as students' remarks or questions directed toward the instructor. Bai and Change (2016) found that students in larger classes have lower levels of class participation than in smaller classes. Large classes allow students to have a passive role in class, which may decrease the likelihood of initiating and responding to the teacher (Blatchford et al., 2009). Weaver and Qi (2005) note that large classes permit greater anonymity and enable students to seat themselves at the periphery of the classroom, thereby facilitating the strategic withdrawal of the majority. Thus:

H3. Student class participation level will be higher in small classes than in large classes.

Finn et al. (2003) refer to student social behaviors such as interaction with peers and teachers in the classroom as social engagement. Although social engagement encompasses both prosocial and antisocial behaviors, this study focuses only on prosocial behaviors and positive interactions. Class size has the potential to affect how students interact with each other (Ehrenberg et al., 2001), and peer interaction may influence student learning outcomes (SLOs) as much as interaction with teachers (Alderman, 2008). Social behavior in small classes is generally more positive than in larger classes (Blatchford, et al., 2009). Students in small classes are less likely to be disruptive due to easier class management. Also, larger classes decrease classmate supportiveness and prosocial interactions (Bai and Chang, 2016). Thus:

H4. Student interaction with classmates will be higher in small classes than in large classes.

Class size may also influence teachers' interpersonal styles, which in turn may affect their interactions with the students (Finn et al., 2003). For example, class size impacts how much time an instructor devotes to understanding and addressing the needs and interests of individual students (Ehrenberg et al., 2001). Current research uses teacher encouragement and teacher supportiveness to represent the quality of student–teacher interactions. Teacher encouragement refers to an instructor's tendency to encourage more class participation by communicating to the entire class as well as by communicating directly with individual students (Fassinger, 1995). With increased interactions between students and teachers in small classes, students may perceive higher levels of teacher encouragement, compared to fewer interactions in large classes. Thus:

H5. Student perception of teacher encouragement will be higher in small classes than in large classes.

Student perception of an instructor's supportiveness is also salient. Teacher supportiveness refers to the extent to which a student feels respected by an instructor and/or receives individual attention from them (Fassinger, 1995). A teacher may distribute time more equitably in a small class than in a large class and may have more opportunities to pay attention to individual needs and to support individual students (Blatchford et al., 2009). Thus:

H6. Student perception of teacher supportiveness will be higher in small classes than in large classes.

Learning behaviors and social behaviors contribute to student academic achievement (Finn et al., 2003). In addition, the research discussed above demonstrates that class sizes affect student academic performance. Accordingly,

H7. The factors affecting student academic performance may include attentiveness, involvement, class participation, interaction with classmates, perception of teacher encouragement, perception of teacher supportiveness and class size.

Many educators argue for the diversification of assessment methods in higher education (Maringe & Sing, 2014). Maher (2004) advocates the use of learning outcomes that focus attention directly on the activities and achievements of students, rather than simply on teaching the curriculum content. According to AACSB, learning goals should reflect broad educational expectations for each degree program. At the university in which this study was conducted, business knowledge and communication skills are key SLOs. As student perception of learning reflects how students evaluate their learning experience at the end of the semester, all classroom activities, processes, social behaviors and class size are involved. Therefore,

H8. The factors affecting the student perceived learning outcome of business knowledge may include attentiveness, involvement, class participation, interaction with classmates, perception of teacher encouragement, perception of teacher supportiveness and class size.

H9. The factors affecting the student perceived learning outcome of communication skills may include attentiveness, involvement, class participation, interaction with classmates, perception of teacher encouragement, perception of teacher supportiveness and class size

Pedagogical researchers have applied the construct of satisfaction to the educational setting, recognizing the need to monitor student satisfaction as a means of assessing the overall performance of higher education institutions (Martirosyan, 2015). Santini et al. (2017) found student satisfaction in higher education as a significant impact on consequent outcomes for the success of student and institutions, such as attitude toward the institution, intention to recommend, involvement loyalty, trust and word-of-mouth. Due to its importance, student satisfaction is added as an educational outcome in this study. Thus,

H10. The factors affecting student satisfaction may include attentiveness, involvement, class participation, interaction with classmates, perception of teacher encouragement, perception of teacher supportiveness and class size.

