Research on Determining the Appropriate Size of Online Classes
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The exponential increase in courses and programs delivered by institutions of higher education in the past decade has been driven by the promise of expanding access to students previously beyond the reach or the capacity of colleges and universities to serve. The physical structure of an institution has been eliminated as a factor in limiting enrollment, and therefore, income possibilities. At the same time, institutions must be concerned with maintaining quality and meeting accreditation standards. Determining optimum class size is critical both to controlling costs and preserving quality. This paper summarizes research pertinent to determining online class size, and planning appropriate faculty workload and compensation. The purpose of the paper is to inform future decisions about staffing IPFW's distance education courses and programs.

Is the concept of class size relevant to the online classroom environment?

The Colorado Online Education Programs Study committee questioned whether a "class" exists in the online environment (2002). In a physical classroom environment, the class size determines the amount and nature of teacher-student interaction, the management of the classroom, and the nature and degree of individualized instruction that will take place. In an online setting, communication is largely asynchronous with the effect that the "class" becomes a collection of individuals, each of whom interacts with the teacher separately, rather than in an assembled group. The Colorado educators suggest that speaking in terms of the number of students that a teacher is "responsible for", or "teacher load", might be a more accurate term. The committee delineates the use of teacher load vs class size between full-time and part-time teachers. It states that where faculty are full-time teachers, their entire workload is managed through the institution. In the case of part-time teachers, "the use of class size might be a better measure of the teachers' online workload" because there are other activities competing for their time, outside of their institutional responsibilities.

American Association of University Professors states the issue of ideal class size in terms of the "faculty-student ratio" that will produce "substantial interaction among students and faculty" (Euben, 2000). The AAUP acknowledges the temptation for universities to create "mega-courses" in order to "make as much money as possible." It cautions that the student-faculty ratio must be considered first in spite of the fact that technology facilitates many more students than a face-to-face course might.

Faculty and student class size preferences

Studies of the connection of class size to student achievement, in higher education have been inconclusive (Borden and Burton, 1999, cited in Orellana). What has been found is that both faculty and students prefer smaller classes (McKeachie, 1980). The issue of preference is significant because it is related to satisfaction. Most current studies of online teaching and learning accept, either implicitly or explicitly, that without satisfaction, the online format is unsustainable. In higher education, faculty believe that smaller class sizes enable greater interaction with the instructor, increase the quality of evaluating student work, and insure timely evaluation. Large online classes are of particular concern to IPFW because large classes (50 or more students) have a higher failure and withdrawal rate overall, from a low of 25% for large face-to-face classes to a high of 35% for Internet courses, than the mean failure and withdrawal rate for all courses (18%).

Kyngma and Keefe (2006), in studying student evaluations of both campus and online courses in Information Studies at Syracuse University from 2003 to 2004, and controlling for different instructors teaching different courses, found that highest student satisfaction with online courses was reached at a class size of 23-25 students. Lower evaluations were obtained at larger class sizes. Lower evaluations also occurred at enrollments of 10 or less, highlighting another observation made by other researchers that too small a class size is also detrimental to useful interaction and group work.

Orellana (2006) studied faculty perceptions of optimal online class size to promote the highest level of interaction. The 131 faculty participants in this study were asked to use a validated rubric for characterizing the interactivity of their online courses. Most were able to categorize their courses as highly interactive. The average actual class size for members of the respondent group was 22.9. Based on the highly interactive nature of their courses, though, these faculty believed that 19 would have been the optimal class size. The researcher also concluded that 15 was a minimum class size to insure the correct level of interaction with the instructor and among students.

Does teaching online take more time?
A fundamental question that has come to light in pursuit of an answer to the question of how much time it takes to teach a course online is the question of how much time it actually takes to teach a face-to-face class. Studies of time spent on teaching courses are rare (Plater, 1995, cited in Dibiase and Rademacher, 2005). Faculty workloads may be computed on the basis of 10 to 12 hours a week, including lectures, preparation and meetings with students. A more useful metric to use when comparing faculty time usage in a face-to-face course to an online course in which there are no class meetings, however, might be actual time expended per student, including communication with the individual student and evaluation. Despite vigorous disagreement by some faculty, Boettcher reports 2 hours per student per semester as a reasonable estimate (in press). The researchers cited in this paper reported per student rates of 2.5 to 6.0 hours connected with face-to-face classes.

