Online Courses and Optimal Class Size:

A Complex Formula

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Over the last decade, with advances in technology and an increasing number of students seeking college degrees, online courses have become increasingly popular. With these changes, questions have arisen about appropriate class size to optimize student learning in an online environment. Although a review of the literature suggests class sizes between 12 and 21 are appropriate, the research also shows that a variety of variables besides class size affects student learning as well as student and instructor satisfaction with a course. These factors include the instructor's experience and comfort teaching online, the qualities of technology employed, and the nature and experience of students enrolled in the course. For instance, a student's level of education (undergraduate or graduate) and degree sought (associate, bachelor, master, or doctoral) is another consideration. Overall, the literature reveals a wide scale of variables in determining the success of an online class in terms of student outcomes.

Orellana (2006) has conducted one of the most comprehensive studies to date on class size, looking specifically at how class size affects the level of interactions in online learning classes. Interactions in Orellana's study included both student-to-student as well as instructor-to-student connections. Orellana sampled 131 instructors teaching courses at a variety of levels; about 30% taught bachelor's level courses, and another 20% respectively instructed at the master's and doctoral levels. Demographical data revealed a mixed set of instructor types (based on such factors as age, gender, number of years teaching in higher education, and extent of experience teaching online). Orellana determined that for the full sample of 131 instructors, the average class size was 23 students, with doctoral programs more typically enrolling 15 students (p. 238). As might be expected, enrollment was higher for public institutions (average class size 23 students) compared to private institutions (average class size18 students) (p. 238). In response

to a question about optimal class size conducive to interaction, instructors in the sample reported 19 students per class was considered desirable, whereas 16 students was deemed ideal (p. 229). Although the purpose of Orellana's study was to examine class size in relation of interaction, the study found numerous variables besides class size affected student learning. Among these were (1) instructors' time commitment, workload, and experience with using the technology, (2) the nature and content of the course, (3) student characteristics such as comfort level with the technology, and (4) limitations of the technology itself (see p. 236). Orellana observed, however, that a high level of interaction was not necessarily a measure of learning (p. 243). Although higher levels of interaction were found in classes that averaged 21 students compared to classes that averaged 26 students, Orellana reported the kinds of interactions also required analysis. For instance, some interactions regardless of class size could be considered disruptive to learning.

Other studies (DiBiase, 2000; Mupinga & Maughin, 2008; Sieber, 2005) have addressed the faculty workload issue in teaching online in relation to class size. In one study, Sieber found that online faculty reported the optimal class size to be 20 students, with more than that number considered "difficult to manage" (p. 336). An important finding of Sieber's research is that new online instructors should start with a class size of no more than 12 students, but such instructors' class sizes might be expected to increase once experience teaching online is acquired. A class size of 12, also, was recommended by Tomei (2006), who conducted a study comparing faculty workload for the same graduate education course taught both online and face-to-face; however, this recommendation was for graduate courses and not based on faculty duration of teaching online. Moreover, considering the variables of time to counsel students, prepare instructional materials, and assess student work, Tomei found that whereas a class size of 17 was appropriate for face-to-face teaching, an online course required more faculty time, and thus warranted a

smaller class size. DiBiase (2004), who studied online instructors' experience over a 3-1/2-period year period, determined that instructors' expertise improved over time and that increasing enrollment in courses in subsequent semesters did not have a negative impact on student satisfaction. These findings coincide with Sieber's conclusion that class size be determined based on instructors' level of experience. Yet, the findings stand in some opposition to the actual findings of Orellana's study (2006), which indicated "the number of years teaching online courses" and "the level of expertise" were not "related to any measure of class size" (p. 242). Of note, the contradiction can also be explained by *what occurred* as measured by Orellana's study as opposed to *what should occur* or *is recommended* for optimal student learning. However, Orellana did find that irrespective of years teaching online, older professors preferred smaller online class sizes than younger professors (p. 242). Orellana did not state or speculate on the reason for this finding. Another study also found a difference between males' and females' teaching styles, which in turn can affect how they teach a course online (see Lee, 2010). Sieber further added that instructors who have themselves taken a course online likely add a valuable component—firsthand knowledge of learners' needs (p. 331), and, thus, enter online teaching with an advantage. It is also possible that these instructors, if they have taken a sufficient number of courses online, might provide guidance for class sizes within the programs in which they teach. Collectively these studies indicate that instructors' perceptions about class size vary not only within studies, but also across studies, which is not surprising given the variables within and among studies also fluctuate.