Methods

This study was conducted in the business school of a medium-sized public university in the northeastern USA. Students were recruited from three introductory business courses (management, marketing and business law) that were offered in both small and large sections. The typical size of most classes in this business school is 25–40 students and a class with more than 50 students is considered large. In general, students are able to select their own classes and all majors were represented in all classes.

Survey participants were invited by their instructors to take an online survey voluntarily at the end of the semester. Participating students granted permission to the researchers to access to their academic records, including course grade. A total of 280 student participated with 52 respondents from small classes and 228 from large classes. The overall response rate was 43% (37% for small classes vs 45% for large classes). Approximately 47.9% of respondents were male and 51.4% were female. Nearly all (98.6%) respondents attended school full-time. The average number of credits completed was 65.

Student academic performance was measured using a student's course grade (A = 4.0, A− = 3.670, B+ = 3.330, B = 3.000, B− = 2.670, C+ = 2.330, C = 2.000, C− = 1.670, D+= 1.330, D = 1.000, D− = 0.670, F = 0.00). The mean and the standard deviation for course grades were 3.223 and 0.497. Most measures of this study were adapted from previous research. Student attentiveness was assessed by items from Leufer's (2007) research on the factors affecting the learning environment. Student involvement with the course was measured by using a personal involvement inventory and the questions were adapted to fit the context of the survey (Zaichkowsky, 1994). Bai and Chang's (2016) measures were adapted to assess class participation, student interaction with classmates, student perception of teacher encouragement and student perception of teacher supportiveness. Measures of the SLOs of business knowledge and communication skills were developed by the researchers. These two SLOs were selected because they are assessed as part of the institution's AACSB AOL process. Student satisfaction was adapted from Eastman et al. (2017). All questions used seven-point scales.

Analysis

SPSS was used to run Cronbach's coefficient alpha of each measure. The results ranged from 0.929 to 0.756, higher than the minimum requirement of 0.7 (Nunnally, 1978). The scores of composite reliabilities for all constructs were higher than 0.6 and demonstrated the reliability of the measures. Harman's single factor test was used to evaluate common method variance (CMV). The CFA results indicate 41% total variance explained and then no CMV issues (Podsakoff et al., 2003). Table 1 displays the means, standard deviations, and correlation matrix of all constructs.

A one-way ANOVA was run to test *H1* with class size as the independent variable and student attentiveness as the dependent variable. On Table 2, there was no significant difference in student attentiveness between small and large class sizes ($F = 1.00, p < 0.32$).

Following the same logic, a series of ANOVA were run to test *H2–H6*. On Table 2, the results indicate no significant differences between class sizes on student involvement (*H2*), class participation (*H3*), interaction with classmates (*H4*) and student perceived teacher encouragement (*H5*). But, the results support *H6* ($F = 6.25, p < 0.013$), suggesting that class size differences impact perceived teacher supportiveness. Students in small classes perceived higher level of teacher supportiveness than those in large class (Mean = 6.14 > Mean = 5.68).

Multiple regression analysis was conducted to test *H7–H10*. A dummy variable was created to represent two categories of class size: small class (coded as 0); and large class (coded as 1). As discussed below, each educational outcome was a dependent variable and all factors involving student learning and social behaviors and the class-size dummy variable were independent variables. Table 3 displays the statistical results for *H7–H10*.