Large (over 50 students, for the purposes of this paper) face-to-face classes take more time to teach than smaller ones, simply because there are more students. If teaching online takes more time, the reasoning goes, then the time needed to teach a large online class ought to be multiplied by a factor representing the online "more time" differential. Does this reasoning hold up? (Note: This paper does not address the time needed to develop an online course.)

The often referred to NEA report about online education (2000) was very influential in shaping policies toward workload and compensation in that it supported the conventional wisdom that teaching online takes much more time than team face to face. DiBiase (2000) points out, however, that this conclusion was based on 53% agreement with the premise, and 44% who agreed that online teaching took as much as or less time as face-to-face. The AAUP Special Committee on Distance Education and Intellectual Property Issues (Euben, 2000) stated that "Interaction with students takes double the time in an online course that it would take in a face-to-face course, according to faculty who have taught both ways." Like many studies performed at the turn of the century, the conclusion of these reports depended on anecdotal evidence. As online delivery of university courses and programs have matured, however, a greater understanding of the relevant variables has developed. Research performed over the last several years, controlling for key variables such as instructor experience and style, class size, content, and course level, both contradicts and supports the conventional wisdom.

Visser (2000, cited in Hislop and Ellis), Hislop and Ellis (2004), Zuckweiler, Schneiderjans, and Ball (2004), Tomei (2004), and Dibiase and Rademacher (2005), are examples of studies based on tracking the actual time spent teaching online and face-to-face courses. Visser's case study of his own experience teaching a distance course involving both the web and videoconferencing showed that more time and effort were required to teach online, as did the Zuckweiler, Schneiderjans, and Ball (2004) study. Visser's study included development time. He estimated that he spent double the time in development of the distance course that he spent on his face to face courses (415 hours compared with 223 hours). He observed, however, that he reduced by 13% the time he spent teaching the course. In the Zuckweiler, Schneiderjans, and Ball (2004) study, 90% of the time logged was spent responding to student email. These researchers noted that time was saved by not having to drive to campus and that, over time, the faculty in the study reduced email handling time by 25 to 30%. Tomei's study, conducted in 2001 with two sections of the same 15-week graduate level course, each with 11 students enrolled in either face-to-face, once a week format or an online format, showed that he spent 136.5 hours with the face-to-face students and 198.13 hours with the online students. He also computed a "target" allowable time per course of 170 hours, based on a ratio of 85% of total faculty time allotted for teaching at his institution (Tomei, 2004). The other studies, again based on teachers conducting the same course in both an online and face-to-face format, did not find a significant difference in the amount of time spent per student between face-to-face and online delivery modes (Hislop and Ellis, 2004; Dibiase and Rademacher, 2005).

In his first study comparing online and classroom delivery methods, Dibiase (2000) found that he spent 2.7 hours per student in the online mode, compared with 3.2 hours in the classroom mode. There was an average of 112 students in his classroom (twice during the study period) and an average of 18 students in his online class (given 4 times during the study period). He observed that that he attended to his online class 5 days a week as compared with 4 days a week for his classroom students. In a second study, involving the same course and the same instructor, in which online enrollments increased by a factor of nearly 3 (averaged enrollment of 49), Dibiase and Rademacher (2005) found that the time spent per student averaged 2.4 hours, even when factoring in the work of a graduate student. They also found that student evaluations of the online course remained as the same levels as the previous iteration with 1/3 the enrollment.

Hislop and Ellis compared 7 pairings of online and classroom versions of the same course taught by the same instructor (2004). In four of the pairings, time spent per student was greater for the classroom delivery than for the online mode. Time spent per student ranged from3.5 to 5.3 hours for online delivery, and 3.3 hours to 7.3 hours for classroom delivery. One pairing was eliminated from study because of errors in record keeping.