Based on the failure of some neophytes to adapt to teaching online, Sieber (2005) offered a lengthy list of guidelines for teaching online based on learning process theory. The need to create such a document suggests a major issue in transitioning to online teaching, that of teaching

pedagogy. Sieber also pointed out, as did Orellana (2006), that the technology itself must be considered. Not all students, for instance, might have access to technology enhancements professors incorporate into their pedagogy. Moreover, students with limited computer skills or access to these newest features might experience frustration, counterproductive to learning (Sieber, p. 337). Sieber, thus, cautioned that "any administrator" who believes that with online course any single teacher can reach vast numbers of students who are out there yearning for an education" is "[n]aive, to say the least" (p. 337). In addition, the skill level and content-readiness of the student audience must also be considered.

Other studies have also supported the need to examine multiple variables and not class size in isolation in determining the optimal online conditions. Mupinga and Maughan's (2008) study of workload issues related to teaching online found inconsistencies across institutions in terms of desirable class sizes as well as the amount of time faculty devoted to teaching online as opposed to teaching the same course face-to-face. For example, Mupinga and Maughan (2008) offered this example. In one institution, online courses with 60 students each per semester was considered a full load, whereas at other institutions the formula used was one student in an online course was equivalent to 4 students in a face-to-face class (p. 19). Comparable to Orellana's (2006) findings, Mupinga and Maughan concluded that institutions need to set firm policies for workload related to teaching online and that conferring with other institutions was a starting point.

In that vein, Mupinga and Maughan (2008) undertook a study of varied institutions to determine class sizes, faculty workload, and incentives for teaching online, with the goal to facilitate policymaking for workload issues related to this form of teaching. Using data from one institution, the researchers cited 9 students per class as equitable based on a workload formula of

85-5-10 (teaching, research, and service) (p. 19). Based on data from 16 institutions, the majority of respondents (60%) reported that online class sizes were comparable to face-to-face ones (p. 19), though not necessarily the desired outcome. Mupinga and Maughan found that some institutions set limits, and for those that did, the mode for online class was found to be 25 students (p. 19). At one institution with a policy in place, the practice was to limit class size in specific disciplines based on course content and best-practices (Mupinga & Maughan, p. 20). Citing the Accrediting Council of Independent Colleges and Schools, Mupinga and Maughan noted that an instructor's teaching load should not "exceed 32 clock hours per week" with the exception of teaching one extra course a semester with appropriate compensation provided (p. 20). However, this formula was based on the traditional face-to-face format. Nevertheless, this same Council, as cited in Mupinga and Maughan, observed: "Teaching loads may differ when using alternative methods of instruction and must be commensurate with the type of delivery method offered" (p. 20). Conducting their research in 2008, Mupinga and Maughan determined: "The practices when calculating faculty workload vary with institutions; and no single formula to calculate teaching load specifically for distance education seems to exist. Besides, a perfect system for calculating faculty workload may not be possible" (p. 20). Like other researchers (Orellana, 2006; Sieber, 2005), Mupinga and Maughan concluded that the discrepant practices at institutions support the need "for a clear statement or guidelines" for what constitutes fair practice in teaching online (p. 20). In setting these guidelines, establishing class size limits will be one among other variables to consider. Although a perfect system may not exist, factors conducive to teaching have been identified in the studies, and the researchers have determined that faculty overall appreciate a desirable class size in terms of expected workload.

Whereas numerous studies have focused on faculty workload and faculty perception of

teaching online, one recent study (Burruss, Billings, Brownrigg, Skiba, & Connors, 2009) focused solely on student perception of enrollment in an online course. Burruss et al. surveyed 1,128 students enrolled in online nursing courses across seven institutions. Surveys were administered at the end of the course, which did not account for possible dropout. Students at both the undergraduate (BSN and RN-BSN, N=265) and graduate level (master's and doctoral, N=863) were surveyed regarding their perceptions of such variables as active participation in learning, student-to-student interaction, faculty-to-student interaction, connectedness with content activities, and professionalism. For the purpose of the study, class sizes were defined in ranges: 1-10, very small; 11-20 small; 21-30 small; 31-40 large; 41+ very large (p. 35). A significant difference was found between undergraduate and graduate student perceptions. For instance, undergraduates found medium size classes promoted more social presence than small classes, whereas graduate students found less social presence in medium size classes compared to small classes. Also, for undergraduates, as class size increased from small to medium, satisfaction increased (p. 39). For graduate students, the reverse was the case: satisfaction decreased as class size increased (p. 39), though Burruss et al. did not state if this comparison was between small and medium as defined in the study. These findings correlate with previous research that has found a difference between undergraduate and graduate class size recommendations. For instance, Colwell and Jenks (as cited in Burruss et al.) determined a desirable maximum for undergraduate classes to be about 20 students and 8-15 for graduate classes (p. 34). Elsewhere in this report, other instances of differences between ideal class sizes for online learning for undergraduate compared to graduate students are offered and support the contention that smaller class sizes for graduate courses may be appropriate. Although additional research comparing undergraduate and graduate class sizes can be expected in the future, the

findings to date also suggest the nature of the curriculum (basic versus in-depth content) as well as the student population are variables to take into consideration when formulating policies on class size.