The regression model for *H7* was not statistically significant ($F_{(7, 272)} = 1.424, p < 0.195$) and the results did not support *H7*. The regression analysis for *H8* was statistically significant ($F_{(7, 272)} = 101.912, P < 0.000$). The results indicate that student involvement ($\beta_2 = 0.321, p < 0.000$), student interaction with classmates ($\beta_4 = 0.085, p < 0.048$), student

Table 1.
Descriptive statistics and correlation matrix

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1. Attentiveness	5.09	1.31	1								
2. Student Invovlement	6.24	0.81	0.171**	1							
3. Student Class Participation	4.59	1.66	0.044	0.320**	1						
4. Peer Interaction	5.34	1.35	0.054	0.324**	0.536**	1					
5. Perceived Teacher Encouragement	5.46	1.28	0.130*	0.365**	0.611**	0.629**	1				
6. Perceived Teacher Supportiveness	5.76	1.20	0.199**	0.348**	0.539**	0.567**	0.776**	1			
7. Perceived Knowledge Outcome	5.71	1.23	0.191**	0.586**	0.540**	0.580**	0.741**	0.744**	1		
8. Perceived Communication Outcome	4.98	1.39	0.054	0.443**	0.626**	0.636**	0.653**	0.603**	0.693**	1	
9. Student Satisfaction	5.58	1.30	0.252**	0.435**	0.540**	0.542**	0.695**	0.724**	0.796**	0.599**	1

Notes: $N = 280$ students (52 from small classes; xxx from large classes). $^{**}p < 0.01$; $^{*}p < 0.05$

Construct	Small class (N = 55) MEAN	SD	Large class (N = 250) MEAN	SD	Class size difference F	Sig
Student Learning Behaviors						
Student Attentiveness (*H1*)	5.25	1.44	5.05	1.28	1.00	0.32
Student Involvement (*H2*)	6.31	0.67	6.23	0.84	0.47	0.49
Student Class Participation (*H3*)	4.90	1.72	4.52	1.64	2.32	0.13
Student Social Behaviors						
Student Interaction with classmates (*H4*)	5.46	1.24	5.31	1.37	0.534	0.465
Student perceived teacher encouragement (*H5*)	5.61	1.22	5.43	1.30	0.838	0.361
Student perceived teacher supportiveness (*H6*)	6.13	1.05	5.68	1.22	6.250	0.013*
Education Outcomes						
Grade value	3.33	0.69	3.30	0.71	0.068	0.795
Perceived Knowledge Outcome	5.90	1.16	5.67	1.24	1.469	0.226
Perceived Communication Outcome	5.20	1.39	4.93	1.39	1.571	0.221
Student Satisfaction	6.17	1.14	4.45	1.30	13.652	0.000*

Notes: Seven-point scale: 1 = Strongly disagree; 7 = Strongly agree; M = means; SD = Standard deviation; *Significant < 0.05

Table 2. ANOVA results

perception of teacher encouragement ($\beta_5 = 0.276$, $p < 0.000$) and teacher supportiveness ($\beta_6 = 0.349$, $p < 0.000$) impact student perceived learning outcome for business knowledge.

The regression model for *H9* was statistically significant ($F_{(7, 272)} = 56.75$, $P < 0.000$). The results reveal that student involvement ($\beta_2 = 0.176$, $p < 0.000$), student class participation ($\beta_3 = 0.254$, $p < 0.000$), student interaction with classmates ($\beta_4 = 0.262$, $p < 0.000$), student perception of teacher encouragement ($\beta_5 = 0.173$, $p < 0.013$) and teacher supportiveness ($\beta_6 = 0.131$, $p < 0.042$) also influenced perceived learning outcome of communication skills.

The regression model for *H10* was statistically significant ($F_{(7, 272)} = 67.174$, $P < 0.000$). Student attentiveness ($\beta_1 = 0.11$, $p < 0.004$), student involvement ($\beta_2 = 0.144$, $p < 0.000$), student class participation ($\beta_3 = 0.099$, $p < 0.042$), student perception of teacher encouragement ($\beta_5 = 0.239$, $p < 0.000$), teacher supportiveness ($\beta_6 = 0.347$, $p < 0.000$) and class size ($\beta_7 = -0.127$, $p < 0.001$) were determinants of student satisfaction. Importantly, student satisfaction level was significantly lower in large classes than those in small classes by 12.7%.