Hislop and Ellis (2004) also focused on the pattern of faculty effort. For example, they found some class activity logged on an average of 55 days in the semester for an online class, while some class activity was logged on only 41 days in the semester for the classroom based course. The overall average total of activities during the semester for the online class was 141, while there the average for the face-to-face course was 79. The average length of the activities tended to be shorter. There was activity on each day of the week, but the researchers observed a shift of half an hour of activity to Friday for the online. The classroom-based course had more activity earlier in the week. Hislop and Ellis speculate that part of the reason faculty perceive that online courses take more time may be due

to the different rhythm of online teaching: it seems like one is always "on", and that one is working at times that one is accustomed to not working.

Schifter (2000) echoed this view: "there is more potential to 'always be in session'", and thus the perception of "taking more time." She points out, too, that teaching online requires adopting a different pedagogical framework, in which students have more control. It takes time to master new methods.

Faculty may perceive that online teaching is more work because of they may type less well than they talk (Hislop and Ellis, 2004). Michael Atwood, a Human Factors faculty member at Drexel commented in 2000, "'For most, typing takes both more effort and more time than speaking. When the time and effort allocated for communicating are met, communication ends'"(Hislop and Atwood, 2000, p. 224). Patching up the misunderstandings that result from "crossed emails" is an example of wasted time and effort that strengthens the perception of online teaching as more work. Lastly, Hislop and Ellis (2004) suggest that if faculty enjoy teaching online less than classroom teaching, their negative attitude helps them perceive online teaching as more work.

"Ideal online class size"
Most of those writing on the issue of class size in online teaching agree that there is no ideal online class size. In its Distance Education Guidelines for Good Practice, published in May 2000, the American Federation of Teachers states that

> Class size should be established through normal faculty channels to insure that educational rather than bureaucratic or financial considerations drive the process, and
>
> Class size should encourage a high degree of interactivity. Given the time commitment involved in teaching through distance education, smaller class size should be considered, particularly at the inception of a new course (p. 11).

On the other hand, Colwell and Jenks (2004) report class sizes between 20 and 30 as the most frequently cited as a general "rule of thumb" for setting a good class size; the size of online graduate classes, as 10 to 15 students. Robert Colley, Associate Dean of Syracuse University Continuing Education/University College warns that "over 25 we proceed with extreme caution" (Colley, 2007).

Tomei (2004) concluded that the ideal class size for his graduate level education course, when given face-to-face, would be 17 students (6 more than were actually enrolled during the period of his study), and 9 students (2 less than were actually enrolled during the period of his study). He based his calculations on a workload ideal of 170 of faculty time per course, with a workload of 3 courses of any type.

Kingma and Keefe report that student evaluations of online teaching for courses in which 15 to 25 students were enrolled were higher that for courses with lower or higher enrollment (Kingma and Keefe, 2006).

Determining Appropriate Online Class Size

There is general agreement that a well-designed course will help both faculty and students make the most of their time and effort. Class size is first of all, an instructional design variable. Judith Boettcher, an educational consultant and researcher frequently quoted on this issue, states the key variables in determining "ideal" class size for a given online course (in press). They are:

- Goals and objectives of a course
- Infrastructure and tools
- Features and design of the tools
- Experience of faculty
- Age and experience of students
- Assessment strategies
- Overall faculty workload

Dibiase and Rademacher (2005) identify four of these variables as having the most influence on the efficiency and satisfaction of online courses: student maturity, instructor experience, pedagogical approach (e.g., discussion-based, problem-based, writing-based), and institutional support.

Boettcher (in press) suggests a step-by-step process for determining an ideal class size for any particular online class.

- Start with what the class size would be on campus, including the instructional team and support for the class.
- Evaluate the goals and objectives of the course, including teaching, learning and assessment strategies
- Evaluate the infrastructure and tools for the delivery and support of the class
- Evaluate the readiness and experience of the faculty member/team
- Increase or decrease class size or instructional team based on this analysis.

The table below summarizes the key variables and their general effect on class size. It is based on the preceding research, instructional design, and general experience. The table is only a starting point and is subject to all sorts of exceptions. Note also that Boettcher recommends either a change in class size or a change in the instructional team. If there is more support in place, and if it is well-coordinated, a higher class size could be accommodated.