In terms of delivery of content and participation or engagement, Burruss et al.'s (2009) research examined several factors related to connectedness, assumed to be critical components to student satisfaction with a course and learning outcomes. Connectedness in their study included student interaction, faculty-student interaction, and interaction with course activities or content. Across the sample, for both graduates and undergraduates, less connectedness was found in larger classes than smaller classes in terms of the various kinds of connectedness measured. Burrusss et al. concluded that group size must be sufficient enough to promote interactions, but not so large that a sense of connectedness is lost (p. 39). To that end, the researchers observed that too few students may not facilitate meaningful discussion and too many might make such discussion difficult to achieve (p. 39). In fact, graduate students in the study found that when class size was very large (41+), asynchronous discussion became "unwieldy" (p. 38). For graduate students, where career building can be assumed to be integral to enrollment in a program, the researchers suggested that although it might be appropriate to have larger classes for core courses, specialty course should remain small scale (p. 39), with the assumption inherent that within specialty courses some degree of career counseling and mentoring is expected. This outcome indicates that discussion of class size also needs to consider the content and purpose of the course. That is, class size as an isolated variable is null point in policymaking for determining the logistics for an online program of study. The particular course and its content, format, and desired outcomes need to be weighed.

Of note, in the Burruss et al. (2009) study, students across the sample, at both the

graduate and undergraduate, rated their online course experience as "satisfactory" irrespective of class size (p. 39). The researchers suspected that students electing to take a course online are predisposed to enjoy working in that kind of environment. In fact, one claim the researchers advanced was that students who had experience already taking an online course were "comfortable with managing their time and using the technology" and that their access to and the convenience of the technology may have well been a prime motivator for enrolling (p. 38). These points highlight the need to consider the nature of the audience when determining a suitable class size. Other studies (see Lee, 2010) have focused on pre-screening students before enrollment in an online course to determine their fit for this kind of learning environment.

A recent Educause document (2010) offers a compendium of research to date on distance education courses, and learning styles was raised as a key point in that document. The report, prepared by Lee, described many discrepancies across institutions in terms of how online courses were delivered and the nature of the programs, but also reached the conclusion that the success of programs hinged on both instructors' teaching styles and students' learning styles. These two variables were found to be more critical than examination of class size alone. The report detailed the use of a variety of learning style inventories, among them the Kolb's Learning Style Inventory (see Fahy & Ally, 2005). Use of this inventory revealed that students with a "convergent" learning style as opposed to an "accommodating" one fared better in online programs. As reported by Gagné Wager, Golas, and Keller (2005), and as also cited in Lee, because online learning environments tend to promote a more "collaborative" style of learning than a "hierarchical" one, learners who do not thrive in "systematic, linear environments" might be comfortable in online classes (p. 329). Based on findings of various learning style studies, Lee counseled institutional administrators to screen students for admissions into online

programs. In essence, the right combination of teaching approach and student learning style, assuming technology needs are met, can be said to be a strong indicator of success in online courses. This is not to say that class size, as in any situation, is not a determining factor, but rather to assert that just as some students can learn well in large classes face-to-face whereas others cannot, the same principle might abide in the online learning environment. Thus, policymaking regarding class size should also advance recommendations about the kinds of instructors suited for this format of delivery as well as types of students recruited for the programs. Students applying for admission to these programs might, therefore, partake in a validated learning style inventory to assess their potential for academic success.

Likewise, institutions should set up procedures for both screening and training faculty as well as consider the discipline and nature of the specific course. Lee and others (Orellana, 2006; Sieber, 2005; Simson, Smaldino, Albright, & Zvacek, 2003) have advocated for also consulting guidelines for class size based on recommendations offered by accrediting and field-specific professional organizations. For instance, in the field of composition studies, The National Council of Teachers of English and the Council of Writing Programs Administrators encourage administrators to cap writing courses at 20 students. Professional organizations such as these two are also likely to suggest guidelines for online classes once this format becomes more prevalent. That is, as online learning increases in popularity, accrediting bodies and professional organizations can be expected to set standards for class size as well as offer recommendations for establishing and assessing ideal learning environments and student outcomes. The popular *U.S. News and World Report* that ranks colleges already rates institutions in the category of online learning services and qualities, including providing class size data and accrediting data for online programs (see Ruth, 2006). Ruth, Sammons, and Paul (2007) write that potential students for