Structural equation modeling (SEM) was conducted to understand how student learning behaviors, peer interaction, and teacher interactions influence the three significant educational outcomes. The partial least square SEM analysis (PLS-SEM) works efficiently with small sample sizes, multi-item measures and complex structural models. It makes no distributional assumptions for data (Hair et al., 2017). We use SmartPLS 3 software to run PLS-SEM analysis, as it is an appropriate approach for our data set to assess the key drivers for educational outcomes.

Given the concern of discriminant validity for teacher encouragement and teacher supportiveness, these two factors are combined into one construct to represent teacher interaction. Figure 2 displays the structural model. The sample size for small classes in this study exceeds the minimum sample size for PLS SEM analysis based on the 10 times rules (Hair et al., 2017).

Table 3.
Multiple regression
H7–H10

Construct	Academic Performance Course Grade (*H7*) Standardized Coefficients	Sig	Student Perceived Learning Outcome on Business Knowledge (*H8*) Standardized Coefficients	Sig	Student Perceived Learning Outcome on Communication Skills (*H9*) Standardized Coefficients	Sig	Student Satisfaction (*H10*) Standardized Coefficients	Sig
Student Learning Behaviors								
Student Attentiveness $\beta 1$	0.083	0.179	0.026	0.429	−0.051	0.205	0.11	0.004*
Student Involvement $\beta 2$	−0.059	0.366	0.321	0.000**	0.176	0.000**	0.144	0.000**
Student Class Participation $\beta 3$	−0.018	0.824	0.035	0.404	0.254	0.000**	0.099	0.042*
Student Social Behaviors								
Student Interaction with classmates $\beta 4$	0.038	0.637	0.085	0.048*	0.262	0.000**	0.084	0.091
Student perceived teacher encouragement $\beta 5$	−0.025	0.811	0.276	0.000**	0.173	0.013*	0.239	0.000**
Student perceived teacher supportiveness $\beta 6$	0.174	0.08	0.349	0.000**	0.131	0.042*	0.347	0.000**
Large Class Dummy $\beta 7$	0.011	0.851	0.016	0.622	−0.007	0.854	−0.127	0.001**
Adjusted R-squared	0.011		0.717		0.583		0.624	
F-value	1.424		101.912		56.75		67.174	
Sig	0.195[b]		0.000**		0.000**		0.000**	

Notes: *Significant < 0.05; **Significant < 0.01

The measurement model on convergent validity, reliability and the discriminant validity were assessed. On Table 4, the values of Cronbach's alpha and composite reliability of all the constructs exceeding the standard level of 0.70. The average variance extracted (AVE) for all the constructs exceeds the lower acceptable limit of 0.50 (Hair et al., 2017) except for attentiveness. Discriminant validity is assessed with Fornell and Larcker criterion and the heterotrait–monotrait ratio of correlations (HTMT) (Hair et al., 2017). Table 5 results support discriminant validity as the variance shared between constructs is lower than the variance shared by a construct with its indicators (Fornell & Larcker, 1981). The bootstrapping results also support discriminant validity as all the HTMT values are significantly from 1 (Hair et al., 2017). Except for attentiveness with a slightly lower AVE of 0.46 (< 0.5), the other constructs demonstrate good reliability, convergent and discriminant validity for the measurement model (Hair et al., 2017).