Heuristic table for estimating appropriate online class size

Class size on campus	Average class size	starting #
	Grader/Asst available	+ students
	Design support	+ students
	Technical support	+ students
	Mentor/collegial support	+ students
Goal of course (may be mixed within a course)	Preparation for licensing, passing a standardized exam	+ students

	Culminating experience	- students
	Application of theory to practice	- students
	Required for major	- students
	Foundation for a sequence	- students
Content type **(may be mixed within a course)**	Declarative knowledge (facts, principles, theories)	+ students
	Critical thinking, problem-solving	- students
	Experiential, reflective	- students
Primary teaching strategies	Discussion among students	- students (but at least 10)
	Team projects (team = at least 3)	- students (but at least 10)
	Writing	- students
	Reading	+ students
	Quizzes and classroom assessments	+ for objective, – for essay or discussion
	Lecture (video, reading, audio)	+ students
	Service, internships (mixed mode delivery)	- students
	Tutoring, individual coaching	- students
Assessment strategies	Objective tests	+ students
	Essay tests/papers/other writing	- students
	Portfolio assessments	- students
	Validated rubrics in use	+ students
	Individual projects	+ students
	Team projects	- students
Tools & Infrastructure	Faculty member has DSL or FIOS, home computer	+ students
	Students have DSL or FOS, home computer	+ students
	Highly reliable LAN, network, hardware/software systems	+ students
	WebCT (has many excellent features, also clunky design)	+ or – depending on attitude

	Technical support available 24/7	+ students
	Course templates available	+ students
Faculty Experience/Workload	2 semesters of online experience	+ students
	Never taught online	- students
	Taught this course at least once before	+ students
	Already teaching another online or distance course OR already responsible for 90-100 students	- students
	Type > 40 wpm	+ students
	High general comfort level with technology	+ students
Student experience, maturity, support	Traditional age students (18-21) (these students expect and need interaction, guidance, coaching, and operate in a culture of social networking)	- students
	Graduate, adult (>21) students (based on high motivation, self-directed profile of typical grad student; also, these students may not have time for highly interactive course)	+ students
	Support available 24/7 through a variety of means (chat, texting, phone, email, in-person)	+ students
	Self-help materials available in multiple media	+ students
	Students have high level of skill in using software to create and evaluate information, not just to receive information	+ students
	Students are able to troubleshoot and problem solve technical problems	+students

Remuneration for large online classes

Recommendations of the Special Committee on Distance Education and Intellectual Property Issues of the Association of American University Professors (Euben, 2000) appear below.

"A. Faculty Workload/Teaching Responsibility

"… Anecdotal evidence 'suggests that investment of faculty time involved in teaching a distance education course is substantially greater than that required for a comparable traditional course. The

time spent on-line answering student inquiries is reported as being more than double the amount of time required in interacting with students in comparable traditional classes.' AAUP, Special Committee on Distance Education and Intellectual Property Issues: Sample Language for Institutional Policies and Contract Language (Dec. 3, 1999).

In terms of enrollment, class size should be based on pedagogical considerations, and '[l]arge sections should be compensated by additional credit in load assignment in the same manner as traditional classes.' The AAUP-Rider University contract provides: 'Enrollment maximums for Distance Learning Courses will be no greater than for the same or similar level courses offered by that department or program.' Art. XXVI, 3.e.

The extra time required by faculty to prepare distance education courses should be additionally compensated either financially or the form of a credit toward load assignment.

Furthermore, faculty regular in-the-office hours for those teaching on-line courses may not be helpful to students; accordingly, faculty members may determine whether some of the expected office hours may be held on-line.

Moreover, that assignment of faculty to distance-education courses should be voluntary, not mandatory. The current AAUP-Rider University Contract provides: 'No faculty member will be required to develop or teach a Distance Learning Course.' Article XXVI, c.

Accordingly, distance-education offerings should not reduce on-campus offering to the point where a faculty member must teach distance-education courses to teach a full load.

As discussed above, these issues should be addressed in writing in collective bargaining agreement policies, faculty contracts and/or institutional policies before the commencement of such work."

Resources
Extensive, research-based resources for optimizing class size can be found at the TLT Group web site at http://planning.tltgroup.org/ClassSizeFall2006/links.htm.

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