online programs are "already beginning to judge programs based on faculty, cost, accreditation, and technology" (p. 38). Given the push and pull between faculty and administrators, the weight of accrediting and professional organizations as well as the student process for selection of programs can be decisive factors in the livelihood of online programs. As Burruss et al. (2009) point out, faculty generally perceive online courses as requiring more of their time than face-to-face ones and thus advocate for small classes online, whereas administrators see based on increasing enrollment and not being bound by physical constraints that online courses "can increase [in size] without sacrificing quality" (p. 40). Thus, additional variables, as noted, for example professional standards and student needs, can assist in arriving at a faculty-administration consensus.

Based on the multitude of variables involved in teaching online, including the technology available, Orellana (2006) and others (e.g., see Mupinga & Maughan, 2008) have concluded that institutions should set policies for online teaching based on how they define faculty workload and institutional commitment to resource allocations (p. 243). Orellana has suggested that accrediting agencies clarify how they expect institutions to measure student outcomes, and then institutions should use those guidelines to establish appropriate class sizes for online courses (p. 243). Yet, Orellana also included that some accrediting agencies as early as 2004, such as The Accrediting Commission of Career Schools and Colleges of Technology, have already prescribed that schools set procedures for establishing teaching load, class size, time for course preparation for online courses (p. 232), and that the American Association of University Professors (AAUP) has recommended class sizes for online teaching correlate with "pedagogical considerations" (p. 233). Given the date of Orellana's work in 2006 and the fact that these agencies' prescriptions predate that work, newer recommendations based on more current information about online

learning are also in order. Thereby, Orellana is correct to assert that institutions should keep abreast of current guidelines from accrediting bodies. Even as early as 2003, Simonson, Smaldino, Albright, and Zvacek cautioned that because accreditation is the means by which institutions of higher education are evaluated for quality, accreditation standards will have to take into account the means by which institutions implement distance education courses. Thus, institutions should not work alone in establishing guidelines and policies and should consult accrediting bodies' recommendations and professional standards, as well as consider the varied other elements known about faculty working conditions and optimal student learning experiences when instituting online learning criteria such as recommended class sizes.

To conclude, given this report was an investigation of class size and online learning classes, based on the data collected, it can be asserted that online classes for undergraduate programs can run reasonably well with enrollments between 15 and 22 (assuming a degree of healthy interactions among students, with the instructor, and with the very content are expected), whereas graduate courses probably fare better with slightly less enrollment, with approximately 15 students considered suitable (to facilitate in-depth discussion and some degree of instructor-to-student mentoring and professional counseling). Moreover, a few sources suggested that neophytes to teaching online might start with smaller classes of 12 enrolled students, though this number could increase in subsequent semesters.

The literature reviewed did not address the intersection of class size and duration of course (e.g., standard 15-week semester or another variation); the relationship between forms of media delivery and class size (e.g., video lecture capture, podcasts, videoconferencing, Skype, platform—i.e., Blackboard, Moodle, Mahara); and, specifically the number of instructors teaching the course (e.g., single instructor, team-taught, teaching assistant-linked to instructor),

though it might be assumed that in most cases one professor taught the course. Assuming this was the case, reasonable questions about course load and working conditions are not unexpected, thereby suggesting concerns about class size. Moreover, the standard formula used for face-to-face instruction of students devoting two hours outside of class time for every hour in class was not addressed as to how this translates into online learning and the implications therefore for the instructor or class size. The issue of learning style—independent versus collaborative—though was raised, and it would seem that a class size conducive to learning online might also be affected by how much time students are willing to devote to their learning.

Still, as we examine the relationship between online learning and class size, we also must be mindful that as the technology evolves and as both students and instructors become more technologically savvy—including students at a younger and younger age adapting to working online—and more and more courses are offered online, the complexion of online learning in the future is a moving target. Mindful of a learning process in motion, institutions should examine their practices periodically and make adjustments accordingly and continue to keep abreast of the research in the field. Lastly, the nature of the curriculum and desired learning outcomes, as is the case for any wise educational decision-making, should be kept paramount. There is no magic, uniform, ideal number for a minimum or maximum number of students in a class. An institution needs to consider what is best for its students in keeping with best professional and educational practices. At this point, only tentative recommendations can be made, and those need to consider class size in light of an array of pertinent variables, only some of which have been identified in this report.

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