On the model results, the value of SRMR is 0.063 (< 0.08) which is considered a good fit. No VIF issue was found as each predictor construct's VIF value was between 0.2 and 5 (Hair et al., 2017). Then, we ran bootstrapping to assess the significance of path efficient. Table 6 displays each path coefficient, *t*-values and *p*-value in the structural model. Most of the paths were statistically significant. However, attentiveness has no significant path coefficients with knowledge and communication outcomes. Student class participation and peer interactions have no significant coefficients with knowledge outcome and satisfaction. The

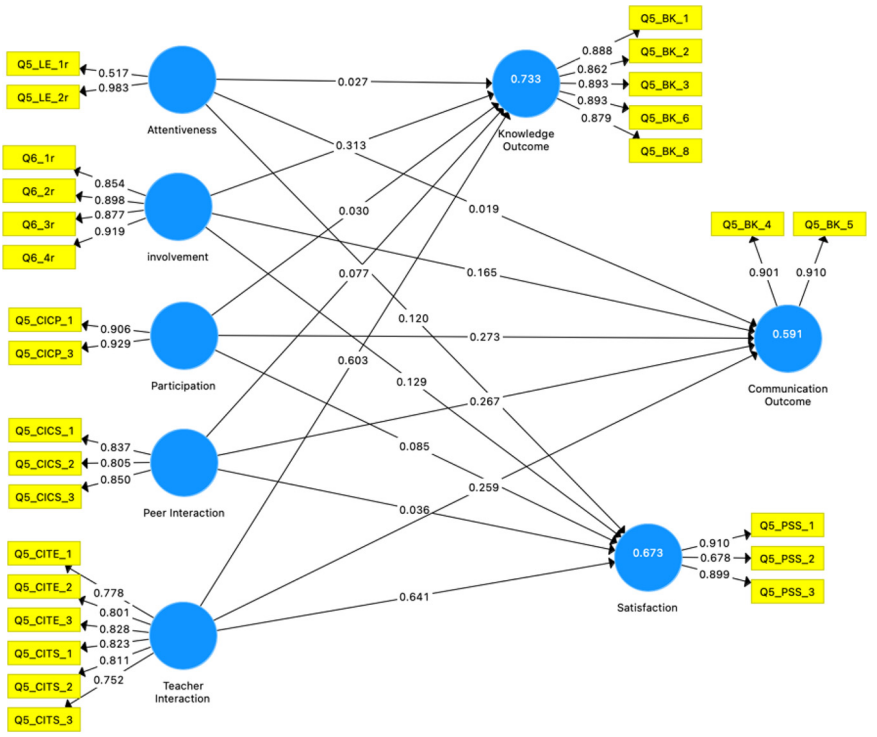

Figure 2.
PLS-SEM structural model

Notes: Inner model: path coefficients; outer model: outer loadings

Table 4.
Measurement model results

Construct	Indicators	Convergent validity			Internal consistency reliability		Discriminant validity
		Loadings	Indicator reliability	AVE	Composite reliability	Cronbach's alpha	HTMT confidence interval does not include 1
		>0.70	>0.50	>0.50	0.60–0.90	0.60–0.90	
Attentiveness	Q5_LE_1r	0.61	0.37	0.46	0.81	0.76	Yes
	Q5_LE_2r	0.88	0.77				
	Q5_LE_4r	0.73	0.54				
	Q5_LE_6r	0.62	0.38				
	Q5_LE_7r	0.51	0.26				
involvement	Q6_1r	0.85	0.73	0.79	0.94	0.91	Yes
	Q6_2r	0.90	0.81				
	Q6_3r	0.88	0.77				
	Q6_4r	0.92	0.84				
Participation	Q5_CICP_1	0.91	0.82	0.84	0.91	0.81	Yes
	Q5_CICP_3	0.93	0.86				
Peer Interaction	Q5_CICS_1	0.84	0.70	0.69	0.87	0.78	Yes
	Q5_CICS_2	0.81	0.65				
	Q5_CICS_3	0.85	0.72				
Teacher Interaction	Q5_CITE_1	0.78	0.61	0.64	0.91	0.89	Yes
	Q5_CITE_2	0.80	0.64				
	Q5_CITE_3	0.83	0.69				
	Q5_CITS_1	0.82	0.68				
	Q5_CITS_2	0.81	0.66				
	Q5_CITS_3	0.75	0.57				
Knowledge Outcome	Q5_BK_1	0.89	0.79	0.78	0.95	0.93	Yes
	Q5_BK_2	0.86	0.74				
	Q5_BK_3	0.89	0.80				
	Q5_BK_6	0.89	0.80				
	Q5_BK_8	0.88	0.77				
Communication Outcome	Q5_BK_4	0.90	0.81	0.82	0.90	0.78	Yes
	Q5_BK_5	0.91	0.83				
Satisfaction	Q5_PSS_1	0.91	0.83	0.70	0.87	0.78	Yes
	Q5_PSS_2	0.68	0.46				
	Q5_PSS_3	0.90	0.81				

Table 5.
Fornell–Lacker criterion

Construct	Attentiveness	Communication outcome	Knowledge outcome	Participation	Peer interaction	Satisfaction	Teacher interaction	Involvement
Attentiveness	0.679							
Communication Outcome	0.163	0.905						
Knowledge Outcome	0.255	0.693	0.883					
Participation	0.139	0.63	0.543	0.918				
Peer Interaction	0.131	0.636	0.585	0.535	0.831			
Satisfaction	0.314	0.612	0.822	0.559	0.552	0.836		
Teacher Interaction	0.222	0.664	0.797	0.609	0.64	0.792	0.799	
Involvement	0.263	0.443	0.587	0.319	0.325	0.451	0.383	0.887

Table 6.
Structural model path coefficients

Path	Path coefficient	T Value	P Values	Sig ($p < 0.05$)
Attentiveness → Communication Outcome	0.021	0.454	0.650	No
Attentiveness → Knowledge Outcome	0.027	0.775	0.439	No
Attentiveness → Satisfaction	0.120	2.978	0.003	Yes
Involvement → Communication Outcome	0.165	3.419	0.001	Yes
Involvement → Knowledge Outcome	0.315	5.209	0.000	Yes
Involvement → Satisfaction	0.131	2.983	0.003	Yes
Participation → Communication Outcome	0.273	5.250	0.000	Yes
Participation → Knowledge Outcome	0.031	0.736	0.462	No
Participation → Satisfaction	0.083	1.759	0.079	No
Peer Interaction → Communication Outcome	0.265	5.300	0.000	Yes
Peer Interaction → Knowledge Outcome	0.075	1.629	0.103	No
Peer Interaction → Satisfaction	0.036	0.678	0.498	No
Teacher Interaction → Communication Outcome	0.259	4.174	0.000	Yes
Teacher Interaction → Knowledge Outcome	0.601	10.090	0.000	Yes
Teacher Interaction → Satisfaction	0.638	11.039	0.000	Yes

coefficients of determination (R^2 value) for communication outcome, knowledge outcome and satisfaction are 0.60, 0.74 and 0.68 respectively, which indicate moderate predictive power (Hair et al., 2017). Among all the paths, teacher interaction has large effects on knowledge outcome (coefficient = 0.601) and satisfaction (coefficient = 0.638). Involvement has a medium effect on knowledge outcome (coefficient = 0.315).

Multiple group analysis was tested for differences on path coefficients between small and large classes in the same structural model. The results only indicate a significant difference on the path coefficient from student peer interaction to communication outcome between the two groups. While the path coefficient for large class is 0.22, the value for small class is 0.54. It suggests that peer interaction in a small class exerts a stronger positive effect on student perceived communication outcome than that in a large class.

Discussion and implications

Large classes are unlikely to disappear given the financial pressures that most institutions face in the USA (Maringe & Sing, 2014). However, large classes are associated with challenges in delivering high-quality and equitable learning opportunities (Bligh, 2002). For example, students in large classes do not have the same opportunities to interact with the teacher compared to students in small classes (Maringe & Sing, 2014). To offer large classes without sacrificing quality of education, educators must understand how and why class sizes influence student engagement behaviors and educational outcomes.

For all class sizes, this study found student involvement as the most influential academic engagement behavior and teacher interaction as the most influential social engagement behavior for positive educational outcomes. In addition, students only perceived teacher supportiveness more positively in small classes with no differences for other engagement behaviors. In terms of educational outcomes, this research found negative effects on student satisfaction in large classes, but no differences on course grade, knowledge and communication learning outcomes in large and small classes. Despite of the mixed effects of class sizes, the study reveals that in the large classes, students may perceive a lower level of teacher interactions and satisfaction. It raises critical concerns as teacher interaction was found as the most influential driver for all

subjective educational outcomes. Given that student satisfaction is a key component of student and institutional success (Santini et al., 2017), educators must develop strategies to enhance teacher interactions and satisfaction in large classes to maintain and enhance the quality of education and student success.

Practical implications

Because teacher interaction is the most influential factor for student satisfaction, business schools may consider allocating technology resources to support a more interactive learning environment in large classes. For example, the use of a student response systems (SRS), such as clickers or Poll Everywhere, has become more popular. Heaslip et al. (2014) found that students in large classes became more engaged and involved when clickers were in use. In addition, SRS enable students to have more equal opportunities to interact with the teacher easily and efficiently.

Choosing educational outcomes that accurately measures learning objectives is critical to monitor and improve education quality. Educational outcomes should reflect what the program wants the students to know and be able to do. For example, this study included a communication student learning outcome because it was assessed as part of AACSB AOL process. The results found that the communication learning outcome is associated with student participation and peer interaction. Thus, when a course focuses on communication goals, faculty should create more opportunities for student participation and peer interaction in course design. For example, in large classes, SRS allow students to participate in class discussion and also to see other students' responses. Additionally, as peer interaction in a small class is stronger on communication outcome than that in a large class, a small class is a better choice for a course focusing on communication skills.

Different educational outcomes may involve different student learning and social behaviors in the classroom, whereas class size may not influence all these behaviors. What educational outcomes do schools expect for students? If, for example, student satisfaction is the key educational outcome, then our study suggests that large class sizes should not be used. On the other hand, if course grade is the key educational outcome, both large and small classes will work as grade differences are not related to class size.

Research implications and future research

While the extant literature focuses on academic performance as the primary learning outcome, this study shifted to a "student-centered" perspective and added three measures of subjective educational outcomes – student satisfaction and the perceived SLOs for knowledge and communication skills – to transcend the usual academic performance outcomes. As schools use AOL results for continuous improvement, educators should consider a broader set of educational outcomes.

There have been tremendous changes in the modality of course delivery in higher education since the covid pandemic. Drea (2021) notes that higher education is unlikely to fully return to pre-COVID-19 course delivery models, as students have now experienced the intensive integration of technology into their courses, and this has likely reset their expectations for the future. There are a variety of course delivery formats emerging since the pandemic. Educators must understand whether a change of modality of content delivery has an impact on quality. The current study recognized the importance of both academic and social engagements in student learning. It may offer a groundwork to investigate how student engagements influent their learning outcomes in different delivery formats, such as online, hybrid, synchronous online or asynchronous online.

Limitations

Because this study was conducted in a face-to-face classroom setting, the results cannot be generalized to different learning environments, such as online or hybrid. Similarly, the results are not generalizable across all types of higher education institutions because it was conducted at one university. In addition, the results are limited to introductory business courses and do not include advanced courses that require higher-order thinking and analytical skills. Finally, the sample included only undergraduate students and does not consider age as a salient factor when considering effects on classroom processes (Blatchford et al., 2009).

Conclusions

Many schools use large classes to respond to shrinking resources. This study contributes to the existing literature by showing how and why class sizes influence student engagement behaviors and educational outcomes other than academic performance. Student involvement and teacher interaction are found as influential factors on student learning outcomes and satisfaction regardless of class sizes. However, the study results indicate students perceive lower levels of teacher interaction and satisfaction in larger classes. In conclusion, to offer large classes without sacrificing quality of education, we suggest faculty creating more opportunities to encourage more student–teacher interactions, such as using SRS technologies.

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